Program Educational Objectives:

Bachelor of Electrical and Electronics Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

1. have successful professional and technical career
2. have strong foundation in basic sciences, mathematics and computational platforms
3. have knowledge on the theory and practices in the field of electrical power engineering and allied areas
4. engross in life-long learning to keep themselves abreast of new developments
5. practice and inspire high ethical values and technical standards

Program Outcome:

a) Ability to apply knowledge of mathematics, sciences and engineering
b) Ability to understand and apply basic theorems and postulate in circuit, field and control theories
c) Ability to identify, formulate and solve electrical power engineering problems
d) Ability to analyse and apply electronics in the field of electrical power apparatus and systems
e) Ability to understand and apply computational platforms and software tools for engineering applications
f) Ability to understand ethical and professional responsibilities
g) Ability to communicate effectively and work in interdisciplinary groups
h) Ability to review, comprehend and report technological development
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# ANNA UNIVERSITY, CHENNAI
## UNIVERSITY DEPARTMENTS
### B.E. ELECTRICAL AND ELECTRONICS ENGINEERING
#### REGULATIONS – 2015
##### CHOICE BASED CREDIT SYSTEM
###### CURRICULA AND SYLLABI I - VIII SEMESTERS

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EMPOYABILITY ENHANCEMENT COURSES (EEC)
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COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students’ communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I   GREETING AND INTRODUCING ONE SELF                            12
Listening- Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/ friend; Reading – Skimming a passage– Scanning for specific information; Writing- Guided writing - Free writing on any given topic ( My favourite place/ Hobbies/ School life, writing about one’s leisure time activities, hometown, etc.); Grammar – Tenses (present and present continuous) -Question types - Regular and irregular verbs; Vocabulary – Synonyms and Antonyms.

UNIT II  GIVING INSTRUCTIONS AND DIRECTIONS                           12
Listening – Listening and responding to instructions; Speaking – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text - Critical reading - Writing –Process description( non-technical)- Grammar – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - Vocabulary – Compound words – Word formation – Word expansion ( root words).

UNIT III   READING AND UNDERSTANDING VISUAL MATERIAL                          12
Listening- Listening to lectures/ talks and completing a task; Speaking –Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative);Grammar – Tenses (perfect), Conditional clauses –Modal verbs; Vocabulary –Cause and effect words; Phrasal verbs in context.

UNIT IV  CRITICAL READING AND WRITING                            12
Listening- Watching videos/ documentaries and responding to questions based on them; Speaking Informal and formal conversation; Reading –Critical reading (prediction & inference);Writing–Essay writing ( compare & contrast/ analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference); Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V  LETTER WRITING AND SENDING E-MAILS                           12
Listening- Listening to programmes/broadcast/ telecast/ podcast; Speaking – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; Reading –Extensive reading; Writing- Poster making – Letter writing (Formal and E-mail) ;Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary –Collocation;
TEACHING METHODS:
Interactive sessions for the speaking module.

Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

LEARNING OUTCOMES:
- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

REFERENCES:
COURSE OBJECTIVES

• The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.

• To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

• To familiarize the student with functions of several variables. This is needed in many branches of engineering.

• To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I  DIFFERENTIAL CALCULUS  12
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II  FUNCTIONS OF SEVERAL VARIABLES  12

UNIT III  INTEGRAL CALCULUS  12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV  MULTIPLE INTEGRALS  12

UNIT V  DIFFERENTIAL EQUATIONS  12
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

TOTAL :  60 PERIODS

COURSE OUTCOMES

• Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.

• Improved facility in algebraic manipulation.

• Fluency in differentiation.

• Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.

• Understanding the ideas of differential equations and facility in solving simple standard examples.
TEXT BOOKS

REFERENCES

PH 7151
ENGINEERING PHYSICS
(Common to all branches of B.E / B.Tech programmes)

OBJECTIVE:
• To introduce the concept and different ways to determine moduli of elasticity and applications.
• To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications
• To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics
• To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors
• To establish a sound grasp of knowledge on the basics, significance and growth of single crystals

UNIT I  PROPERTIES OF MATTER  9

UNIT II  ACOUSTICS AND ULTRASONICS  9

UNIT III THERMAL AND MODERN PHYSICS 9

UNIT IV APPLIED OPTICS 9

UNIT V CRYSTAL PHYSICS 9
Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS

OUTCOME:
• The students will understand different moduli of elasticity, their determination and applications.
• The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics
• The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
• The students will gain knowledge on interferometers, lasers and fiber optics
• The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXTBOOKS:

REFERENCES:
COURSE OBJECTIVES

- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I  POLYMER CHEMISTRY  9
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II  SURFACE CHEMISTRY AND CATALYSIS  9

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY  9

UNIT IV  CHEMICAL THERMODYNAMICS  9
Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtzand Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V  NANO CHEMISTRY  9

TOTAL: 45 PERIODS
COURSE OUTCOMES

- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXT BOOKS


REFERENCES


GE7151 COMPUTING TECHNIQUES

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Common to all branches of Engineering and Technology

OBJECTIVES:

- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION

Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS


UNIT III ARRAYS AND STRINGS


23
UNIT IV  POINTERS
Macros - Storage classes – Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V  FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL: 45 PERIODS

OUTCOMES
At the end of the course, the student should be able to:
- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort.
- Use programming language to solve problems.

TEXT BOOKS

REFERENCES

BS7161  BASIC SCIENCES LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of liquids.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc - Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box - Determination of Band gap of a semiconductor.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

OUTCOME:
Upon completion of the course, the students will be able
- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY:
(Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
9. Estimation of iron content of the water sample using spectrophotometer.
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXTBOOKS
• To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
• To learn to use user defined data structures.

LIST OF EXPERIMENT
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function
10. Program using structures and unions.

TOTAL : 60 PERIODS

OUTCOMES
At the end of the course, the student should be able to:
• Write and compile programs using C programs.
• Write program with the concept of Structured Programming
• Identify suitable data structure for solving a problem
• Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
30 Systems with C compiler

MA7251 MATHEMATICS – II
4 0 0 4

(Course common to all branches of B.E. /B.Tech. Programmes in II Semester)

COURSE OBJECTIVES
• To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
• 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 of the 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.

UNIT I MATRICES
12
UNIT II  VECTOR CALCULUS
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III  ANALYTIC FUNCTION
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z+c, az, \frac{1}{z}$ - Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION

UNIT V  LAPLACE TRANSFORMS

TOTAL : 60 PERIODS

COURSE OUTCOMES
Upon successful completion of the course, students should be able to:
- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXT BOOKS

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

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING 14

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14
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 trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14
Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15
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 and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3
Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS
OUTCOMES:
On Completion of the course the student will be able to
- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, planes and solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.
OBJECTIVE:
The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I  
STATICS OF PARTICLES  
12

UNIT II  
EQUILIBRIUM OF RIGID BODIES  
12

UNIT III  
DISTRIBUTED FORCES  
16
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV  
FRICITION  
8

UNIT V  
DYNAMICS OF PARTICLES  
12

L – 45 + T – 15 TOTAL: 60 PERIODS

OUTCOMES:
- Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

REFERENCES

EE7201 ELECTRIC CIRCUIT ANALYSIS

COURSE OBJECTIVES

- To make the students to understand the concept of circuit elements, lumped circuits, waveforms, circuit laws and network reduction techniques. To analyze the, series and parallel AC circuits, and to solve problems in three phase circuits.

UNIT I INTRODUCTION
9
Types of sources; relation between voltage and current in network elements; concept of active, passive, linear, nonlinear, unilateral, bilateral, lumped, distributed elements; Kirchhoff's laws and their application to node and mesh analysis of networks. Concept of tree, branch, cotree, link, loop, and cutset. Problems involving D.C. circuits only.

UNIT II NETWORK REDUCTION TECHNIQUES AND NETWORK THEOREMS
9
Series parallel circuits; star, delta and reverse transformation; superposition, reciprocity, compensation, Thevenin’s, Norton’s, Millman’s and maximum power transfer theorems; principle of duality. Problems involving D.C. circuits only.

UNIT III AC CIRCUITS
9
Basic definitions; phasors and complex representation; RMS, Average value, form factor peak factor- AC signals; solution of RLC networks; power and energy relations; application of Kirchhoff’s laws, Thevenin’s, Norton’s, Maximum power transfer theorems to A.C. circuits.

UNIT IV RESONANCE AND APPLICATIONS
9

UNIT V THREE PHASE CIRCUITS
9
Three phase balanced / unbalanced voltage sources phase sequence – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL : 45 PERIODS

COURSE OUTCOMES

- Learners will be able to analyse the electric circuits with DC and AC excitation by applying various circuit laws.
TEXT BOOKS

REFERENCES

EC7252 ELECTRON DEVICES AND CIRCUITS L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
• Be familiar with the structure of basic electronic devices.
• Be exposed to the operation and applications of electronic devices.

UNIT I PN JUNCTION DEVICES 9
PN junction diode –structure, operation and V-I characteristics, diffusion and transient capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diode-characteristics-Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS 9
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS 9
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response – MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

TOTAL: 45 PERIODS

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

32
• Explain the structure of basic electronic devices.
• Design applications using basic electronic devices

TEXT BOOKS:

REFERENCES:

GE7162

ENGINEERING PRACTICES LABORATORY (Common to all Branches of B.E./B.Tech. Programmes) 0 0 4 2

COURSE OBJECTIVES
• To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES

PLUMBING
• Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
• Laying pipe connection to the suction side of a pump.
• Laying pipe connection to the delivery side of a pump.
• Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK
• Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY
• Study of joints in door panels and wooden furniture
• Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES

• Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
• Stair case light wiring
• Tube – light wiring
• Preparation of wiring diagrams for a given situation.
• Study of Iron-Box, Fan Regulator and Emergency Lamp
GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICES
   WELDING
   • Arc welding of Butt Joints, Lap Joints, and Tee Joints
   • Gas welding Practice.
   • Basic Machining - Simple turning, drilling and tapping operations.
   • Study and assembling of the following:
     a. Centrifugal pump
     b. Mixie
     c. Air Conditioner.

   DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES
   • Soldering simple electronic circuits and checking continuity.
   • Assembling electronic components on a small PCB and Testing.
   • Study of Telephone, FM radio and Low Voltage Power supplies.

   TOTAL: 60 PERIODS

COURSE OUTCOMES
• Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
• Ability to use welding equipments to join the structures
• Ability to do wiring for electrical connections and to fabricate electronics circuits.

EE7211 ELECTRIC CIRCUITS LABORATORY

COURSE OBJECTIVES
• To impart hands on experience to understand the various electric circuit laws and theorems

LIST OF EXPERIMENT
1. Experimental verification of Kirchhoff’s voltage and current laws.
2. Experimental verification of network theorems (Thevenin’s, Norton’s, Superposition and maximum power transfer Theorem, reciprocity theorem).
3. Study of CRO and measurement of RMS voltage, frequency and power factor.
4. Experimental determination of time constant of series RL, RC circuits.
5. Experimental determination of frequency response of RLC circuits.
6. Design and Simulation of series resonant circuits.
7. Design and Simulation of parallel resonant circuits.
8. Simulation of three phase balanced and unbalanced star & delta connected networks.
9. Experimental determination of power in a three phase circuits by two-watt meter method.
10. Calibration of single phase energy meter.
11. Steady state analysis of series RL and RC circuits

   TOTAL: 60 PERIODS

COURSE OUTCOMES
• Students are exposed to experimental knowledge on analysing the function of electric circuits.
OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- 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 in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I  PARTIAL DIFFERENTIAL EQUATIONS  12

UNIT II  FOURIER SERIES  12
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

UNIT III  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION  12
Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in cartesian coordinates.

UNIT IV  FOURIER TRANSFORM  12

UNIT V  Z – TRANSFORM AND DIFFERENCE EQUATIONS  12

TOTAL : 60 PERIODS

OUTCOMES :

- The students can able to solve the partial differential equations , find the Fourier series analysis and solve the problems by using Fourier transform and Z transform techniques.
TEXTBOOKS:

REFERENCES:

EE7301 DIGITAL SYSTEMS AND MICROCONTROLLERS LT P C 3 2 0 4

OBJECTIVES:
• To introduce the fundamentals of Computational Digital System Technologies
• To introduce digital simulation techniques for development of application oriented logic circuits.
• To study the Architecture, addressing modes & instruction set of 8085 and 8051 and to develop skills in writing simple programs.
• To introduce commonly used peripheral interfacing ICs.
• To study and understand the typical applications of micro-controllers

UNIT I DIGITAL LOGIC FAMILIES 9
Introduction to Digital Logic for Design of adder, subtractor, comparators, code converters, encoders, decoders – Introduction through Comparison to Logic families: RTL ad DTL circuits, TTL, ECL, CMOS family- Basics of Programmable Architectures- PROM, PLA, PLD, FPGA.

UNIT II 8085 PROCESSOR AND ITS PERIPHERAL INTERFACING 9

UNIT III PROGRAMMING FUNCTIONALS IN PROCESSORS 9
Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions, stack.
UNIT IV MICRO CONTROLLER 8051  

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS  
Simple programming exercises - key board and display interface – Manipulation, Control of Temperature control system - stepper motor control.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:
• Ability to analyse, comprehend, design and simulate microprocessor and microcontroller based systems used for control and monitoring.

TEXT BOOKS:

REFERENCES:

EE7302 ELECTROMAGNETIC THEORY LT P C 4 0 0 4

OBJECTIVES:
To impart knowledge on the concepts and the computation of Electro-magnetic fields which is essential for understanding the working principle, design and analysis of Electrical machines and Systems.

UNIT I ELECTROSTATICS I 12
Sources and effects of electromagnetic fields, Vector fields, Vector Calculus- Gradient, Divergence, Curl – theorems and applications. Coulomb’s Law – Electric field intensity – Field due to discrete and continuous charges – Gauss’s law and applications.

UNIT II ELECTROSTATICS II 12
UNIT III  MAGNETOSTATICS  12
Lorentz force, magnetic field intensity (H) – Biot– Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, Scalar and vector potential, Poisson’s Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV  ELECTRODYNAMIC FIELDS  12

UNIT V  ELECTROMAGNETIC WAVES  12

TOTAL: 60 PERIODS

OUTCOMES:
• Ability to understand Electro-magnetic field theory and apply them for modelling and analysis of electrical equipment.

TEXT BOOKS:

REFERENCES:

EE7303 NETWORK ANALYSIS AND SYNTHESIS  LT P C 4 0 0 4

OBJECTIVES
• To analyse the relationship between various two port parameters, ladder and lattice networks.
• To analyse the transients in electrical networks with DC and AC excitation
• To synthesise RL, RC & RLC networks by Foster and Cauer form
• To design different types of passive filters.
UNIT I  INTRODUCTION TO GRAPH THEORY  12
Linear Graphs in Electrical Networks, Basic Definitions, Incidence, Loop and cut-set matrices, Fundamental Loop and Fundamental Cut-Set Matrices, Graph Theoretic version of KCL and KVL, Loop Impedance and Node Admittance Matrices, Duality in Electrical Networks.

UNIT II  TWO PORT NETWORK  12
Network functions - Poles and Zeros of network functions - Complex frequency - Two port parameters Z,Y,H and ABCD - Scaling network functions -T and π equivalent circuits - Bridged networks - Analysis of ladder and lattice networks - Coupled circuits as two port network - Tuned circuits.

UNIT III  TRANSIENT RESPONSE OF RLC CIRCUITS 12
Transient response of RL,RC,RLC, circuit for DC input and AC input with sinusoidal excitation.

UNIT IV  TRANSFER FUNCTION SYNTHESIS  12
Properties of LC,RL,RC driving point functions, Synthesis of driving point LC,RC and RL functions - Foster and Cauer forms- Synthesis of transfer admittance, transfer impedance with a one ohm termination - Synthesis of constant-resistance network.

UNIT V   DESIGN OF FILTER  12
Design of filters -Low pass filters, high pass filters, band pass filters, band reject filters, Butterworth filters, m-derived filters, constant k-filters

TOTAL: 60 PERIODS

OUTCOMES
• Students can have the ability to analyse various electrical networks in steady & transient states and also equipped to design various types of filters.

TEXT BOOKS

REFERENCES
ME7355                          POWER PLANT ENGINEERING                 LT P C
3 0 0 3

OBJECTIVES:
- To understand the working of power plants and analyse their performance.
- To learn the economics of power generation.

UNIT I HYDRO POWER PLANTS

UNIT II COAL, OIL AND GAS TURBINE POWER PLANTS

UNIT III NUCLEAR POWER PLANTS

UNIT IV RENEWABLE ENERGY POWER PLANTS

UNIT V ECONOMICS OF POWER GENERATION

OUTCOME:
Upon completion of this course the students will be able to:
- Understand the working of different power plants
- Arrive at cost of power generation, electricity billing and rate of return on power plant investments

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To obtain the characteristics of electronic devices and amplifier circuits
- To simulate electronic circuits using standard software packages

LIST OF EXPERIMENTS
1. PN Junction and Zener diode V-I Characteristics
2. Line and load regulation in Zener regulator
3. Common Emitter characteristics
4. JFET – characteristics and parameter determination
5. CE Amplifier frequency response
6. Common Source amplifier
7. Wien bridge oscillator
8. Characteristics of Differential amplifier

TOTAL: 60 PERIODS

OUTCOMES:
- Operating principles, characteristics of semiconductor devices are studied, simulated and verified.
- Features of amplifiers and oscillators are verified.

OBJECTIVES:
- To learn graphical representation of fields (using Mathematical Development Tool) and Electromagnetic Field Computation using FEM packages.

LIST OF EXPERIMENTS:
Graphical Representation of fields (using Mathematical Development Tool)
1. Plotting of vector, divergence and curl fields
2. Plotting of electric field and equipotential lines
3. Plotting of Magnetic fields

Computation of Electric (E) and Magnetic (H) fields (using FEM/FDM packages) for simple configurations
5. Computation of Electric field intensity, voltage distribution and capacitance
6. Computation of Magnetic field intensity and inductance
7. Calculation of Skin depth
Measurement using field meter

8. Measurement of Electric Fields (E)
9. Measurement of Magnetic fields (H)
10. Measurement of E and H around practical appliances

TOTAL: 60 PERIODS

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS:

1. 15 computers with FEM and Mathematical Development Tool packages
2. Electromagnetic field meters

OUTCOMES:
- Ability to compute Electric (E) and Magnetic (H) fields and to measure the same using field meter

MA7354  NUMERICAL METHODS  L T P C
(Branch specific course)  4 0 0 4

OBJECTIVES:
- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

UNIT II INTERPOLATION AND APPROXIMATION 12
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Spline’s - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

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

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 PERIODS

OUTCOMES:
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods

TEXT BOOKS:

REFERENCES:

EE7401  CONTROL SYSTEMS  LT P C  4 0 0 4

OBJECTIVES:
To emphasize the importance of control and empower the students with basic concepts on modelling, analysis and design of control systems restricted to linear continuous time system. The specific objectives of each unit are

- To introduce the classical way of modelling systems, commonly used control components and their mathematical models from physical laws
- To introduce the time domain analysis of transfer function models and understand the concepts of poles, zeros and movement of poles under feedback
- To introduce the various graphical methods available to analyse and assess systems in frequency domain
- To impart knowledge in the modern state variable approach, closed form solution methods and analysing system properties
- To educate on drawing of specification, choosing of control structures and methods of designing the controllers
UNIT I  INTRODUCTION
Control system - Basic components - Open and closed Loop - Effect of feedback - System representations - Transfer functions of single input & single output and multivariable systems – Block diagrams – Signal flow graphs – Gain formula – Modelling of control components – Mechanical and electrical systems

UNIT II  TRANSFER FUNCTION MODEL AND ANALYSIS

UNIT III  FREQUENCY DOMAIN ANALYSIS

UNIT IV  STATE VARIABLE MODEL AND ANALYSIS

UNIT V  DESIGN OF CONTROL SYSTEMS
Design Specification – Controller configurations – PID controller - Design using reaction curve and Ziegler-Nichols technique – Compensation schemes - Effect of providing Lag, Lead and Lag- Lead compensation on system performance and design. State variable design

OUTCOMES:
• Ability to analyse systems using transfer function and state space models
• Ability to design controllers and compensators using conventional techniques

TEXTBOOKS

REFERENCES
OBJECTIVES:
• To study the fundamental principles of Magnetic Circuits, Electro-mechanical energy conversion.
• To study the theory, operation and complete steady state behaviour of stationary and rotating transformers.
• Starting and speed control of three-phase induction motors.
• Principle of operation and performance of single phase induction motors.

UNIT I MAGNETIC CIRCUITS AND ELECTRO-MECHANICAL ENERGY CONVERSION 12

UNIT II TRANSFORMERS: THEORY 12

UNIT III TRANSFORMERS: PERFORMANCE 12

UNIT IV INDUCTION MACHINES: THEORY 12

UNIT V INDUCTION MACHINES: PERFORMANCE 12

OUTCOMES:
• Understanding of fundamental concepts of magnetic circuits and energy conversion.
• Application knowledge of steady state performance analysis of induction machines.
• Knowledge on various starting and speed control methods of induction motor.
• Knowledge principle and operation of single-phase induction motor.

TEXT BOOKS:

REFERENCES:
1. Say M.G ‘Performance and Design of Alternating Machines ‘ CBS Publishers and

EE7403
LINEAR INTEGRATED CIRCUITS

OBJECTIVES

• To study the IC fabrication procedure.
• To analyse circuit characteristics with signal analysis using Op-amp ICs.
• To design and construct application circuits with ICs as Op-amp, 555,565etc.
• To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator ICs, ADCs.

UNIT I
IC FABRICATION
IC classification, fundamentals of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging.

UNIT II
CHARACTERISTICS OF OPAMP
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
APPLICATIONS OF OPAMP
Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clamplers, 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, Sigma- Delta ADC.

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

UNIT V
APPLICATION ICS
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.

OUTCOMES:

• Ability to analyse comprehend and design of analog electronic circuits involving linear ICs.

TEXT BOOKS:
REFERENCES:

EE7404 TRANSMISSION AND DISTRIBUTION LT P C 3 0 0 3

OBJECTIVES
• To impart knowledge about the configuration of the electrical power system
• To analyse and model different components of power system

UNIT I STRUCTURE OF POWER SYSTEM 9
Structure of electric power system: generation, transmission and distribution; Types of AC and DC distributors—distributed and concentrated loads—interconnection—EHVAC and HVDC transmission—Introduction to FACTS.

UNIT II TRANSMISSION LINE PARAMETERS 9
Parameters of single and three phase transmission lines with single and double circuits—Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition—application of self and mutual GMD; skin and proximity effects—interference with neighbouring communication circuits—Typical configurations, conductor types and electrical parameters of 765 kV, 400kV, 220 kV, 110kV, 66kV and 33kV lines, corona discharges.

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9
Classification of lines—short line, medium line and long line—equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance, transmission efficiency and voltage regulation, real and reactive power flow in lines, Power-circle diagrams, surge impedance loading, methods of voltage control; Ferranti effect.

UNIT IV INSULATORS AND CABLES 9

UNIT V MECHANICAL DESIGN OF LINES AND GROUNDING 9
Mechanical design of transmission line—sag and tension calculations for different weather conditions, Tower spotting, Types of towers, Sub-station Layout (AIS, GIS), Methods of grounding.

TOTAL: 45 PERIODS
OUTCOMES:
• Ability to understand transmission line models, insulations types and distribution schemes.

TEXTBOOKS:

REFERENCES:

GE7251 ENVIRONMENTAL SCIENCE AND ENGINEERING LT P C 3 0 0 3

OBJECTIVES:
• To study the nature and facts about environment.
• To finding and implementing scientific, technological, economic and political solutions to environmental problems.
• To study the interrelationship between living organism and environment.
• To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
• To study the dynamic processes and understand the features of the earth’s interior and surface.
• To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

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

Attested
Salim
DIRECTOR
Centre For Academic Courses
Anna University, Chennai-600 025.
UNIT II     ENVIRONMENTAL POLLUTION
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 municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

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

UNIT IV     SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V     HUMAN POPULATION AND THE ENVIRONMENT

TOTAL : 45 PERIODS

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

TEXTBOOKS :
REFERENCES:

EE7411 ELECTRICAL MACHINES LABORATORY I

OBJECTIVES
• To study the load characteristics of AC machines and transformers.
• To determine the performance characteristics of AC machines and transformers using direct and indirect tests.
• To study the different speed control methods of Induction Motor.
• To study the need for starters in three phase Induction motor.
• To study the various connections in three phase transformers.

LIST OF EXPERIMENTS
1. Load Test on three phase Induction motor
2. Load Test on single phase Induction motor
3. Predetermination of performance characteristics of Load Test on three phase Induction motor
4. Predetermination of performance characteristics of Load Test on single phase Induction motor
5. Circle Diagram
6. Study of starters in three phase Induction motor
7. Load Characteristics of Induction Generator
8. Open circuit and short circuit test on single-phase transformer.
10. Sumpner’s test Connections of multi-phase transformers.

TOTAL: 60 PERIODS

OUTCOMES:
1. Complete performance characteristics of AC machines and transformers are obtained.
2. AC motor starters and three phase transformer connections are studied.
OBJECTIVES:

- To develop an in-depth understanding of the operation of microprocessors and microcontrollers
- To program microprocessor/microcontroller using assembly languages
- To understand the standard microprocessor/microcontroller interfaces
- To design combinational logic circuits using digital IC’s
- To analyse and design various applications of Op-Amp

LIST OF EXPERIMENTS

1. Simple arithmetic operations: Multi precision addition / subtraction / multiplication / division.


3. Interface Experiments:
   - A/D Interfacing.
   - D/A Interfacing.
   - Traffic light controller.

4. Interface Experiments:
   - Simple experiments using 8251, 8279, 8254.

5. Demonstration of basic instructions with 8051 Microcontroller execution, including:
   1. Conditional jumps, looping
   2. Calling subroutines.
   3. Stack parameter testing

6. Parallel port programming with 8051 using port 1 facility:
   1. Stepper motor and D/A converter.


9. Sequential Logic: Study of Flip-Flop, Counters (synchronous and asynchronous), Shift Registers

10. Op-Amp Linear Application: Comparator, Differentiator, Integrator, Adder, Subtractor. Op-amp,
    Non Linear Application: Clipper, Clamper, Peak detector,

11. Timer IC application, astable multi-vibrator and VCO circuit.
LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

1. 8085 – Microprocessor student trainer kit – 15 Nos
2. 8051 – Micro controller student trainer kit – 15 Nos
3. DAC, ADC interface cards – 5 Nos
4. Traffic light controller interface board – 5 Nos
5. Stepper motor drive interface – 5 Sets
6. Keypad – display interface card – 5 Nos
7. Oscilloscope (CRO) – 5 Nos
8. Regulated Power supply ± 12V, 0.5A and +5V, 2A along with Bread – board and analog digital IC, as per the above list – 5 sets

TOTAL:60 PERIODS

OUTCOMES:
The students are able to
- Understand and apply the fundamentals of assembly level programming of microprocessors/ microcontrollers
- Work with standard microprocessor/ microcontroller interfaces
- Implement real-time systems
- Design and conduct experiments using digital IC’s and Op-Amp

EE7501 ELECTRICAL MACHINES II LT P C 3 0 0 3

OBJECTIVES:
- To study the machine windings and the MMF curves of armature and field windings and to derive the EMF and torque equations of rotating machines.
- To impart knowledge on Theory and performance of salient and non-salient pole synchronous generators.
- Principle of operation and performance of synchronous motor.
- To study the theory, operation and complete steady state behaviour of DC machines.

UNIT I ROTATING MACHINE THEORY
Doubly excited systems - permanent magnets - synchronous and reluctance principle - force, torque and power equation - armature winding - distribution and pitch factors - magnetic leakage - DC and AC windings - coil span - brushes - commutation - symmetry requirement.

UNIT II SYNCHRONOUS MACHINES: THEORY
Synchronous generators : Constructional details – Types – principle of operation - concept of space phasor – EMF, torque and Power equations – Armature reaction – Synchronous

UNIT III  SYNCHRONOUS MACHINES: PERFORMANCE 9
Voltage regulation – EMF, MMF, ZPF methods - Two reaction theory, slip test - Synchronization - parallel operation – Effect of change in excitation and mechanical input - Capability curves - variable load and constant excitation - constant load and variable excitation - V curves and inverted V curves - Synchronous condenser.

UNIT IV  DC MACHINES: THEORY 9

UNIT V  DC MACHINES: PERFORMANCE 9

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand MMF curves for field and armature windings.
- Ability to formulate generalised form of EMF and Torque equations.
- Application knowledge of steady state performance analysis of synchronous machines.
- Knowledge on predetermination of voltage regulation of salient and non-salient pole generators, V-curves and inverted V-curves, power factor correction.
- Application knowledge of DC machines theory.
- Knowledge on performance on DC machines.

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To enable the student to have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.
- To introduce the general instrument system, error, calibration etc.
- To explain the techniques for measurement of voltage and current.
- To explain the techniques for measurement of other electrical parameters namely power, energy, frequency, phase etc.
- To discuss the comparison methods of measurement.
- To give exposure to non-electrical measurements and data acquisition system.

UNIT I UNITS AND STANDARDS IN MEASUREMENT

Principle of measurement – absolute, comparative, direct reading and null balance methods. SI units - rules for display of results of a measurement – Systematic errors – accuracy- and random errors - precision index – peak (unipolar and bipolar) and standard deviations - statistical evaluation of measurement data - Gaussian distribution - Standards and calibration

UNIT II ANALOG AND INDICATING INSTRUMENTS

PMMC ammeter – range conversion – PMMC voltmeter – Figure of merit - moving iron ammeter – range conversion – MI voltmeter – Electrodynamometer type ammeter – Electrodynamometer type wattmeter – UPF, LPF types – Induction type energy meter - Single and three phase power and energy measurement.

UNIT III DIGITAL INDICATING INSTRUMENTS


UNIT IV NULL BALANCE METHODS OF MEASUREMENT


UNIT V MISCELLANEOUS INSTRUMENTS


TOTAL: 45 PERIODS

OUTCOMES:

- Ability to implement and verify different measurement schemes for measuring of electrical and non-electrical parameters.

TEXT BOOKS:

REFERENCES:

EE7503        POWER ELECTRONICS                   L T P C
3 0 0 3

OBJECTIVES:
• To understand the various applications of electronic devices for conversion, control and conditioning of the electrical power.
• To get an overview of different types of power semiconductor devices and their dynamic characteristics.
• To understand the operation, characteristics and performance parameters of controlled rectifiers.
• To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
• To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
• To study the operation of AC voltage controller and various configurations of AC voltage controller.

UNIT I       SWITCHING POWER SUPPLIES         9
SCR and MOSFET dynamic behaviour - driver and snubber circuits - low power high switching frequency switching Power supplies, buck, boost, buck-boost converters – Isolated topologies – resonant converters - switching loss calculations and thermal design.

UNIT II       INVERTERS                   9
IGBT : Static dynamic behaviour - single phase half bridge and full bridge inverters - SCR based : six step three phase VSI, ASCI - PWM (both unipolar and Bipolar) – third harmonic injected sine PWM - space vector PWM – selective harmonic elimination.

UNIT III     UNCONTROLLED RECTIFIERS     9

UNIT IV      CONTROLLED RECTIFIERS      9
Two transistor analogy based turn- ON – turn ON losses – thermal protection – controlled converters (1 pulse, 2 pulse, 3 pulse, 6 pulse) - displacement factor – ripple and harmonic factor - power factor mitigation, performance parameters – effect of source inductance - inverter angle limit.
UNIT V  AC PHASE CONTROLLERS
TRIAC triggering concept with positive and negative gate pulse triggering, TRIAC based phase controllers - various configurations for SCR based single and three phase controllers.

OUTCOMES:
• Ability to simulate and design different power converters
• Ability to implement and verify the performance specifications of power converters.

TEXT BOOKS:

REFERENCES:
UNIT IV  FAULT ANALYSIS–UNBALANCED FAULTS
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

TOTAL: 60 PERIODS

OUTCOMES:
• The students are equipped with power flow, short-circuit and transient stability studies that are useful for transmission expansion planning and day-to-day operation of power system.

TEXTBOOKS

REFERENCES

HS7551  EMPLOYABILITY SKILLS  L T P C
3 0 0 3

COURSE DESCRIPTION
This course aims to help the students acquire the employability skills necessary for the workplace situations. It also attempts to meet the expectations of the employers by giving special attention to language skills, presentation skills, group discussion skills and soft skills. This will be achieved through expert guidance and teaching activities focusing on employability skills.

COURSE OBJECTIVES
• To enhance the employability skills of students with a special focus on presentation skills, group discussion skills and interview skills
• To help them improve their reading skills, writing skills, and soft skills necessary for the workplace situations
• To make them employable graduates
CONTENTS

UNIT I READING AND WRITING SKILLS
Reading: skimming & scanning strategies – note making skills – interpreting visual material (charts & tables) – critical reading – fast reading necessary for reading letters & files - preparing job applications - writing covering letter and résumé - applying for jobs online - email etiquette – writing official letters (placing an order, letters to consumers, etc.) writing reports – collecting, analyzing and interpreting data

UNIT II SOFT SKILLS
Hard skills & soft skills – soft skills: self-management skills & people skills - training in soft skills - persuasive skills – sociability skills – interpersonal skills – team building skills – leadership skills – problem solving skills – adaptability - stress management – motivation techniques – life skills -

UNIT III PRESENTATION SKILLS
Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentation

UNIT IV GROUP DISCUSSION SKILLS
Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying –GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD

UNIT V INTERVIEW SKILLS

TOTAL: 45 PERIODS

LEARNING OUTCOMES
• Students will be able to make presentations and participate in group discussions with high level of self-confidence.
• Students will be able to perform well in the interviews
• They will have adequate reading and writing skills needed for workplace situations

REFERENCES:

EXTENSIVE READING

WEB RESOURCES
1. www.humanresources.about.com
2. www.careerride.com
OBJECTIVES

• To provide knowledge on analysis and design of controller for the system along with basics of instrumentation

LIST OF EXPERIMENTS

CONTROL SYSTEMS:

1. P, PI and PID controllers
2. Stability Analysis
3. Modelling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks – AC and DC Bridges
9. Dynamics of Sensors/Transducers
10. a. Temperature  
    b. Pressure  
    c. Displacement  
    d. Optical  
    e. Strain  
    f. Flow
11. Signal Conditioning
    a. Instrumentation Amplifier
    b. Analog – Digital and Digital – Analog converters (ADC and DACs)
REQUIREMENT FOR A BATCH OF 30 STUDENTS

CONTROL SYSTEMS:
1. PID kit – 1 No.
   DSO – 1No.
   CRO Probe – 2 Nos
2. Personal computers
3. DC motor – 1 No.
   Generator--1No.
   Rheostats – 2 Nos
   Ammeters
   Voltmeters
   Connecting wires (3/20))
4. CRO 30MHz – 1 No.
   2 MHz Function Generators – 1No.
5. Position Control Systems Kit (with manual) – 1 No.,
   Tacho Generator Coupling set
6. AC Synchro transmitter& receiver – 1No.
   Digital multimeters

INSTRUMENTATION:
7. R, L, C Bridge kit (with manual)
8. a) Electric heater – 1No.
   Thermometer – 1No.
   Thermistor (silicon type)
   RTD nickel type – 1No.
   b) 30 psi Pressure chamber (complete set) – 1No.
   Current generator (0 – 20mA)
   Air foot pump – 1 No. (with necessary connecting tubes)
   c) LVDT 20mm core length movable type – 1No.
   CRO 30MHz – 1No.
   d) Optical sensor – 1 No.
   Light source
   e) Strain Gauge Kit with Handy lever beam – 1No.
   100gm weights – 10 Nos
   f) Flow measurement Trainer kit – 1 No.
   (1/2 HP Motor, Water tank, Digital Milli ammeter, complete set)
10. Watt hour meter (energy meter) – 1No. Ammeter
    Voltmeter Rheostat
    Stopwatch
    Connecting wires (3/20)
11. IC Transistor kit – 1No.

TOTAL: 60 PERIODS
OUTCOMES:
- Will be able to understand and apply basic science, circuit theory, theory control theory signal processing and apply them to electrical engineering problems.

EE7512 ELECTRICAL MACHINES LABORATORY II

OBJECTIVES
- To study the predetermination of voltage regulation of synchronous generator.
- To study the variation of reluctance in salient pole machines.
- To determine the performance characteristics of DC machines using direct and indirect tests.
- To study the different speed control methods of DC shunt motor.

LIST OF EXPERIMENTS
1. Predetermination of voltage regulation of Alternator using EMF, MMF and ZPF method.
2. Slip test
3. V curves and inverted V curves of synchronous motor
4. Load test on induction synchronous motor
5. Characteristics of permanent magnet machines
6. Characteristics of BLDC machines
7. Open circuit and load characteristics of a separately and self-excited DC Generator
8. Speed control of separately excited DC motor.
9. Load test and Swinburne’s test on DC shunt motor.
10. Load test on DC series motor.
11. Load test of DC compound motor
12. Hopkinson’s Test.

TOTAL : 60 PERIODS

OUTCOMES:
- Characteristics of synchronous machines are studied using direct and in direct methods.
- Regulation of three phase alternator is predetermined using optimistic, pessimistic and accurate method are done.
- Saliency nature of synchronous machine is studied.
- Speed control of DC shunt motor above and below rated speed is studied.
OBJECTIVES

• To impart knowledge about causes, effects of over voltages, dielectric breakdown mechanism and to emphasis the need for generation, measurement and testing of High voltages and currents.

UNIT I  OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS
Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages – Reflection and Refraction of Travelling waves- Protection against over voltages.

UNIT II  DIELECTRIC BREAKDOWN
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
Generation of High DC, AC, impulse voltages and currents - Triggering and control of impulse generators.

UNIT IV  MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS

UNIT V  HIGH VOLTAGE TESTING & INSULATION COORDINATION
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.

OUTCOMES:

• Ability to analyze the different electrical stress in a Power System and design & develop appropriate insulation schemes

TEXT BOOKS


REFERENCES

OBJECTIVES

- 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.

UNITI INTRODUCTION

An overview of power system operation and control - system load variation - load characteristics - load curves and load-duration curve - load factor - diversity factor - Importance of load forecasting quadratic and exponential curve fitting techniques of forecasting - system reserve requirements - plant level and system level controls.

UNITII REAL POWER - FREQUENCY CONTROL

Basics of speed governing mechanism and modelling - 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 - two-area system - modelling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model - integration of economic dispatch control with LFC.

UNITIII REACTIVE POWER - VOLTAGE CONTROL

Generation and absorption of reactive power - basics of reactive power control - excitation systems - modelling - static and dynamic analysis - stability compensation - methods of voltage control: tap-changing transformer, SVC (TCR + TSC) and STATCOM - secondary voltage control.

UNITIV UNIT COMMITMENT AND ECONOMIC DISPATCH

Formulation of economic dispatch problem - I/O cost characterization - incremental cost coordination equations with out and with loss (No derivation of loss coefficients) - solution by direct method and λ-iteration method - statement of unit commitment problem - priority-list method - forward dynamic programming.

UNITV COMPUTER CONTROL OF POWER SYSTEMS

Need for computer control of power systems - concept of energy control centre - functions - system monitoring - data acquisition and control - system hardware configuration - SCADA and EMS functions - state estimation - WLSE - Contingency Analysis - state transition diagram showing various state transitions and control strategies.

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to analyse load profiles and EMS functions
- Ability to understand and analyse power system operation, stability, control and protection.

TEXTBOOKS
REFERENCES

EE7603 PROTECTION AND SWITCHGEAR

OBJECTIVES:
- To discuss about the nature, types and causes of faults in Power System and the construction and operating principle of protective components.

UNIT I PROTECTION SCHEMES
Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation – Methods of Neutral grounding – Zones of protection and essential qualities of protection.

UNIT II ELECTROMAGNETIC RELAYS
Operating principles of relays - Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION
Application of Current transformers and Potential transformers in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION
Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Overcurrent protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS

TOTAL : 45 PERIODS

OUTCOMES:
- Acquire the knowledge about the faults in Power System and analyze the design of protective scheme with suitable selection of protective components.
TEXT BOOKS:

REFERENCES:

MG7451 PRINCIPLES OF MANAGEMENT LT P C
3 0 0 3

OBJECTIVES:
1. To study the Evolution of Management
2. To study the functions and principles of management
3. To learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

UNIT II PLANNING

UNIT III ORGANISING

UNIT IV DIRECTING
UNIT V CONTROLLING

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Define and discuss the various types of business organizations
- Set objectives and plan accordingly
- Perform managerial functions like planning, organizing, staffing, leading & controlling.
- Comprehend the facts on motivation, communication and leadership aspects
- Identify and carry out IT solutions for the managerial control

TEXTBOOKS:

REFERENCES:

EE7611 HIGH VOLTAGE LABORATORY LT P C 0 0 4 2

OBJECTIVES
- To learn breakdown study of Dielectrics, High Voltage testing of Power Apparatus, generation and measurement of High Voltages

LIST OF EXPERIMENTS
1. Design and Analysis of High voltage generation using Circuit simulation packages.
   - Impulse Generator
   - HVDC Generator
2. Generation and Measurement of High AC voltage
3. Generation and Measurement of High DC voltage
4. Generation and Measurement of High Impulse voltage
5. Breakdown study of Gaseous dielectrics under Uniform and Non-uniform field
6. Breakdown study of Liquid dielectrics under Uniform and Non-uniform field
7. Breakdown study of Solid dielectrics under uniform field
8. Measurement of Capacitance & $\tan \delta$
9. Power Frequency voltage withstand test on High voltage power apparatus
10. Impulse voltage withstand test on High voltage power apparatus
11. Measurement of Earth Resistance

TOTAL: 60 PERIODS

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
1. High AC, DC and Impulse voltage generators with measuring devices
2. Test kits for Breakdown study
3. Capacitance and $\tan \delta$ bridge
4. Earth resistance kit
5. Harmonic Analyzer

OUTCOMES:
- Ability to review, prepare and present technological development in insulation design for High Voltage Power Apparatus

EE7612 POWER ELECTRONICS LABORATORY L T P C
0 0 4 2

OBJECTIVES:
- To study, analyse the performance of different power electronic converter circuits.
- To simulate different power electronic converter circuits and analyse their performance

LIST OF EXPERIMENTS
1. Characteristics of SCR and TRIAC
2. Characteristics of MOSFET and IGBT
3. AC to DC half controlled converter
4. AC to DC fully controlled Converter
5. Step down and step up MOSFET based choppers
6. IGBT based single phase PWM inverter
7. IGBT based three phase PWM inverter
8. AC Voltage controller
9. Switched mode power converter.
10. Simulation of PE circuits (1Φ&3Φsemiconverter,1Φ&3Φfullconverter,dc-dc converters ,ac voltage controllers).
REQUIREMENT FOR A BATCH OF 30 STUDENTS

1. Device characteristics (for SCR, MOSFET, TRIAC and IGBT kit with built-in power supply and meter) -2 each
2. Single phase SCR based half controlled converter and fully controlled converter along with built-in/separate/firing circuit/module and meter -2 each
3. MOSFET based step up and step down choppers -1 each
4. IGBT based single phase PWM inverter module -2
5. IGBT based three phase PWM inverter module -2
6. Switched mode power converter module -2
7. SCR & TRIAC based single phase AC controller along with lamp or rheostat load -2
8. Cyclo-converter kit with firing module -2
9. Dual regulated DC power supply with common ground
10. Cathode Ray Oscilloscope - 10
11. Isolation Transformer -3
12. Single phase Autotransformer -3
13. Components (Inductance, Capacitance) 3 sets for each
14. Multimeters -5
15. LCR meter -3
16. Rheostats of various ranges -2 sets of 10 value, Worktables -10
17. DC and AC meters of required ranges - 20

OUTCOMES:
- Ability to design and analyse the performance and applications of various power converters
- Design of power converters using Software.

EE7701 DESIGN OF ELECTRICAL APPARATUS

OBJECTIVES
To provide sound knowledge about constructional details and design of various electrical machines, in order
- To study magnetic circuit parameters and thermal rating of various types of electrical machines.
- 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 and synchronous machines.
- To introduce the importance of computer aided design method.

UNIT I DESIGN OF FIELD SYSTEM AND ARMATURE

UNIT II DESIGN OF TRANSFORMERS
Construction - KVA output for single and three phase transformers – Overall dimensions – design...
of yoke, core and winding for core and shell type transformers – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers. Computer program: Complete Design of single phase core transformer

UNIT III DESIGN OF DC MACHINES 12
Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field Computer program: Design of Armature main dimensions

UNIT IV DESIGN OF INDUCTION MOTORS 12

UNIT V DESIGN OF SYNCHRONOUS MACHINES 12

TOTAL : 60 PERIODS

OUTCOMES:

- Understand basics of design considerations for rotating and static electrical machines
- Ability to model and analyse electrical apparatus and their application to Electrical Engineering.

TEXT BOOKS

REFERENCES

EE7711 POWER SYSTEM SIMULATION LABORATORY LT P C 0 0 4 2

OBJECTIVES

- To study the modelling and parameter estimation of transmissions lines
- To study the various methods used for solving load flow analysis.
- To study the stability, dynamics and transient analysis of power systems.
- To understand the concept of economic dispatch.
LISTOFEXPERIMENTS:

1. Computation of Parameters and Modelling of Transmission Lines
2. DC Power Flow Analysis
3. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
4. Load Flow Analysis using Gauss-Seidel Method
6. Fault Analysis
8. Transient Stability Analysis of Multi machine Power Systems
9. Electromagnetic Transients in Power Systems
10. Load –Frequency Dynamics of Single-Area and Two-Area Power Systems

TOTAL: 60 PERIODS

LABORATORY REQUIREMENT FOR A BATCH OF 30 STUDENTS

1. Personal computers (Pentium-IV,80 GB, 512MBRAM)– 25nos
2. Printer laser- 1No.
3. Dotmatrix-1No.
4. Server (PentiumIV, 80 GB, 1GBRAM) (High Speed Processor)–1No.
5. Software: Any Power System Simulation Software- 5 licenses

OUTCOMES:

• Ability to develop algorithms to study load flow, short circuit and stability analysis.

EE7811 PROJECT WORK

OBJECTIVES :
The student should be made to:
• learn methodology to select a good project and able to work in a team leading to development of hardware/software product.
• prepare a good technical report.
• Gain Motivation to present the ideas behind the project with clarity.

A project must be selected either from research literature published list or the students themselves may propose suitable topics in consultation with their guides. The aim of the project
work is to deepen the comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

OUTCOMES:
At the end of the course, the student should be able to:
• select a good project and able to work in a team leading to development of hardware/software product.
• prepare a good technical report and able to present the ideas with clarity.

TOTAL : 300 PERIODS

CS7452 OPERATING SYSTEMS

OBJECTIVES:
• To learn the concepts of operating systems.
• To learn about the various issues in operating systems.
• To familiarize with the important mechanisms in operating systems.
• To appreciate the emerging trends in operating systems.

UNIT I OPERATING SYSTEMS OVERVIEW

UNIT II PROCESS MANAGEMENT

UNIT III STORAGE MANAGEMENT
UNIT IV  I/O SYSTEMS  9
Directory implementation – Allocation methods – Free-space management – Disk scheduling –
Disk management – Swap-space management – Protection.

UNIT V  CASE STUDY  9
Scheduling – Memory management – File systems – Input and Output – Inter-process

TOTAL: 45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:
• Articulate the main concepts, key ideas, strengths and limitations of operating systems
• Explain the core issues of operating systems
• Know the usage and strengths of various algorithms of operating systems

TEXT BOOK:

REFERENCES:
   Education”, 1996.
   Prentice Hall, 2011.

EE7001  ADAPTIVE CONTROL  LT P C  3 0 0 3

OBJECTIVES
• To illustrate the concept of system identification and adaptive control
• To give an introductory knowledge about black-box approach based system identification
• To give adequate knowledge on batch and recursive identification
• To give basic knowledge on Computer Controlled Systems
• To introduce the design concept for adaptive control schemes

UNIT I  NON-PARAMETRIC METHODS  9
Non-parametric methods - Transient analysis - frequency analysis - Correlation analysis -Spectral
analysis - Input signal design for identification

UNIT II  PARAMETRIC METHODS  9
Least squares estimation – Analysis of the least squares estimate - Best linear unbiased estimate
– Model parameterizations - Prediction error methods
UNIT III
RECURSIVE IDENTIFICATION METHODS
The recursive least square method - Model validation - Model structure determination - Introduction to closed loop system identification

UNIT IV
ADAPTIVE CONTROL SCHEMES
Introduction – Auto-tuning of PID controller using relay feedback approach – Types of adaptive control, Gain scheduling, Model reference adaptive control, Self-tuning controller – Design of gain scheduled adaptive controller – Applications of gain scheduling

UNIT V
MRAC & STR
STR – Pole placement design – Indirect STR and direct STR – MRAC - MIT rule – Lyapunov theory – Relationship between MRAC and STR

TOTAL: 45 PERIODS

OUTCOMES:
• Various system identification techniques are studied.
• Features of adaptive control and other control techniques viz., STR, MRAC are studied.

TEXTBOOKS

REFERENCES

EE7002
ADVANCED CONTROL SYSTEMS
LT P C
3 0 0 3

OBJECTIVES
To gain knowledge in design of state variable systems, analysis of non-linear systems and introduction of optimal control
• To study the state variable design
• To provide adequate knowledge in the phase plane analysis
• To study describing function analysis
• To analyse the stability of the systems using different techniques
• To introduce the concepts on design of optimal controller

UNIT I
STATE VARIABLE DESIGN
Control law design – State feedback and pole placement - Estimator design – Regulator design - Combined control law and estimator – Introduction of the reference input – Integral control and disturbance estimation – Effect of delays

UNIT II
PHASE PLANE ANALYSIS
Features of linear and non-linear systems - Common physical non-linearities – Methods of linearizing non-linear systems - Concept of phase portraits – Singular points – Limit cycles–

UNIT III DESCRIBING FUNCTION ANALYSIS
Basic concepts - Derivation of describing functions for common non-linearities – Analysis of non-linear systems – Limit cycle - Stability

UNIT IV STABILITY ANALYSIS

UNIT V OPTIMAL CONTROL
Problem formulation - Linear quadratic regulator - Finite and infinite time - Variational approach to optimal control problem - Solution of Ricatti equation - Differential and Algebraic

TOTAL: 45 PERIODS

OUTCOMES
- Features of tools used for studying the nature of non-linear systems are studied.
- Basics of stability and the assessment of stability are studied.
- Basics of optimal control and its features are studied.

TEXT BOOKS

REFERENCES
2. Ashish Tewari, Modern Control Design with Matlab and Simulink, John Wiley, New Delhi, 2002

EE7003 ANALYSIS OF ELECTRICAL MACHINES

OBJECTIVES
- To study the fundamentals of electromechanical energy conversion process in electrical equipments.
- To study the theory of transformation of multi-phase circuits and systems and its application to multi-phase induction and synchronous machines.
- To develop the time domain mathematical model of DC and AC machines and analyse their steady state and dynamic state performance

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION
General expression of stored magnetic energy, co-energy and force/ torque – example using single and doubly excited system – Calculation of air - gap mmf and per phase machine inductance using physical machine data.
UNIT II   DC MACHINES
Voltage and torque equations – dynamic characteristics of permanent magnet and shunt DC machines – state equations - solution of dynamic characteristics by Laplace transformation.

UNIT III  REFERENCE FRAME THEORY

UNIT IV   INDUCTION MACHINES

UNIT V   SYNCHRONOUS MACHINES
Voltage and Torque Equation – voltage Equation in arbitrary reference frame and rotor reference frame – Park equations - steady state analysis – dynamic performances for torque variations-

TOTAL: 45 PERIODS

OUTCOMES:
• Development of generalised force/torque equations of electro-mechanical systems from
  energy and co-energy equations are studied and analysed.
• Transformation theory is studied and applied to three-phase induction and synchronous
  machines.
• Dynamic state models of DC and AC machines are developed and their complete time
  domain performance is analysed.

TEXT BOOKS
1. Paul C.Krause, OlegWasyzczuk, Scott S. Sudhoff, “Analysis of Electric Machinery and
2. R.Krishnan, “Electric Motor Drives, Modeling, Analysis and Control , Prentice Hall of India,
   2002.
   2012, New Delhi.

REFERENCES
   Reprint 2000
EE7004  COMPUTER AIDED DESIGN OF ELECTRICAL APPARATUS  LT P C
3 0 0 3

OBJECTIVES
To impart knowledge on
• Problem formulation for field computation Finite Element analysis
• Computer aided design of practical problems

UNIT I  INTRODUCTION
Review on electromagnetic theory – Basic field equations, calculation of field distribution, inductance, capacitance, force and torque, Review on conventional electrical machine design methodology – computer aided design aspects - advantages.

UNIT II  CAD PACKAGES

UNIT III  FINITE ELEMENT ANALYSIS

UNIT IV  FILED ANALYSIS USING FEA(PRACTICALS
Electrostatics, Magneto statics – linear and non-linear problems, permanent magnet, eddy current analysis, calculation of force/torque.

UNIT V  DESIGN EXAMPLES (PRACTICALS)
Design of cylindrical magnetic devices, transformer, Rotating machines.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to design electrical apparatus using finite element package.

TEXT BOOKS

REFERENCES
OBJECTIVES

- To provide an introduction to computer algorithms and data structures, with an emphasis on foundational material.
- To have a good understanding of the fundamental data structures used in computer science.
- To have a good understanding of how several fundamental algorithms work, particularly those concerned with sorting, searching and graph manipulation.
- To analyze the space and time efficiency of most algorithms.
- To design new algorithms or modify existing ones for new applications and reason about the efficiency of the result.

UNIT I  INTRODUCTION AND BASIC DATA STRUCTURES

Problem solving techniques and examples-Abstract Data Type (ADT)-The list ADT Arrays-Stacks and Queues: Implementation and Application

UNIT II  ADVANCED DATA STRUCTURES

Trees: Preliminaries-Binary Tree-Tree traversals-Binary search Trees-AVL Trees

UNIT III  SORTING AND HASHING


UNIT IV  ALGORITHM DESIGN TECHNIQUES

The role of algorithms in computing-Getting Started-Growth of functions. Divide and conquer-dynamic programming-Greedy Algorithm-Backtracking.

UNIT V  GRAPHS ALGORITHMS

Elementary Graph Algorithms-Minimum Spanning Trees-Single-source shortest paths-All pairs shortest paths

OUTCOMES:

- Fundamentals of data structures and algorithms are studied.
- Features of various algorithms for different applications are studied.

TEXT BOOKS


REFERENCES

OBJECTIVES:

- To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.
- To classify signals and systems & their mathematical representation.
- To analyse 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.

UNIT I   INTRODUCTION

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. Digital signal representation.

UNIT II   DISCRETE TIME SYSTEM ANALYSIS

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Introduction to Fourier Transform – Discrete time Fourier transform.

UNIT III   DISCRETE FOURIER TRANSFORM & COMPUTATION


UNIT IV   DESIGN OF DIGITAL FILTERS

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping -Frequency transformation.

UNIT V   DIGITAL SIGNAL PROCESSORS

Introduction – Architecture of one DSP processor– Features – Addressing Formats – Functional modes - Introduction to Commercial Processors

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply Fourier transforms for processing of signals
- Ability to design and develop digital filters algorithms in digital signal processor platforms.

TEXT BOOKS:


REFERENCES:


78
OBJECTIVES

• To impart knowledge on EHV AC, HVDC and FACTS transmission trends with parameter calculations and study on the effect of EHV lines on living organisms.

UNIT I TRANSMISSION LINE TRENDS

Standard transmission voltages, average values of line parameters – Power handling capacity and line losses - number of lines.

UNIT II LINE AND GROUND PARAMETERS


UNIT III HIGH VOLTAGE DIRECT CURRENT (HVDC)

HVDC system – Principle of operation, control and design consideration, HVDC circuit breaking.

UNIT IV FACTS

Basic concepts – Reactive power control, uncompensated transmission line, series compensation, SVC, thyristor control, series capacitor, static synchronous compensator, unified power flow controller and applications.

UNIT V ELECTROSTATIC AND MAGNETIC FIELDS OF EHV LINES

Electric shock – threshold currents – Calculation of electrostatic fields and magnetic fields of AC and DC lines – Effect of fields on living organism – Electrical field measurement.

TOTAL : 45 PERIODS

OUTCOMES:

• Expose to the components of electrostatic and magnetic field effects of EHV lines.

TEXT BOOKS


REFERENCES

OBJECTIVES

• To introduce different types of sensors used extensively in vehicle automation
• To understand the basic scheme for interfacing sensing and actuating component
• To focus on scope for embedded based secured environment for industrial and home automation

UNIT I INTRODUCTION TO SENSORS AND ACTUATORS


UNIT II AUTOMOTIVE SYSTEM AND CONTROL


UNIT III AUTOMOTIVE INSTRUMENTATION


UNIT IV BUILDING AUTOMATION


UNIT V ADVANCES IN AUTOMOTIVE ELECTRONIC SYSTEMS


TOTAL: 45 PERIODS

OUTCOMES:

• Able to design an efficient embedded automation system for vehicles.

TEXT BOOKS


REFERENCES

OBJECTIVES
To provide a clear understanding on the basic concepts of embedded system design and its applications to various fields:

- Building Blocks of Embedded System
- Introduction to Embedded software Tools
- Bus Communication protocol, input/output interfacing.
- Various scheduling concepts for process & basics of Real time operating system.
- Discussions through Phases of development of embedded products.

UNIT I  INTRODUCTION TO EMBEDDED SYSTEMS
Introduction to Embedded Systems – The build process for embedded systems- Structural units for an Embedded microcontroller, selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock– IDE, assembler, compiler, linker, simulator, debugger, In circuit emulator, Target Hardware Debugging, Boundary Scan

UNIT II  EMBEDDED NETWORKING

UNIT III  INTERRUPTS SERVICE MECHANISM AND DEVICE DRIVERS
Programmed-I/O busy-wait approach without interrupt service mechanism-ISR concept-interrupt sources – multiple interrupts – context and periods for context switching, interrupt latency and deadline – Introduction to Device Drivers

UNIT IV  RTOS BASED EMBEDDED SYSTEM DESIGN
Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Pre-emptive and non-pre-emptive scheduling, Task communication-shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of commercial Real time Operating systems: Vx Works, uC/OS-II, RT Linux

UNIT V  EMBEDDED SYSTEM APPLICATION WITH DEVELOPMENT
Case Study: Washing Machine- Automotive Application-Embedded Product Development Life Cycle, Objective, Need, and different Phases & Modelling of the EDLC

TOTAL: 45 PERIODS

OUTCOMES:
- Able to understand the hardware and software functional required to design automation for an embedded process.

TEXT BOOKS
REFERENCES

EE7010 ENERGY MANAGEMENT AND AUDITING

COURSE OBJECTIVES
- To study the concepts behind economic analysis and Load management.
- To emphasize the energy management on various electrical equipments and metering.
- To illustrate the concept of lighting systems and cogeneration.

UNIT I INTRODUCTION
Need for energy management - energy basics- designing and starting an energy management program – energy accounting -energy monitoring, targeting and reporting-energy audit process.

UNIT II ENERGY COST AND LOAD MANAGEMENT
Important concepts in an economic analysis - Economic models-Time value of money-Utility rate structures- cost of electricity-Loss evaluation
Load management: Demand control techniques-Utility monitoring and control system-HVAC and energy management-Economic justification

UNIT III ENERGY MANAGEMENT FOR MOTORS, SYSTEMS, AND ELECTRICAL EQUIPMENT
Systems and equipment- Electric motors-Transformers and reactors-Capacitors and synchronous machines

UNIT IV METERING FOR ENERGY MANAGEMENT
Relationships between parameters-Units of measure-Typical cost factors-Utility meters - Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current transformers - Instrument transformer burdens-Multitasking solid-state meters - Metering location vs. requirements- Metering techniques and practical examples

UNIT V LIGHTING SYSTEMS & COGENERATION
Concept of lighting systems - The task and the working space -Light sources - Ballasts - Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration: Forms of cogeneration - feasibility of cogeneration- Electrical interconnection.

TOTAL:45 PERIODS
TEXT BOOKS

REFERENCES

EE7011 FLEXIBLE AC TRANSMISSION SYSTEMS LT P C
3 0 0 3

OBJECTIVES
- To expose the students to the start-of-art of the power system
- To analyze the performance of power systems with FACTS controllers.
- To model FACTS controllers for load flow and dynamic analysis

UNIT I INTRODUCTION
Reactive power control in electrical power transmission lines–loads & system compensation–Uncompensated transmission line–shunt and 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

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS
UNITV CO-ORDINATION OF FACTS CONTROLLERS


OUTCOMES:
• Able to understand, analyse and develop analytical model of FACTS controller for power system application.

TEXTBOOKS

REFERENCES

EE7012 FUNDAMENTALS OF COMPUTER ARCHITECTURE LT P C 3 0 0 3

OBJECTIVES
To understand the basic concepts and organization of Computers
• To understand the basic concepts and organization of Computers.
• To study implementation of combinational circuits, the design of various synchronous and asynchronous circuitry supportive to CPU operation.
• To introduce various memory devices, Significances of Memory management.
• Introduce the CPU architecture, micro programming and peripheral interfacing.
• Concepts and importance of parallelism through various processor technologies

UNIT I BASIC STRUCTURE OF COMPUTING PROCESSORS
Functional units – Number system, error detection, corrections & codes conversions, Binary Arithmetic, Boolean algebra: Basic operational concepts. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers.

UNIT II DIGITAL CIRCUIT DESIGN
Flip flops - SR, D, JK and T, shift registers, counters, state assignments analysis and design of synchronous sequential circuits, state diagram; state reduction-Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.
UNIT III  CONTROL AND CENTRAL PROCESSING UNIT  
Micro programmed control – design of control unit – Central processing unit – general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, execution of instruction set in computer – concepts in design of addition and subtraction, multiplication algorithms for arithmetic operations – Memory organization – ROM, PROM, EPROM, cache memory, need for memory management.

UNIT IV  INPUT OUTPUT ORGANIZATION  
Input output organization: peripheral devices, input output interface, asynchronous data transfer, Bus arbitration – Instruction and instruction sequencing – modes of transfer, interrupt service, input output interface, communication ports – need for Serial BUS-RS232, Ethernet Bus, Parallel port communication – ISA, PCI

UNIT V  PIPELINE AND PARALLELISM IN COMPUTER PROCESSORS
Parallel Processing – Pipelining–Arithmetic Pipeline—Instruction Pipeline—Introduction to Vector processors and Array processors.

TOTAL: 45 PERIODS

OUTCOMES:

• Ability to understand the architecture and various components of computer hardware system. Introduction to functions of various types of digital circuits are analysed and studied as building blocks of a computation processor.

TEXT BOOKS

REFERENCES

EE7013  FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING  LT P C  3 0 0 3

OBJECTIVES
To introduce the concept of Object Oriented Programming and C++.

• Familiar with the concepts of Object Oriented Programming.
• Able to appreciate the features of C++ programming Language.
• Having a thorough understanding about Classes and Objects.
• Able to develop programs in C++

UNIT I  INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING AND C++
Comparison of C++ with C—Object-Oriented Terms and Concepts—Object-Oriented Languages—
Differences between Procedural and Object-Oriented Programming—Merits and Demerits of
Object-Oriented Methodology. Structure of a C++ Program—Data Types—Operators in C++—
Control Structures—Functions in C++

UNIT II      CLASSES AND OBJECTS  8
Introduction to Classes and objects—Member Functions and Member Data—Objects and
Functions—Objects and Arrays—Name Spaces—Nested Classes—Dynamic Memory Allocation and
Deallocation—Constructors and Destructors

UNIT III     INHERITANCE AND POLYMORPHISM  9
Introduction—Base Class and Derived Class Pointers—Function Overriding—Base Class
Initialization—Protected Access Specifier—Deriving by Different Accessing specifiers—Different
Kinds of Inheritance—Order of Invocation of Constructors and Destructors—Virtual Functions—
Mechanism of Virtual Functions—Pure Virtual Functions—Virtual Destructors and Constructors

UNIT IV    OPERATOR OVERLOADING, TEMPLATES  9
Operator Overloading—Overloading of various Operators—Type Conversion—New Style Casts
and the typed Operator—Function Templates—Class Templates—The Standard Template Library
(STL)

UNIT V     EXCEPTION HANDLING AND CASE STUDIES  9
Introduction—C-Style Handling of Error-generating Code—C++-Style Solution—the try/throw/catch
Construct—Limitations of Exception Handling. Case Studies: String Manipulations—Building
classes for matrix operations

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to develop the object oriented programs for simple projects

TEXT BOOKS
   2007

REFERENCES
   2003
   Pearson Education 2007
OBJECTIVES

To understand the concept, planning of DC power transmission and comparison with AC power transmission.

- To analyse HVDC converters.
- To study about the HVDC system control.
- To analyse harmonics and design of filters.
- To model and analysis the DC system under study state.

UNIT I

INTRODUCTION

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

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

UNIT III

CONVERTER AND HVDC SYSTEM CONTROL

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

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

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

TOTAL:45 PERIODS

OUTCOMES:

- Basic principles and types of HVDC system are studied.
- Features of converters used in HVDC system are studied.
- Concepts and reactive power management, harmonics and power flow analysis are studied.

TEXTBOOKS


REFERENCES

OBJECTIVES
• To know the Industrial power quality standards
• To know mitigation techniques for harmonics and flicker problem

UNIT I  MOTOR STARTING STUDIES
Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-
Calculation of Acceleration time-Motor Starting with Limited Capacity Generators-
Computer-Aided Analysis.

UNIT II  POWER FACTOR CORRECTION STUDIES
Introduction-System Description and Modelling-Acceptance Criteria-Frequency Scan Analysis-
Voltage Magnification Analysis-Sustained Over voltages-Switching Surge Analysis-Back-to-Back
Switching.

UNIT III HARMONIC ANALYSIS
Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-
Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study.

UNIT IV  FLICKER ANALYSIS
Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc
Furnace Load-Minimizing the Flicker Effects.

UNIT V GROUND GRID ANALYSIS
Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving
the Performance of the Grounding Grids-Conclusions.

TOTAL : 45 PERIODS

OUTCOMES:
• Different standards of power quality are studied.
• Features of different PF correction studies, harmonic analysis and flicker analysis and grid
analysis are studied.

TEXT BOOKS
and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987

REFERENCES
1. A.Shanmugasundara, G. Gangadharan, R. Palani " Electrical machine Design Date Book"
OBJECTIVES:
- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING
Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals -
Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney
and blood flow - Biomechanics of bone - Biomechanics of soft tissues – Basic mechanics of spinal
column and limbs - Physiological signals and transducers - Transducers – selection criteria –
Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature
sensors.

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC
PROCEDURES
Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function
measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas
analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR
measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS
Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro,
needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper
amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording
methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage
current-Instruments for checking safety parameters of biomedical equipments.

UNIT IV IMAGING MODALITIES AND ANALYSIS
Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography–
Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging
application in Biometric systems - Analysis of digital images

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES
Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano
Robots - Robotic surgery – Advanced 3D surgical techniques- Orthopaedic prostheses fixation.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyze instrumentation systems and their applications to
  various industries.

TEXT BOOKS:
1. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice hall of India, New
   Delhi, 2007.
   Raton, CRC Press LLC, 2000

89
REFERENCES

EE7017 MICRO ELECTRO MECHANICAL SYSTEMS LT P C 3 0 0 3

OBJECTIVES
• To introduce MEMS technology
• To study the different MEMS materials and their properties
• To study the different fabrication process used in MEMS technology.
• To introduce the fundamental working principles of different micro sensors and actuators.

UNIT I INTRODUCTION

UNIT II MICROMACHINING
Bulk Micromachining - Surface micromachining and LIGA processes

UNIT III SENSORS AND ACTUATORS - I

UNIT IV SENSORS AND ACTUATORS - II

UNIT V APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES:
• Able to design and analyse the performance of MEMS devices.
• Able to identify the right MEMS device against the applications.
TEXT BOOKS.

REFERENCES

EE7018 NANO TECHNOLOGY LT P C 3 0 0 3

OBJECTIVES
• To introduce the concept and knowledge of Nano science and Nanotechnology.
• To know about preparation methods and nanofabrication techniques.
• To create awareness of clean room environment & societal implications of Nanotechnology
• To know about the different characterization techniques used for Nano systems

UNIT I INTRODUCTION
Nano scale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of bulk nano structured materials- Nano particles- quantum dots, nano wires-ultra-thin films – multilayered materials, Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties

UNIT II PREPARATION ENVIRONMENTS
Clean rooms: specifications and design, air and water purity, requirements for particular Processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological Contamination, Safety issues, flammable and toxic hazards, biohazards, implication of Nano science and Nanotechnology on society.

UNIT III PREPARATION ROUTES AND LITHOGRAPHY FOR NANOSCALEDEVICES
Preparation of nanoscale materials: precipitation, mechanical milling, colloidal routes, self assembly; vapour phase deposition, CVD, sputtering, evaporation, molecular beam epitaxy, atomic layer epitaxy, lithography: optical/UV, electron beam and x-ray lithography, systems and processes, wet etching, dry etching
UNIT IV CHARACTERIZATION TECHNIQUES

X-ray and Neutron diffraction technique, Scanning Electron Microscopy plus environmental techniques, Transmission Electron Microscopy including high-resolution imaging, analytical electron microscopy, EDX and EELS, Surface Analysis techniques, XPS, SIMS, Auger

UNIT V EVOLVING INTERFACES OF NANO

Applications of nanotechnology: NEMS – Nanosensor – nanomedicines - nanotechnology Applications to electrical engineering – Nanoelectronics: quantum transport devices, molecular electronics devices, quantum computing, memory, CNT and its applications, Nano motor, Nano robot, energy efficient battery technology, Nano dielectrics, lighting system, solar cell

TOTAL: 45 PERIODS

OUTCOMES:

- To understand unique properties of Nano material structure and apply them for Electrical and Electronics Engineering.

TEXT BOOKS


REFERENCES

2. Charles P. Poole & Frank J. Owens, Introduction to nanotechnology, WileyIndia.

EE7019 OPERATIONAL RESEARCH

OBJECTIVES

- To learn the basics of optimization techniques and their applications to Electrical Engineering

UNIT I LINEAR PROGRAMMING

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

UNIT II ADVANCES IN LPP

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

UNIT III NON LINEAR PROGRAMMING

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

UNIT V  DYNAMIC PROGRAMMING  9

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to understand and apply the optimization technique for electrical engineering applications.

TEXT BOOKS

REFERENCES

EE7020  POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS  LT P C 3 0 0 3

OBJECTIVES
• To study the features of different elements used in renewable energy conversion.
• To study the hybrid operation of wind and PV systems.
• To study the features of MPPT tracking.

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
UNIT IV  ANALYSIS OF WIND AND PV SYSTEMS  9
Standalone 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 PERIODS

OUTCOMES:
- Features of renewable energy sources are studied.
- Features of electrical machines and converters used in renewable energy conversion are studied.
- Wind and PV systems are analysed and its hybrid operation is successfully studied.

TEXT BOOK:

REFERENCES:

OBJECTIVES
- To study the causes & Mitigation techniques of various PQ events
- To study various Active & Passive power filters.

UNIT I  INTRODUCTION TO POWER QUALITY  9
Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuation - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II  VOLTAGE SAGS AND SWELLS  9
Estimating voltage sag performance - Thevenin’s equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sags, Static transfer switches and fast transfer switches. - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swells.
UNIT III HARMONICS
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, IEEE and IEC standards

UNIT IV PASSIVE POWER COMPENSATORS

UNIT V POWER QUALITY MONITORING & CUSTOM POWER DEVICES

TOTAL: 45 PERIODS

OUTCOMES
• Students learn about the various sources, causes, effects and understand the monitoring techniques and preventive measures of different Power quality issues in electrical systems.

TEXT BOOKS

REFERENCES

EE7022 RESTRUCTURED POWER SYSTEMS

COURSEOBJECTIVES
• To introduce there structuring of power industry and market models.
• To impart knowledge on fundamental concepts of congestion management.
• To analyze the concepts of locational marginal pricing and financial transmission rights.
• To Illustrate about various power sectors in India

UNIT I INTRODUCTION TO RESTRUCTURING OF POWER INDUSTRY
Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems–Fundamentals of Economics: Consumer
behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production— Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis–a–vis other commodities, Market architecture, Case study.

UNIT II  TRANSMISSION CONGESTION MANAGEMENT  

UNIT III  LOCALATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHT  

UNIT IV  ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK  
Introduction of ancillary services—Types of Ancillary services Classification of Ancillary services—Load generation balancing related services Voltage control and reactive power support devices—Blackstart capability service—How to obtain ancillary service—Co-optimization of energy and reserve services—International comparison Transmission pricing—Principles—Classification—Rolled in transmission pricing methods—Marginal transmission pricing paradigm—Composite pricing paradigm—Merits and demerits of different paradigm.

UNIT V  REFORMS IN INDIAN POWER SECTOR  
Introduction—Frame work of Indian power sector—Reform initiatives—Availability based tariff Electricity act 2003—Open access issues—Power exchange—Reforms in the near future

TOTAL : 45 PERIODS

OUTCOMES
- Learners will have knowledge on restructuring of power industry, basics of congestion management and also have enriched with the significance ancillary services and pricing of transmission network and various power sectors.

TEXT BOOKS

REFERENCES
1. Sally Hunt, “Making competition work inelectricity”, John Willey and Sons Inc., 2002
OBJECTIVES
- To study the basics of artificial neural network.
- To study the concepts of modelling and control of neural and fuzzy control schemes.
- To study the features of hybrid control schemes.

UNIT I  ARTIFICIAL NEURAL NETWORK  9

UNIT II  NEURAL NETWORKS FOR MODELING AND CONTROL  9
Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox

UNIT III  FUZZY SET THEORY  9
Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions

UNIT IV  FUZZY LOGIC FOR MODELING AND CONTROL  9

UNIT V  HYBRID CONTROL SCHEMES  9

TOTAL: 45 PERIODS

OUTCOMES:
- Basic concepts of ANN, different features of fuzzy logic and their modelling, control aspects; different hybrid control schemes are studied through practice.

TEXTBOOKS

REFERENCES
OBJECTIVES:
• 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.

UNIT I DRIVE CHARACTERISTICS

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE
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

UNIT IV SYNCHRONOUS MOTOR DRIVES
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
Transfer function for DC motor / load and converter – closed loop control with current and speed feedback – armature voltage control and field weakening mode – design of controllers; current controller and speed controller-converter selection and characteristics.

TOTAL: 45 PERIODS

OUTCOMES:
• Basic requirement of motor selection for different load profiles are studied.
• Stability aspects of drive systems are studied.
• Important features of DC and AC drives are studied.
• Controller design for DC drives is studied.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To explore the theory and applications of special electrical machines.
- To review the fundamental concepts of permanent magnets and the operation of permanent magnet brushless DC motors.
- To introduce the concepts of permanent magnet brushless synchronous motors and synchronous reluctance motors.
- To develop the control methods and operating principles of switched reluctance motors.
- To introduce the concepts of stepper motors and its applications.
- To understand the basic concepts of other special machines.

UNIT I PERMANENT MAGNET BRUSHLESS DC MOTORS

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Characteristics and control

UNIT II PERMANENT MAGNET SYNCHRONOUS MOTORS


UNIT III SWITCHED RELUCTANCE MOTORS


UNIT IV STEPPER MOTORS


UNIT V OTHER SPECIAL MACHINES


OUTCOMES:

- Need for special electrical machines are studied. Different features of special machines and converter circuits for special machines are obtained

TEXT BOOKS:


REFERENCES:

EE7026  VLSI DESIGN AND ARCHITECTURE  LT P C  3 0 0 3

OBJECTIVES
To understand the basic concepts of VLSI and CMOS design.

- Introduce the basics of VLSI design and its importance.
- Analyse the switching Characteristics of MOS transistor.
- Study the construction of NMOS, CMOS and Bi-CMOS based logic circuits.
- To learn about the programming of Programmable device using Hardware description Language.

UNIT I  BASIC MOS TRANSISTOR  9
Introduction to logic design –switching devices- MOS transistor current equation – second order effects – MOS Transistor Model- Fabrication Technologies (NMOS, PMOS, CMOS, BiCMOS).

UNIT II  NMOS & CMOS GATES  9
NMOS & CMOS inverter – Determination of pull up / pull down ratios – CMOS based logic design- stick diagram – lambda based rules – super buffers – BiCMOS.

UNIT III  SUB SYSTEM DESIGN & LAYOUT  9

UNIT IV  DESIGN OF COMBINATIONAL ELEMENTS & REGULAR ARRAYLOGIC  9
Programmable Logic Devices- PLA, PAL, GAL, CPLD, FPGA— Implementation of Finite State Machine with PLDs.

UNIT V  VHDL PROGRAMMING  9

TOTAL:45 PERIODS

OUTCOMES
- Expose to HDL language and ability to design PLD devices and simple application.

TEXT BOOKS

REFERENCES
COURSE OBJECTIVES

- To give an overview of the Industrial data communications systems.
- To provide a fundamental understanding of common principles, various standards, protocols.
- To provide insight into some of the new principles those are evolving for future networks.

UNIT I  DATA NETWORK FUNDAMENTALS  9

UNIT II  MODBUS AND HART  9

UNIT III  PROFIBUS AND FF  9

UNIT IV  AS – INTERFACE (AS-i), DEVICENET AND INDUSTRIAL ETHERNET  9

UNIT V  WIRELESS COMMUNICATION  9
Wireless sensor networks: Hardware components – energy consumption of sensor nodes – Network architecture – sensor network scenario. Wireless HART – Existing Wireless Options: IEEE 802.15.4 - ISA 100 – Zigbee – Bluetooth – their relevance to industrial applications

TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)

1. Gain knowledge on various industrial data communication networks, protocols and their selection.
2. Able to select and use most appropriate networking technologies and standards for a given application.
3. Ability to design and ensuring that best practice is followed in installing and commissioning the data communications links to ensure they run fault-free.
4. Ability to understand requirements of industrial application and provide wired or wireless solution.
TEXT BOOKS:


REFERENCES:

5. NPTEL Lecture notes on, “Computer Networks” by Department of Electrical Engg., IIT Kharagpur.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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102
OBJECTIVES:
• To provide students an exposure to disasters, their significance and types.
• To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
• To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
• To enhance awareness of institutional processes in the country and
• To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I  INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II  APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III  INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV  DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V  DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

OUTCOMES:
The students will be able to
• Differentiate the types of disasters, causes and their impact on environment and society
• Assess vulnerability and various methods of risk reduction measures as well as mitigation.

TOTAL: 45 PERIODS
• Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

**TEXT BOOKS:**

**REFERENCES**
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005

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**GE7074 HUMAN RIGHTS**

**OBJECTIVES:**
• To sensitize the Engineering students to various aspects of Human Rights.

**UNIT I**

**UNIT II**

**UNIT III**
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

**UNIT IV**
Human Rights in India – Constitutional Provisions / Guarantees.

**UNIT V**

**TOTAL : 45 PERIODS**

**OUTCOMES:**
• Engineering students will acquire the basic knowledge of human rights.

**REFERENCES:**

GE7351 ENGINEERING ETHICS AND HUMAN VALUES
(Common to all branches)

OBJECTIVES
• To emphasise into awareness on Engineering Ethics and Human Values.
• To understand social responsibility of an engineer.
• To appreciate ethical dilemma while discharging duties in professional life.

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.

UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY

UNIT V GLOBAL ISSUES
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOMES
- Students will have the ability to perform with professionalism, understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.

TEXT BOOKS
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics –
AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I INTRODUCTION
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM --Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I
UNIT IV  TQM TOOLS & TECHNIQUES II  

UNIT V  QUALITY MANAGEMENT SYSTEM  

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to apply TQM concepts in a selected enterprise.
- Ability to apply TQM principles in a selected enterprise.
- Ability to apply the various tools and techniques of TQM.
- Ability to apply QMS and EMS in any organization.

TEXT BOOK:

REFERENCES:

MA7357  PROBABILITY AND STATISTICS  
(Branch specific course)

OBJECTIVES:
- To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
- The Students will have a fundamental knowledge of the concepts of probability.

UNIT I  RANDOM VARIABLES  
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.
UNIT II    TWO-DIMENSIONAL RANDOM VARIABLES  
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III   TESTS OF SIGNIFICANCE  

UNIT IV    DESIGN OF EXPERIMENTS  
Completely randomized design – Randomized block design – Latin square design – 2² - factorial design - Taguchi’s robust parameter design.

UNIT V    STATISTICAL QUALITY CONTROL  
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS

OUTCOMES:
- Students will be able characterize probability models using probability mass (density) functions & cumulative distribution functions.
- The students can independently participate in the processes of analysis, planning, formulating strategies of development, decision-making, governing and management, and independent making of tactical and strategic decisions related to the statistics.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

At the end of the course, students would

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups.

UNIT I LOGIC AND PROOFS 12

UNIT II COMBINATORICS 12

UNIT III GRAPHS 12
Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV ALGEBRAIC STRUCTURES 12

UNIT V LATTICES AND BOOLEAN ALGEBRA 12

TOTAL: 60 PERIODS

OUTCOMES:

On completion of the module the student should be able to:

- Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
- Understand the basics of discrete probability and number theory, and be able to apply the methods from these subjects in problem solving.
- Use effectively algebraic techniques to analyse basic discrete structures and algorithms.
- Understand asymptotic notation, its significance, and be able to use it to analyse asymptotic performance for some basic algorithmic examples.
• Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.

TEXTBOOKS:


REFERENCES:


MG7001 MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING LT P C 3 0 0 3

OBJECTIVES

• To study the features of demand supply analysis.
• To study the pricing objectives and its methods.
• To study the basics of accounting and its types.
• To study the procedures for capital budgeting and investments.

UNIT I DEMAND & SUPPLY ANALYSIS
Firm: Types & objectives - Managerial decisions - Fundamental economic concepts Demand - Types of demand - Determinants of demand - demand function - demand forecasting - supply - Determinants of supply - supply function - supply elasticity

UNIT II PRODUCTION AND COST ANALYSIS
Production function - returns to scale - Managerial uses of production function. Cost concepts - cost function - Determinants of cost - Short run and long run cost curves

UNIT III PRICING
Pricing Objectives - Determinants of price - Pricing under different market structures – price discrimination - pricing methods in practice

UNIT IV FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT)
UNIT V  CAPITAL BUDGETING
Investments - Methods of capital budgeting and accounting for risk in capital budgeting

TOTAL: 45 PERIODS

OUTCOMES:
• Basics of demand, supply and cost analysis are studied.
• Different methods of financial accounting and capital budgeting are studied.

TEXT BOOKS

REFERENCES

GE7072  FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

OBJECTIVES:
• To understand the global trends and development methodologies of various types of products and services
• To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
• To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them into design specification
• To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
• To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT
UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

UNIT III DESIGN AND TESTING 9

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES:

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