Vision of the Institute

The vision of Anna University is to be a world-class institution by producing professionals with high technical knowledge, professional skills and ethical values, and remain a preferred partner to the industry and community for their economic and social development through excellence in teaching, research and consultancy. Anna University shall be recognized as a point of reference, a catalyst, a facilitator, a trend setter and a leader in technical education.

Mission of the Institute:

Anna University shall contribute to the educational, economic and social development by

- Producing students who are intellectually and technically equipped with well defined knowledge, skills and ethics, who are creative thinkers, inspiring leaders and contributing citizens
- Introducing high quality academic and research programmes and providing extension services in cutting edge technologies
- Ensuring a supportive campus climate with dynamic leadership and development opportunities to meet the needs of the students, faculty and staff
- Enhancing academic productivity through induction of quality faculty, accelerated graduation, credit banking, augmented continuing education opportunities and adoption of current technology
- Sharing the intellectual resources and the infrastructural facilities among the academia from other institutions and among the industrial society, funding agencies and government
- Enhancing the collaborative partnership between Industry and Institute for commercializing and transferring the latest technological know-how towards societal development
- Setting up a Global University Network Campus that embodies the ideals of an open, democratic and global society catering to the needs of the global community and satisfying cultural, ethnic and racial diversity
- Expanding global participation spread across continents with the aid of interactive satellite based education and the usage of digital library
- Enriching the national and international character of the University
- Ensuring efficient administrative coordination and effective decision making through necessary reforms and by strategically allocating resources
- Benchmarking against technologically sound global leaders with a view towards continuous improvement.
Vision of the Department:
The vision of the department is to produce analytically proficient and technologically competent Electrical and Electronics Engineers who can serve and take forward the academic, industry and research organizations to newer heights and be effective for building the nation.

Mission of the Department:

M1: To impart high quality technical education with the state of the art laboratory practice.
M2: To provide conducive academic ambience to enable best teaching and learning processes.
M3: To generate resources through research and consultancy projects for pursuing research and developmental activities in emerging areas.
M4: To associate with academic and industrial organizations for research activities to develop and provide vital and viable solutions for social needs indigenously.
M5: To develop leadership skills in students with high degree of ethics, morals and values and instill confidence to lead the organization.

Program Educational Objectives:

PEO 1 Acquire adequate knowledge in theory and practice to develop necessary skills and excel in core Electrical and Electronics Engineering and service sectors.

PEO 2 Get elevated to technical lead position and lead the organization competitively.

PEO 3 Enter into higher studies leading to post-graduate and research degrees.

PEO 4 Become consultant and provide solutions to the practical problems of core organization.

PEO 5 Become an entrepreneur and be part of electrical and electronics product and service industries.

Program Specific Outcomes (PSOs):

After completion of B.E (Electrical and Electronics Engineering) Program the student will have

1. Foundation of Electrical engineering: Ability to understand the principles and working of electrical components, circuits and systems, that are forming a part of power generation, transmission, distribution, energy saving. Students can assess the power management, auditing, crisis and saving aspects.

2. Foundations of power system development: Ability to understand the structure and development methodologies of electrical systems using knowledge on circuits, electronics for automation and control. Possess professional skills and
knowledge of electrical system modeling and design of small and large systems. Familiarity and practical competence with a broad range of practice through experimentation on electrical circuits, electronic circuits and programming platforms.

3. **Foundation of mathematical concepts:** Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate engineering tools and suitable algorithm.

4. **Applications of Computing and Research Ability:** Ability to use knowledge in various domains to identify research gaps and hence to provide solution leading to new ideas and innovations.

**Program Outcome:**

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<th>PO#</th>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
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<td>1</td>
<td>Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
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<td>Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
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<td>3</td>
<td>Design/development of solutions</td>
<td>Design an electrical system or process to improve its performance, satisfying its constraints.</td>
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<td>4</td>
<td>Conduct investigations of complex problems</td>
<td>Conduct experiments in electrical and electronics systems and interpret the data.</td>
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<td>5</td>
<td>Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
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<td>6</td>
<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
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<td>7</td>
<td>Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
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<td>8</td>
<td>Ethics</td>
<td>Interacting industry, business and society in a professional and ethical manner.</td>
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<td>9</td>
<td>Individual and team work</td>
<td>Function in a multidisciplinary team.</td>
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<td>10</td>
<td>Communication</td>
<td>Proficiency in oral and written Communication.</td>
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<td>11</td>
<td>Project management and finance</td>
<td>Implement cost effective and improved system.</td>
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<td>12</td>
<td>Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
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### EMPLOYABILITY 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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Students will improve their reading and writing skills
CO2: Students will become fluent and proficient in communicative English
CO3: Students will be able to improve their interpersonal communication

TEXTBOOK:
1. Richards, Jack.C with Jonathan Hull and Susan Proctor New Interchange : English for
   International Communication. (level2, Student’s Book) Cambridge University Press, New
   Delhi: 2010.

REFERENCES:
   Rutledge, 2011.
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book &

MA7151 MATHEMATICS – I

L T P C

4 0 0 4

(Common to all branches of B.E. /B.Tech. Programmes in I Semester)

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
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

UNIT III INTEGRAL CALCULUS
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

UNIT V DIFFERENTIAL EQUATIONS
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:
After completion the above subject, students will be able to understand
CO1: Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
CO2: Improved facility in algebraic manipulation.
CO3: Fluency in differentiation.
CO4: Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
CO5: Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXT BOOKS
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

UNIT II ACOUSTICS AND ULTRASONICS

UNIT III THERMAL AND MODERN PHYSICS
UNIT IV  APPLIED OPTICS

UNIT V  CRYSTAL PHYSICS
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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: The students will understand different moduli of elasticity, their determination and applications.
CO2: The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics
CO3: The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
CO4: The students will gain knowledge on interferometers, lasers and fiber optics
CO5: 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

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermostetting. 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


UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT IV CHEMICAL THERMODYNAMICS

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

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Preparation of nanoparticles — sol-gel and solvothermal. Preparation of carbon nanotube by chemical vapour deposition and laser ablation. Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning. Properties and uses of nanoparticles, nanoclusters, nanorods, nanotubes and nanowires.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Will be familiar with polymer chemistry, surface chemistry and catalysis.
CO2: Will know the photochemistry, spectroscopy and chemical thermodynamics.
CO3: Will know the fundamentals of Nano chemistry.

TEXT BOOKS

REFERENCES

GE7151 COMPUTING TECHNIQUES
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
Arrays – Initialization – Declaration – One dimensional and two dimensional arrays Strings- String operations – String Arrays simple programs- sorting- searching – matrix operations.

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Write C program for simple applications
CO2: Formulate algorithm for simple problems
CO3: Analyze different data types and arrays
CO4: Perform simple search and sort.
CO5: Use programming language to solve problems.

TEXT BOOKS

REFERENCES

BS7161 BASIC SCIENCES LABORATORY
(10 0 4 2)
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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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: To determine various moduli of elasticity and also various thermal and optical properties of materials.
CO2: 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 lodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXTBOOKS

GE7161 COMPUTER PRACTICES LABORATORY L T P C
0 0 4 2

OBJECTIVES
• To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
• 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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Write and compile programs using C programs.
CO2: Write program with the concept of Structured Programming
CO3: Identify suitable data structure for solving a problem
CO4: Demonstrate the use of conditional statement.

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

MA7251 MATHEMATICS – II
L T P C
4 0 0  4
(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 12
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 12
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function Conformal mapping – Mapping by functions \( \frac{w}{z}, \frac{az}{z}, \frac{z^2}{z} \) - Bilinear transformation.
UNIT IV          COMPLEX INTEGRATION             12
Line integral     Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s and Laurent’s series – 
Singularities – Residues – Residue theorem – Application of residue theorem for 
evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V          LAPLACE TRANSFORMS             12
Existence conditions – Transforms of elementary functions – Transform of unit step function 
and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem — 
Transform of periodic functions – Application to solution of linear ordinary differential equations 
with constant coefficients.

TOTAL : 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
CO2: Appreciate how complex methods can be used to prove some important theoretical results.
CO3: Evaluate line, surface and volume integrals in simple coordinate systems
CO4: Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish 
identities connecting these quantities
CO5: Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

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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
Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

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 14 SURFACES
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
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Perform free hand sketching of basic geometrical shapes and multiple views of objects.
CO2: Draw orthographic projections of lines, planes and solids
CO3: Obtain development of surfaces.
CO4: Prepare isometric and perspective views of simple solids.

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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  FRICTION  8

UNIT V  DYNAMICS OF PARTICLES  12
Kinematics  Rectilinear Motion and Curvilinear Motion of Particles.

L – 45 + T – 15 TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
- 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.
- To understand the Laplace Transforms in the context of circuit representations
- To the analyze two port network and its parameters

UNIT I INTRODUCTION
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
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
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  

UNIT V THREE PHASE CIRCUITS  
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:
After completion the above subject, students will be able to understand
CO1: Able to understand the basic concepts of electrical circuits.
CO2: Ability to compute solutions to first and second order networks
CO3: Ability to construct and analyze equation representing AC circuits
CO4: Ability to compute circuit representations quantitatively in Laplace domain
CO5: Able to construct and analyze two port networks and its parameters

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TEXT BOOKS

REFERENCES
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
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
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS
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
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

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
• Explain the structure of basic electronic devices.
• Design applications using basic “electronic devices

TEXT BOOKS:

REFERENCES:
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:
After completion the above subject, students will be able to understand

- 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

L  T  P  C
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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:
After completion the above subject, students will be able to understand

- Students are exposed to experimental knowledge on analysing the function of electric circuits.

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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

COURSE OUTCOMES:

After completion the above subject, students will be able to understand
- 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
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
UNIT III PROGRAMMING FUNCTIONALS IN PROCESSORS

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

Functional block diagram – Instruction format and addressing modes – Interrupt structure – Timer – I/O ports – Serial communication, Data Transfer, I/O instructions

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Ability to design digital Logic Circuits
CO2: Ability to write assembly language program for microprocessor and microcontroller
CO3: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller
CO4: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring.
CO5: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring.

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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-magnetics
- To review the fundamentals of the different coordinate systems, vector algebra and calculus
- To learn to compute and visualize the electrostatic and magnetostatic fields for simple configurations
- To analyse the time varying electric and magnetic fields and to understand Maxwell’s equations
- To understand the propagation of electromagnetic waves through different media

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
- CO1: Ability to identify appropriate coordinate systems and visualize and understand the practical significance of vector calculus
- CO2: Understanding of the basic laws of electromagnetism
- CO3: Ability to compute, visualize electrostatic and magnetostatic fields along with practical applications
- CO4: Understanding of Maxwell’s equations in different forms and media
CO5: Able to understand the concept of generation and propagation of electromagnetic waves through single and multiple media

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**TEXT BOOKS:**

**REFERENCES:**

**EE7303 NETWORK ANALYSIS AND SYNTHESIS**

**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 analyze two port network and its parameters
- 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

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

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Students can have the ability to analyse various electrical networks in steady & transient states
CO2: Ability to compute solutions to first and second order networks
CO3: Ability to construct and analyze equation representing AC circuits
CO4: Ability to compute circuit representations quantitatively in Laplace domain
CO5: Able to construct and analyze two port networks and its parameters

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TEXT BOOKS

REFERENCES
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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
- Understand the working of different power plants
- Arrive at cost of power generation, electricity billing and rate of return on power plant investments

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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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Ability to understand the structure and underlying semiconductor physics concepts.
CO2: Ability to design circuits employing electronic devices.
CO3: Analyze, comprehend and design of analog electronic circuits involving OP-AMP
CO4: Analyze, comprehend and design of analog electronic circuits involving timer 555
CO5: Analyze, comprehend and design of analog electronic circuits involving ADC & DAC other specializes.

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EE7311 ELECTROMAGNETIC FIELD LABORATORY

OBJECTIVES:
- To learn graphical representation of fields (using Mathematical Development Tool) and Electromagnetic Field Computation using FEM packages.
- To formulate electromagnetic field problems
- To compute and analyze electric and magnetic fields for basic configurations using computational software package and compare with the analytical values
- To compute E/H fields for practical applications.
- To measure electric and magnetic fields using field meters

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1 Computation, plotting and Visual understanding of vectors and vector calculus.
CO2 Ability to formulate the electromagnetic field problem to solve numerically
CO3 Ability to compute and analyze the electrostatic and magneto static field problem.
CO4 Ability to formulate, solve and analyze EM problems for practical applications.
CO5 Ability to measure the E/H fields

MA7354 NUMERICAL METHODS
(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  

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

- 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.

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TEXT BOOKS:

REFERENCES:
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 asses 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

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

- Represent simple systems in transfer function and state variable forms.
- Analyse simple systems in time domain.
- Analyse simple systems in frequency domain.
- Infer the stability of systems in time and frequency domain.
- Interpret characteristics of the system and find out solution for simple control problems.
TEXTBOOK

REFERENCES

EE7402 ELECTRICAL MACHINES I L T P C 4 0 0 4

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

UNIT II TRANSFORMERS: THEORY
Principle of operation - Construction — equivalent circuit - phasor diagrams — determination of equivalent circuit parameters - efficiency - all-day efficiency - back to back test - voltage regulation.

UNIT III TRANSFORMERS: PERFORMANCE
UNIT IV  INDUCTION MACHINES: THEORY  

UNIT V  INDUCTION MACHINES : PERFORMANCE

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1:Understand the concepts of magnetic circuits.
CO2:Understand the principles of induced emf's and torque in stationary and rotating machines.
CO3:Understand the operation of dc machines.
CO4:Analyse the differences in operation of different dc machine configurations.
CO5:Analyse the single phase and three phase transformers circuits.

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TEXT BOOKS:

REFERENCES:

EE7403  LINEAR INTEGRATED CIRCUITS  LT P C
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OBJECTIVES
- To study the IC fabrication procedure.
- To analyse circuit characteristics with signal analysis using Op-amp ICs.
- To study the application of 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, clamps, 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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Ability to understand the structure and underlying semiconductor physics concepts.
CO2: Ability to design circuits employing electronic devices.
CO3: Analyze, comprehend and design of analog electronic circuits involving OP-AMP
CO4: Analyze, comprehend and design of analog electronic circuits involving timer 555
CO5: Analyze, comprehend and design of analog electronic circuits involving PLL, voltage regulator & other specializes.

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TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To impart knowledge about the configuration of the electrical power system
- To analyse and model different components of power system
- To study the line parameters and interference with neighbouring circuits
- To learn different insulators and underground cables
- To compute sag and conductor length for different weather conditions

UNIT I STRUCTURE OF POWER SYSTEM  
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  
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, 66kVand33kVlines, corona discharges.

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES  
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  

UNIT V MECHANICAL DESIGN OF LINES AND GROUNDING  
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

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1 Ability to understand structure of power system with different voltage levels
CO2 Ability to compute line parameters for different configurations
CO3 Ability to model transmission line and to determine the performance of line
CO4 Ability to choose various insulators and cables for transmission and distribution
CO5 Ability to do mechanical design of transmission line and grounding
TEXTBOOKS:

REFERENCES:

GE7251 ENVIRONMENTAL SCIENCE AND ENGINEERING 

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 Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – 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. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems — Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification — role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Environmental Pollution or problems cannot be solved by mere laws.
CO2: Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
CO3: Public awareness of environmental is at infant stage.
CO4: Ignorance and incomplete knowledge has lead to misconceptions
CO5: 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**
COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Steady State Performance characteristics of DC machines and Transformers
CO2: Speed control of DC shunt motor above and below rated speed
CO3: DC motor starters and Three phase transformer connections
CO4: Application of the Predetermination tests on Electrical Machines
CO5: Comparison of performance of different types of DC machines

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EE7412 INTEGRATED CIRCUITS AND MICROCONTROLLER LABORATORY

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 Micro controller 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


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 – Microcontroller 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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Ability to design and implement combinational logic circuits and to analysis simple sequential logic circuits.

CO2: Ability to write assembly language program for microprocessor and microcontroller

CO3: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller

CO4: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring.

CO5: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring.
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

UNIT III  SYNCHRONOUS MACHINES: PERFORMANCE
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
Construction - Principle of operation- EMF and torque equation — armature reaction — commutation — interpoles and compensating windings — methods of excitation and characteristics.

UNIT V  DC MACHINES: PERFORMANCE

TOTAL: 45 PERIODS
COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Ability to understand MMF curves for field and armature windings.
CO2: Ability to formulate generalised form of EMF and Torque equations.
CO3: Application knowledge of steady state performance analysis of synchronous machines.
CO4: Knowledge on predetermination of voltage regulation of salient and non-salient pole generators, V-curves and inverted V-curves, power factor correction.
CO5: Application knowledge of DC machines theory and performance on DC machines.

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TEXT BOOKS:

REFERENCES:

EE7502 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
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
Timer – counter – Dual slope DVM – Digital multi meter (DMM) – Digital energy meter
(DEM) – DAC – ADCs Data acquisition systems – PC based measurements.

UNIT IV NULL BALANCE METHODS OF MEASUREMENT
Potentiometer: - DC and AC – Wheatstone, Kelvin and Mega ohm bridges A.C. bridges: Maxwell,
Anderson, Hay, Wien and Schering.

UNIT V MISCELLANEOUS INSTRUMENTS
Q- meter – Instrument transformers – CRT and CRO – DSO Multiple earth and earth loops –
Grounding techniques - Electrostatic and electromagnetic interference Measurement of pressure
- temperature: thermocouple and RTD; Measurement of displacement: LVDT – Measurement

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
- Ability to implement and verify different measurement schemes for measuring of electrical and non-
electrical parameters.

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TEXT BOOKS:
1. A.K. Sawhney, Puneet Sawhney ‘A Course in Electrical & Electronic Measurements &
2. A. D. Helfrick and W. D. Cooper, Modern Electronic Instrumentation and Measurement
   Delhi, 2008

REFERENCES:
   New Delhi, 2009
2. J.J. Carr, ‘Elements of Electronic Instrumentation and Measurement’, Pearson Education India,
   New Delhi, 2011
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

UNIT V AC PHASE CONTROLLERS 9
TRIAC triggering concept with positive and negative gate pulse triggering, TRIAC based phase controllers – various configurations for SCR based single and three phase controllers.

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand

CO1: To understand operation of semiconductor devices and dynamic characteristics and to design & analyze low power SMPS
CO2: Analyze the various uncontrolled rectifiers and design suitable filter circuits
CO3: Analyze the operation of the n-pulse converters and evaluate the performance parameters
CO4: Understand various PWM techniques and apply voltage control and harmonic elimination methods to inverter circuits.
CO5: Understand operation of AC voltage controllers and its applications.
TEXT BOOKS:

REFERENCES:

EE7504 POWER SYSTEM ANALYSIS LT P C
4 0 0 4

OBJECTIVES
• To model and analyse the power system under steady state operating condition.
• To apply numerical methods to solve the power flow problem.
• To model and analyse the system under balanced and unbalanced conditions.
• To learn about the symmetrical components and their application to carry out short circuit studies of power system for unsymmetrical faults and to determine the fault levels of different buses.
• To model and analyse the stability of power system when it is subjected to a fault.

UNIT I INTRODUCTION
12

UNIT II POWER FLOW ANALYSIS
12

UNIT III FAULT ANALYSIS–BALANCED FAULTS
12

UNIT IV FAULT ANALYSIS–UNBALANCED FAULTS
12
Introduction to symmetrical components–sequence impedances–sequence circuits of
synchronous machine, transformer and transmission lines-sequence networks analysis of single line to ground, line to line and double line to ground faults using Thevenin’s theorem and Z-bus matrix.

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

TOTAL: 60 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Model the various power system components for steady-state analysis.
CO2: Carry out the power flow analysis by Gauss-Seidel and Newton-Raphson methods.
CO3: Conduct the fault analysis of power system for balanced faults.
CO4: Carry out the short circuit analysis of the power system for unbalanced faults using symmetrical component theory.
CO5: Compute the stability of the system with the help of equal area criteria and Modified-Euler and Runge-Kutta fourth order methods.

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TEXTBOOKS

REFERENCES
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 9
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 9

UNIT III PRESENTATION SKILLS 9
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 9
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 9

COURSE OUTCOMES
After completion the above subject, students will be able to understand
- 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
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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
- To design compensators
- To simulate the various control system models
- To provide knowledge on various sensors
- To provide knowledge on 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.
    AmmeterVoltmeter Rheostat
    Stopwatch
    Connecting wires (3/20)
11. IC Transistor kit – 1No.

TOTAL:60 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Will be able to understand and apply basic science, circuit theory, theory control theory signal processing and apply them to electrical engineering problems.
CO2: Will able to design compensators
CO3: Will able to calibrate various types of sensors.
CO4: Will able to simulate various control system models
CO5: Will able to analyze various controllers

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EE7512 ELECTRICAL MACHINES LABORATORY II LT P C 0042

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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1 Understanding the over voltage phenomenon and insulation coordination in electrical Power systems

CO2: Ability to understand the various breakdown mechanisms of different dielectrics

CO3: Able to analyse and generate high voltage and high current

CO4: Understanding measurements techniques of high voltages & currents with their relativemerits and demerits

CO5: Ability to conduct dielectric tests on various electrical equipment with safety precautions in HV Lab
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**TEXT BOOKS**

**REFERENCES**

**EE7602 POWER SYSTEM OPERATION AND CONTROL**

**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.

**UNIT I 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

**UNIT II REALPOWER-FREQUENCYCONTROL**

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.

UNIT III REACTIVE POWER—VOLTAGE CONTROL 12
Generation and absorption of reactive power—basic methods of reactive power control—excitation systems—modelling—static and dynamic analysis—stability compensation—methods of voltage control—tap-changing transformers, SVC(TCR+TSC) and STATCOM—secondary voltage control.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 12
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.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 12
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 system transitions and control strategies.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Illustrate the day-to-day operation of electric power system.
CO2: Apply the control actions that are implemented to meet the minute-to-minute variation of system real power demand.
CO3: Categorize the compensators for reactive power control.
CO4: Determine day ahead and real time economic generation scheduling.
CO5: Adapt the necessity of computer control of power systems.

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TEXTBOOKS

REFERENCES


EE7603 PROTECTION AND SWITCHGEAR

OBJECTIVES:

- To teach the principles and need for protection schemes by different fault current calculations
- To teach the basic principles, construction and characteristics of different electromagnetic relays
- To learn to protect different power equipments like transformer, generator etc.,
- To teach different aspects of static relays and numerical protection schemes
- To learn the principles, construction and problems associated with different types of circuit breakers

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


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

Physics of arcing phenomenon and arc interruption — DC and AC circuit breaking — re-striking voltage and recovery voltage — rate of rise of recovery voltage — resistance switching — current chopping — interruption of capacitive current — Types of circuit breakers — air blast, air break, oil, SF and vacuum circuit breakers — comparison of different circuit breakers — Rating and selection of Circuit breakers.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1 Ability to analyse different types of faults and their effects on the power system and understand the practical significance of protection zones

CO2 Understanding the basic principles, construction and characteristics of different electromagnetic relays

CO3 Ability to protect different power equipments like transformer, generator etc., against
various electrical faults
CO4 Understanding different aspects of static relays and numerical protection schemes
CO5 Able to understand the principles, construction, selection and problems associated with different types of circuit breaker

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TEXT BOOKS:

REFERENCES:

MG7451 PRINCIPLES OF MANAGEMENT  LT P C  3 0 0 3

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

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS  9

UNIT II PLANNING  9

UNIT III ORGANISING  9

UNIT IV DIRECTING

UNIT V CONTROLLING

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
- 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

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TEXTBOOKS:

REFERENCES:
OBJECTIVES

- To learn breakdown study of Dielectrics.
- To test High Voltage Power Apparatus.
- To generate and measure 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 δ
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 δ bridge
4. Earth resistance kit
5. Harmonic Analyzer
COURSE OUTCOMES:
After completion the above subject, students will be able to understand

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

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EE7612 POWER ELECTRONICS LABORATORY

OBJECTIVES:
- To study the performance of different power electronic converter circuits.
- To simulate different power electronic converter circuits
- To analyse the characteristics of SCR, IGBT, TRIAC, MOSFET and IGBT
- To learn PWM inverter circuits
- To learn DC/DC topologies

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 2
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).

TOTAL:60 PERIODS

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 –5
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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Determine the characteristics of SCR, IGBT, TRIAC, MOSFET and IGBT

CO2: Understand the performance of AC voltage controllers by simulation and experimentation and Find the transfer characteristics of full converter, semi converter, step up and step down choppers by simulation experimentation.

CO3: Analyze the voltage waveforms for PWM inverter using various modulation techniques.

CO4: Design and experimentally verify the performance of basic DC/DC converter topologies Used for SMPS.

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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 12

UNIT II  DESIGN OF TRANSFORMERS 12
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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to understand basics of design considerations for rotating and static electrical machines
CO2: Ability to design single and three phase transformer.
CO3: Ability to design armature and field of DC machines.
CO4: Ability to design stator and rotor of induction motor.
CO5: Ability to design and analyze synchronous machines.

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TEXT BOOKS

REFERENCES

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

OBJECTIVES
- To study the modeling 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.

LIST OF EXPERIMENTS:
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-1 No.
4. Server (Pentium IV, 80 GB, 1GBRAM) (High Speed Processor) – 1 No.
5. Software: Any Power System Simulation Software - 5 licenses

**COURSE OUTCOMES:**
*After completion the above subject, students will be able to understand*

**CO1:** Outline the model of the transmission lines.
**CO2:** Experimenting the power evacuation studies for future generation and transmission system planning.
**CO3:** Analyze the day-to-day operation of power system with respect to voltage and frequency.
**CO4:** Measuring the stability of AVR.
**CO5:** Managing the optimal scheduling of generators and compute the state of the power system.

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**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.

**TOTAL : 300 PERIODS**

**COURSE OUTCOMES:**
After completion the above subject, students will be able to understand
- 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.

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**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

UNIT V CASE STUDY

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: A thorough understanding of OS concepts and its services
CO2: Clear idea about the process, memory and storage management
CO3: Various file system concepts and their implementation
CO4: A complete knowledge of file system security and protection
CO5: How these concepts are implemented in Windows and Linux

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TEXT BOOK:

REFERENCES:
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
Non-parametric methods - Transient analysis - frequency analysis - Correlation analysis Spectral
analysis Input signal design for identification

UNIT II  PARAMETRIC METHODS
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 – MRACMIT rule – Lyapunov
theory – Relationship between MRAC and STR

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1 Understand the effect of parameter variation and principle of adaptive control schemes.
CO2 Distinguish different parametric identification methods.
CO3 Understand Deterministic and Stochastic Self Tuning Regulators.
CO4 Design of model reference adaptive controller
CO5 Design gain scheduling controller and apply adaptive control schemes for industrial processes.
TEXTBOOKS

REFERENCES
2. Narendra and Annasamy, "Stable Adaptive Control Systems".

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

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
Introduction – Concept of stability – Equilibrium points- Lyapunov’s stability theorems
Lyapunov’s direct method for LTI systems – Lyapunov’s method for non-linear systems
Krasovski’s theorem on Lyapunov function

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1 design state feedback controller and state observer.
CO2 analyse linear and nonlinear systems using phase plane method.
CO3 analyse nonlinear systems using describing function method.
CO4 design optimal controller.
CO5 design optimal estimator including Kalman Filter.

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TEXT BOOKS

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

EE7003 ANALYSIS OF ELECTRICAL MACHINES LT P C

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
☐ To understand the theory of transformation of three phase variables to two phase variables.
☐ To analyse the steady state and dynamic state operation of three-phase induction machines using transformation theory based mathematical modeling and digital computer simulation

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 9
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 9

UNIT IV INDUCTION MACHINES 9
Voltage and torque equations — transformation for rotor circuits — voltage and torque equations in reference frame variables — analysis of steady state operation — free acceleration characteristics — dynamic performance for load and torque variations — dynamic performance of single phasing operation.

UNIT V SYNCHRONOUS MACHINES 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
* understand the magnetic circuits and force components of electrical machines
* understand the transformation theory and its need for machine modeling
* acquire and apply the knowledge of machine dynamics in Electrical engineering.
* model, simulate and analyze the dynamic performance of electrical machines using computational software.
* formulate, design, simulate power supplies and loads to analyse complete electrical machine performance

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TEXT BOOKS
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EE7004 COMPUTER AIDED DESIGN OF ELECTRICAL APPARATUS LT P C
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OBJECTIVES
- To impart knowledge on
- To understand the basics of electromechanical energy conversion.
- To design an electrical machine.
- To impart knowledge on problem formulation for field computation.
- To analyse the performance parameters for rotating machines.
- To analyse the performance parameters for linear machines.

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 FIELD 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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Understand the basics of electromechanical energy conversion.
CO2: Design an conventional electrical machine using finite element package.
CO3: Define boundary conditions and formulate the equations for FEA.
CO4: Enhance the performance parameters using FEA of rotating machines.
CO5: Enhance the performance parameters using FEA of linear machines.
TEXT BOOKS

REFERENCES

EE7005 DATA STRUCTURES AND ALGORITHMS LT P C 3 0 0 3

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 9
Problem solving techniques and examples-Abstract Data Type (ADT)-The list ADT Arrays-Stacks and Queues: Implementation and Application

UNIT II ADVANCED DATA STRUCTURES 9
Trees: Preliminaries-Binary Tree- Tree traversals-Binary search Trees-AVL Trees

UNIT III SORTING AND HASHING 9
Sorting by Selection- Sorting by Insertion- Sorting by Exchange- Sorting by Diminishing Increment-Heap Sort- Heaps Maintaining the Heap Property-Building a Heap- Heap sort Algorithm-Quick sort- Description-Performance of quick sort-Analysis of Quick Sort. Hashing
UNIT IV ALGORITHM DESIGN TECHNIQUES 9
The role of algorithms in computing—Getting Started—Growth of functions. Divide and conquer—
dynamic programming—Greedy Algorithm – Backtracking.

UNIT V GRAPHS ALGORITHMS 9
Elementary Graph Algorithms—Minimum Spanning Trees—Single-source shortest paths—All pairs
shortest paths

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: A comprehensive understanding of fundamentals data structures
CO2: Implement and compare the fundamental data structures
CO3: Develop programs on their own for advanced data structures
CO4: Correlate the use of data structures in real life situations
CO5: Confidence to develop programs for complex problems with improved performance

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2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest, "Introduction to Algorithms",
   2nd Edition, prentice Hall of India, 2002

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2. R G Dromey, "How to solve it by computers", Pearson Education Asia, 2005.
3. Robert L Kruse, Clovis L Tando and Bruce P Leung, "Data structures and Program Design in
4. Jean Paul Trembley, Paul G Sorenson, "An Introduction to Data Structures with Applications",
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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to understand Signals and systems by their mathematical representation.
CO2: Ability to do system representation using transforms
CO3: Learn the transformation techniques for time to frequency conversion.
CO4: Ability to understand the types of filters and their design for digital implementation.
CO5: Capacity to involve digital signal processor for application development

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TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

EE7007 EHV POWER TRANSMISSION  LT P C  3 0 0 3

OBJECTIVES
• To impart knowledge on structure of power system and standard voltage levels
• To compute transmission line parameters
• To know about HVDC system
• To locate various FACTS devices on power system
• To study the effect of fields on living and non-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
COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Ability to identify transmission (HVAC and HVDC) and distribution voltage levels
CO2: Ability to extract transmission line parameters
CO3: Ability to locate required HVDC transmission in power system
CO4: Ability to know the uses of placing FACTS devices
CO5: Able to compute electrostatic and magnetic fields of EHV lines

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TEXT BOOKS
2. Rakosh Das Begamudre “Extra high voltage AC transmission Engineering”, New Age

REFERENCES

EE7008 EMBEDDED AUTOMATION SYSTEMS LT P C
3 0 0 3

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
• To observe the need for smart cities and systems
• To understand the embedded system role in IOT and use it for application development.

UNIT I INTRODUCTION TO SENSORS AND ACTUATORS 9
Sensor electronics and techniques – Overview of sensor measurements – Sensor
linearization and characterization – Sensor classification – sensors and actuators for
automotive systems

UNIT II AUTOMOTIVE SYSTEM AND CONTROL 9

UNIT III AUTOMOTIVE INSTRUMENTATION 9
Sensor and actuator circuit, Display devices – onboard diagnostics

UNIT IV BUILDING AUTOMATION 9

UNIT V ADVANCES IN AUTOMOTIVE ELECTRONIC SYSTEMS 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to understand hardware and software requirements in embedded systems.
CO2: Ability to do develop data management through cloud interface with processor technology.
CO3: Learn the development smart system solutions and analyse issues.
CO4: Ability to understand the types of sensors and Bus for control implementation.
CO5: Capacity to involve communication concepts for vehicle application development.

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TEXT BOOKS

REFERENCES

EE7009 EMBEDDED SYSTEM DESIGN LT P C 3 0 0 3

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 9
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 9

UNIT III INTERRUPTS SERVICE MECHANISM AND DEVICE DRIVERS 9
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 9
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, 큐C/OS-II, RT Linux

UNIT V EMBEDDED SYSTEM APPLICATION WITH DEVELOPMENT 9
Case Study: Washing Machine- Automotive Application-Embedded Product Development Life Cycle, Objective, Need, and different Phases & Modelling of the EDLC

TOTAL:45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Able to understand the hardware functionals and software strategies required to develop various Embedded systems
CO2: Understanding of the basic differences of various Bus communication standards
CO3: Learn to incorporate interface as Interrupt services
CO4: Observe various scheduling algorithms through Real time operating system.
CO5: Ability to involve embedded concepts for developing automation applications.

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REFERENCES
7. Han-Way Huang, ”Embedded system Design using C8051”, Cengage Learning,2009

EE7010  ENERGY MANAGEMENT AND AUDITING  L T P C  3 0 0 3

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.
- To analyse the material and energy balance.
- To learn the methods to improve the energy efficiency in thermal utilities.
- To understand the concept of compressed air system and its energy efficiency.

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Develop the ability to learn about the need for energy auditing process and usage of energy audit equipment.
CO2: Students will learn about the basic concepts of economic analysis and understand the energy management techniques
CO3: Learn the fundamental concepts and energy saving potentials for various electrical equipment
CO4: Develop the skills to learn and understand the energy efficient tools for industrial systems
CO5: Students will be able to learn about the concepts of energy efficiency in electrical utilities

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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
- To analyze the problems in AC transmission systems and establish the Flexible AC transmission systems
- To study the different modes of operation TCSC and to model it for power flow and stability.

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
Voltage control by SVC–Advantages of slope in dynamic characteristics–Influence of SVC on
system voltage–Design of SVC voltage regulator–Modelling of SVC for power flow and fast
transient stability–Applications: Enhancement of transient stability – Steady state power transfer
–Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS
Operation of the TCSC–Different modes of operation–Modelling of TCSC, Variable reactance
model– Modelling for Power Flow and stability studies. Applications: Improvement of the system
stability limit–Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS
Static Synchronous Compensator (STATCOM)–Principle of operation–V-I Characteristics.
Applications: Steady state power transfer-enhancement of transient stability-prevention of
voltage instability. SSSC-operation of SSSC and the control of power flow–modelling of SSSC
in load flow and transient stability studies.

UNIT V CO-ORDINATION OF FACTS CONTROLLERS
Controller interactions–SVC–SVC interaction–Co-ordination of multiple controllers using linear control
techniques –Control co-ordination using genetic algorithms.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Analyze the problems in AC transmission systems and understand the need for Flexible
AC transmission systems
CO2: Analyze the operation and control of SVC and its applications to enhance the stability
and damping.
CO3: Analyze the different modes of operation TCSC and to model it for power flow and
stability studies.
CO4: Analyze basic operation and control of voltage source converter based FACTS controllers.
CO5: Analyze the interaction between the FACTS controllers
TEXTBOOKS

REFERENCES
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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Apply different formats of data representation and number systems
CO2: Design and evaluate combinational and sequential logic circuits with multiple inputs and outputs
CO3: Explain the architecture and functionality of central processing to unit
CO4: Exemplify in a better way the I/O and memory organization
CO5: Exemplify in a better way parallelism and data pipelining

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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++


UNIT II CLASSES AND OBJECTS

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

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

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

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

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: Develop simple programs using C++
CO2: Develop simple programs in C++ for object oriented concepts
CO3: Develop programs using inheritance and polymorphism
CO4: Overload operators and functions
CO5: Confidence to develop programs for complex problems with error handling

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TEXT BOOKS

REFERENCES

E7014 HIGH VOLTAGE DIRECT CURRENT TRANSMISSION LT P C 3 0 0 3

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 of 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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: understand the need for HVDC transmission and its evolution
CO2: analyze the operation of the converters
CO3: to understand the different modes of operation HVDC link and mode shaping
CO4: design filters to eliminate AC/DC harmonics and provide support to reactive power support by means of FACTS.
CO5: Perform AC/DC load flow by including HVDC link.

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TEXTBOOKS

REFERENCES

EE7015 INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN LT P C
3 0 0 3

OBJECTIVES
• To know the Industrial power quality standards
• To know the motor starting techniques
• To study the power factor correction techniques
• To know mitigation techniques for harmonics and flicker problem
• TO understand the ground grid analysis for electrical safety

UNIT I MOTOR STARTING STUDIES
9

UNIT II POWER FACTOR CORRECTION STUDIES
9

UNIT III HARMONIC ANALYSIS

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

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Perform motor starting studies.
CO2: To model and carry out power factor correction studies.
CO3: Perform harmonic analysis and reduce the harmonics by using filters.
CO4: Carryout the flicker analysis by proper modeling of the load and its minimization.
CO5: Design the appropriate ground grid for electrical safety.

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TEXT BOOKS

REFERENCES

EE7016 MEDICAL INSTRUMENTATION LT P C 3 0 0 3

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

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

UNIT IV IMAGING MODALITIES AND ANALYSIS

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Able to understand the fundamental art of biomedical engineering.
CO2: Able to understand the non electrical parameters measurement and diagnostic procedures
CO3: Able to understand the concept of biomedical data acquisition and the working of EEG, ECG etc.
CO4: Able to understand about imaging modalities and analysis through computer tomography.
CO5: Able to understand the life assisting, therapeutic and robotic devices and their technical applications.
### TEXT BOOKS:

### REFERENCES

### EE7017 MICRO ELECTRO MECHANICAL SYSTEMS

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### 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

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UNIT IV  SENSORS AND ACTUATORS - II  9

UNIT V  APPLICATIONS  9

TOTAL : 45 PERIOD

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Understanding the material properties and the significance of MEMS.
CO2: Knowledge delivery on micromachining and micro fabrication.
CO3: Applying the concepts of MEMS to design the sensors and actuators.
CO4: Applying the fabrication mechanism for MEMS sensor and actuators.
CO5: Able to identify the right MEMS device against the applications.

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TEXT BOOKS.

REFERENCES
3. M.H.Bao, “Micromechanical Transducers: Pressure sensors, Accelerometers and
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 NANOSCALE DEVICES

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
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Students will be able to understand the significance and implication of nanotechnology
CO2: To be able to apply the concept of nanotechnology for Electrical and Electronics Engineering Applications.
CO3: Familiar with Rules and guidelines of clean room standards
CO4: Understanding the Fabrication methods and characterization techniques
CO5: Students will be able to know the recent trends of nanotechnology

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TEXT BOOKS

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

EE7019  OPERATIONAL RESEARCH  LT P C
3 0 0 3

OBJECTIVES
- To learn the basics of optimization techniques and their applications to Electrical Engineering
- To perform various method of linear programming
- To perform various method of non linear programming
- To perform various method of dynamic programming

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

UNIT V DYNAMIC PROGRAMMING

TOTAL : 45 PERIODS

O COURSE OUTCOMES:
After completion the above subject, students will be able to understand
Ability to understand and apply the optimization technique for electrical engineering applications.
☐ Ability to perform various method of linear programming
☐ Ability to perform various method of non linear programming
☐ Ability to perform various method of dynamic programming

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 basics of power converters
☐ To study the fundamentals, principle of operation and analysis of electrical machines for renewable energy conversion
☐ To study the features of MPPT tracking.
UNIT I INTRODUCTION  
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) -- Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION  
Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

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

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS  
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  
Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Features of different renewable energy sources are studied.
CO2: Features of electrical machines used in renewable energy conversion are studied.
CO3: Various topologies of power converters used for interfacing renewable energy system are studied.
CO4: Wind and PV systems are analysed and its hybrid operation is successfully studied.
CO5: Different MPPT algorithms are studied.

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REFERENCES:

EE7021 POWER QUALITY LT P C 3 0 0 3

OBJECTIVES
• To study the causes & Mitigation techniques of various PQ events
• To study various Active & Passive power filters.
• To understand the concept of power and power factor in single phase and three phase systems supplying nonlinear loads
• To understand the conventional compensation techniques used for power factor correction and load voltage regulation.
• To understand the active compensation techniques used for power factor correction and load voltage regulation

UNIT I INTRODUCTION TO POWER QUALITY
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
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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

□ CO1 Able to classify power quality disturbances, their causes , detrimental effects and knowledge about national and international Power quality standards

• CO2 Ability to assess the impact of harmonics in single phase and three phase distribution systems
• CO3 Capability to adopt passive harmonic mitigation techniques for load compensation and voltage regulation.
• CO4 Able to employ dynamic harmonic current compensation methods in distribution systems
• CO5 Able to employ dynamic voltage regulation methods in distribution systems

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TEXT BOOKS

REFERENCES

EE7022  RESTRUCTURED POWER SYSTEMS  3003

COURSE OBJECTIVES
• 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  9
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  9

UNIT III  LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHT  9

UNIT IV  ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK  9
Introduction of ancillary services – Types of Ancillary services Classification of Ancillary services–Load generation balancing related services Voltage control and reactive power support devices–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  9

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: To be able to gain knowledge on the fundamentals of deregulation of power systems
CO2: To understand the basics and classification of transmission congestion management
CO3: To learn about the fundamental concepts involved in locational margin prices and financial transmission rights
CO4: To understand the significance of ancillary services and pricing of transmission network
CO5: To gain knowledge about the various reforms in the power sectors of India

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TEXT BOOKS

REFERENCES

EE7023 SOFT COMPUTING TECHNIQUES LT P C 3 0 0 3

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.
- To designing hybrid control schemes, selected optimization algorithms with case study using simulation tool box.

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

– Introduction to support vector machine – Particle swarm optimization – Case study
– Familiarization with ANFIS toolbox

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Be able to study the overview of artificial neural network and training algorithms.
CO2: Be able to analyze problems to formulate models and develop control schemes using Neuro controller systems
CO3: Be able to design fuzzy controller form on-linearsystems
CO4: Be able to apply engineering fundamentals to use hybrid schemes and optimization algorithms to obtain solution for complex engineering problems.
CO5: Be capable of using modern IT tool boxes to simulate case studies

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TEXTBOOKS

REFERENCES

EE7024 SOLID STATE DRIVES LT P C
3 0 0 3

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 9
Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant
Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics –
Selection of motor

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9
Steady state analysis of the single and three phase converter fed separately excited DC motor
drive – continuous and discontinuous conduction – Time ratio and current limit control –
4 quadrant operation of converter / chopper fed drive.

UNIT III INDUCTION MOTOR DRIVES 9
Stator voltage control – energy efficient drive – v/f control – constant air gap flux – field
weakening mode – voltage / current fed inverter – closed loop control.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9
V/f control and self-control of synchronous motor: Margin angle control and power factor control –
permanent magnet synchronous motor.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9
Transfer function for DC motor / load and converter – closed loop control with current and speed
feedback – armature voltage control and field weakening mode – design of controllers; controller and speed controller-converter selection and characteristics.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
☐ 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.

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TEXT BOOKS:

REFERENCES:
EE7025 SPECIAL ELECTRICAL MACHINES LT P C 3 0 0 3

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 9
Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Characteristics and control

UNIT II PERMANENT MAGNET SYNCHRONOUS MOTORS 9

UNIT III SWITCHED RELUCTANCE MOTORS 9

UNIT IV STEPPER MOTORS 9

UNIT V OTHER SPECIAL MACHINES 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Analyze given magnetic circuit and understand operation characteristics and control of PMBLDC motor
CO2: Understand the construction, operation performance characteristics of PMSM and its power controllers.
CO3: Understand the construction, operation and control of SRM drive and its power controllers
CO4: Understand the construction, operation, characteristics and control of stepper motor
CO5: Understand the operation & characteristics of other special electrical machines.
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
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
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
Structured design of combinational circuits – Dynamic CMOS & clocking – Tally circuits – (NAND-
UNIT IV DESIGN OF COMBINATIONAL ELEMENTS & REGULAR ARRAYLOGIC

Programmable Logic Devices- PLA, PAL, GAL, CPLD, FPGA-- Implementation of Finite State Machine with PLDs

UNIT V VHDL PROGRAMMING


TOTAL:45 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: Understanding the role of MOSFET for computation.
CO2: The learning process delivers insight into developing CMOS design techniques
CO3: Insight into IC fabrication methods.
CO4: Improved skill set in programmable logic devices usage for applications.
CO5: Understating and usage of HDL computational processes with improved design strategies.

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TEXT BOOKS

REFERENCES

EI7071 INDUSTRIAL DATA COMMUNICATION

COURSE OBJECTIVES

- To give an overview of the Industrial data communications systems.
- To provide a fundamental understanding of common principles, various standards,
To impart knowledge on industrial networks and Field buses
To impart the fundamental understanding on SCADA systems
To provide insight into some of the new principles those are evolving for future networks.

**UNIT I DATA NETWORK FUNDAMENTALS**

**UNIT II MODBUS AND HART**

**UNIT III PROFIBUS AND FF**

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

**UNIT V WIRELESS COMMUNICATION**
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:**
After completion the above subject, students will be able to understand

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.
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**TEXT BOOKS:**


**REFERENCES:**


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

TOTAL: 45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

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TEXT BOOKS:

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

EE7591 INTRODUCTION TO CONTROL SYSTEMS LT P C 3 0 0 3

OBJECTIVES:
- To impart knowledge on various representations of systems.
- To familiarize time response analysis of LTI systems and steady state error.
- To analyze the frequency responses and stability of the systems.
- To analyze the stability of linear systems in frequency domain and time domain.
- To develop linear models mainly state variable model and transfer function model.

UNIT I MATHEMATICAL MODEL SOF PHYSICAL SYSTEMS 9
Definition & classification of system – terminology & structure of feedback control theory – Analogous systems - Physical system representation by Differential equations – Block diagram reduction – Signalflowgraphs.

UNITII TIME RESPONSE ANALYSIS & ROOTLOCUSTECHNIQUE 9

UNITIII FREQUENCY RESPONSE ANALYSIS 9
Correlation between Time & Frequency response – Polar plots – Bode Plots – Determination of Transfer Function from Bode plot.
UNITIV STABILITY CONCEPTS&ANALYSIS 9

UNITV STATE VARIABLE ANALYSIS 9
Concept of state – State Variable & State Model – State models for linear & continuous time systems– Solution of state & output equation—controllability & observability.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Design the basic mathematical model of physical System.
CO2: Analyze the time response analysis and techniques.
CO3: Analyze the transfer function from different plots.
CO4: Apply the stability concept in various criterion.
CO5: Assess the state models for linear and continuous Systems.

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TEXT BOOKS:

REFERENCES
2. Control System Dynamics" by Robert Clark, Cambridge University Press, 1996 USA.
OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.
- To learn the basics of human rights such as social, cultural, economic, political legal rights
- To learn the evolution of human rights
- To know about the human rights declarations
- To know about the human rights protection in India

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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
- Engineering students will acquire the basic knowledge of human rights.
- Will able to know the basics of human rights
- Will able to know the declaration of human rights
- Will able to know the human rights protection in India

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**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**

**COURSE OUTCOMES:**
After completion the above subject, students will be able to understand
- 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 –
REFERENCES

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E7652 TOTAL QUALITY MANAGEMENT

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
The seven traditional tools of quality – New management tools – Six-sigma Process

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY MANAGEMENT SYSTEM

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
• 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.

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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 ( X̄ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits Acceptance sampling.

TOTAL : 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

□ 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.

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TEXT BOOKS:

REFERENCES:
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., “Probability and Statistics
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
Propositional Logic – Propositional equivalences
Predicates and Quantifiers – Nested quantifiers
– Rules of inference
Introduction to proofs – Proof methods and strategy.

UNIT II COMBINATORICS 12
Mathematical induction – Strong induction and well ordering – The basics of counting
The pigeonhole principle – Permutations and combinations – Recurrence relations
Solving linear recurrence relations using generating functions – Inclusion - Exclusion - Principle and its applications.

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

UNIT IV ALGEBRAIC STRUCTURES 12
Algebraic systems – Semi groups and monoids – Groups - Subgroups Homomorphisms – Normal subgroup and coset
Lagrange’s theorem – Definitions and examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA 12

TOTAL : 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

- 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.

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**TEXTBOOKS:**


**REFERENCES:**


**MG7001 MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING**

**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

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
- Basics of demand, supply and cost analysis are studied.
- Different methods of financial accounting and capital budgeting are studied.

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TEXT BOOKS

REFERENCES
OBJECTIVES:

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

UNIT I  FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

UNIT II  REQUIREMENTS AND SYSTEM DESIGN 9

UNIT III  DESIGN AND TESTING 9

UNIT IV  SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9
Introduction to Product verification processes and stages-- Introduction to Product Validation processes and stages - Product Testing Standards and Certification Product Documentation - Sustenance -Maintenance and Repair – Enhancements Product EoL - Obsolescence Management – Configuration Management EoL Disposal

UNIT V  BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
- 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

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

REFERENCES:

EE7712 Comprehension

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