REGULATIONS – 2013

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM AND SYLLABI OF
B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL ENGINEERING COLLEGE, K.R.NAGAR, KOVILPATTI
(An Autonomous Institution, Affiliated to Anna University, Chennai)

COLLEGE VISION

• Transforming lives through quality Education and research with human values

COLLEGE MISSION

• To maintain excellent infrastructure and highly qualified and dedicated faculty

• To provide a conducive learning environment with an ambience of humanity, wisdom, creativity and team spirit

• To promote the values of ethical behavior and commitment to the society

• To partner with academic, industrial and government entities to attain collaborative research
VISION

- Promoting active learning, critical thinking coupled with ethical values to meet the global challenges.

MISSION

- To instill state-of-the-art technical knowledge and research capability that will prepare our graduates for professionalism and life-long learning.
- To update knowledge to meet industrial and real world challenges.
- To inculcate social and ethical values.

Program Educational Objectives (PEO)

- Excel in industrial or graduate work in Electrical Engineering and allied fields
- Practice their profession conforming to ethical values and active participation in the affairs of the profession
- Adapt to evolving technologies and stay current with their profession
Program Outcomes (PO)

POs describe the expectation of students to know by the time of graduation from the programme. Programme Outcomes are recognized as per the process described in 2.1.3. The Programme Outcomes of UG in Electrical and Electronics Engineering are:

1. An ability to apply the knowledge of mathematics, physical sciences, and engineering fundamentals to the solution of complex problems in electrical and electronics engineering.

2. An ability to identify, formulate and analyze the complex electrical and electronics engineering problems by applying first principles of engineering knowledge.

3. An ability to design a system, component, or process and development of solutions to meet desired needs with economic, environmental, social, health and safety constraints.

4. An ability to investigate complex electrical and electronics engineering problems by conducting suitable experiment, analysis and interpretation of data and synthesize the solutions.

5. An ability to use the techniques, skills, and modern engineering tools necessary for electrical and electronics engineering practice.

6. An ability to develop an understanding of contemporary technical and professional issues in the practice of complex electrical and electronics engineering problems in societal context.

7. An ability to understand and evaluate the sustainability of the solutions of complex electrical and electronics engineering problems in global and environmental contexts.

8. An ability to practice the profession with ethical responsibilities.

9. An ability to apply the coordinated effort as an individual or as a part of the team.

10. An ability to communicate effectively in oral and written forms.

11. An ability to apply the project and finance management skills.

12. An ability to recognize the need for and to engage in life-long learning in the broadest context of technological changes.
# REGULATIONS 2013 – CURRICULUM AND SYLLABI

## B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING

**SEMESTER I** (Common to all B.E. / B.Tech., Degree Programmes)

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# Semester II

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(Common to all)                                                     | 3 | 0 | 0 | 3 |
| 2.     | 13D21       | Integral Calculus and Transforms  
(Common to all)                                                   | 3 | 1 | 0 | 4 |
| 3.     | 13D22       | Solid State Physics  
(Common to ECE, CSE, EEE, EIE, and IT)                             | 3 | 0 | 0 | 3 |
| 4.     | 13D23       | Chemistry of Electrical and Electronic Materials  
(Common to ECE, CSE, EEE, EIE and IT)                      | 3 | 0 | 0 | 3 |
| 5.     | 13D24       | Circuit Theory (EEE)                                                      | 3 | 1 | 0 | 4 |
| 6.     | 13D25       | Basic Civil and Mechanical Engineering  
(Common to ECE, CSE, EEE, EIE and IT)                    | 4 | 0 | 0 | 4 |

| **PRACTICAL** |             |                                                                                   |   |   |   |   |
| 7.     | 13D26       | Computer Programming Laboratory  
(Common to all)                                         | 0 | 1 | 2 | 2 |
| 8.     | 13D27       | Physics and Chemistry Laboratory – II  
(Common to all)                                    | 0 | 0 | 3 | 2 |
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(Common to all)                        | 0 | 0 | 3 | 2 |
|         |             | Part B – Chemistry Laboratory – II  
(Common to all)                   | 0 | 0 | 3 | 2 |
| 9.     | 13D28       | Electric Circuits Laboratory  
(Common to EEE and EIE)                         | 0 | 0 | 3 | 2 |
| 10.    | 13D29       | English Language Skill Laboratory  
(Common to all)                                   | 0 | 0 | 3 | 2 |

Total Number of Credits: 29
# Curriculum & Syllabus for B.E. (EEE) Regulations-2013

## SEMESTER III

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Total Number of Credits: 26

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Total Number of Credits: 28
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SH100          TECHNICAL ENGLISH – I
(Common to all B.E. / B.Tech., Degree Programmes)  L T P C
                                                3 1 0 4

COURSE OUTCOMES
The Student will
• apply basic grammar in Writing and Speaking.
• prepare formal Letter Writings.
• come out with proper pronunciation.
• speak confidently in interactions.
• develop interest to read any article.

UNIT I                                                                                                                             12
Language Focus: Technical Vocabulary, Word Formation, Concord, Tense (Present).
Writing: Leave Application Letter, Paragraph writing.
Listening: Listening to correct pronunciation of words.

UNIT II                                                                                                                             12
Language Focus: Words often misspelled, Articles, Tense (Past)
Writing: Permission letters (In-plant training/Seminar/Workshop), Chart description.
Listening: Listening to the Sentences with correct stress and Intonation.
Speaking: Situational Conversations.

UNIT III                                                                                                                             12
Language Focus: Compound nouns, Tense (Future), Preposition, Comparative Adjectives.
Listening: Listening to the conversations.
Speaking: One minute speech.

UNIT IV                                                                                                                             12
Language Focus: Modal verbs, Gerund, Infinitives, Voice.
Writing: Writing Instructions, Letters to Editor.
Listening: Listening to the different Tonal Expressions.
Speaking: Giving Opinions.

UNIT V                                                                                                                             12
Language Focus: ‘If’ Conditionals, ‘Wh’ questions, Question Tags.
Writing: Reading and Note - taking
Speaking: Group Discussion.
Reading: ERC, one word questions from the suggested book.

SUGGESTED ACTIVITIES
2. Exercises on gap filling and correction of errors on Concord (Subject – Verb Agreement).
3. Gap filling exercises using the appropriate Tense forms.
4. Exercises on transferring information from Graph to Text – Bar charts, Flow charts.
5. Making sentences using Modal verbs to express probability, compulsion, etc.
6. Exercises on Writing Instructions.
7. Exercises on framing Questions.
8. Other relevant classroom activities.

L: 45 T: 15  TOTAL: 60 PERIODS
BOOK SUGGESTED FOR READING

REFERENCES
SH101 MATRICES AND DIFFERENTIAL CALCULUS
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
• Ability to find inverse and integral powers of matrices and to perform transformations of matrices.
• Ability to find the evolutes of various curves.
• Ability to solve ordinary and partial differential equations.
• Ability to obtain constrained maxima and minima.

UNIT I MATRICES 12
Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties (excluding proofs); Cayley – Hamilton theorem (excluding proof) – Inverse and integral powers of a matrix using Cayley – Hamilton theorem; Diagonalisation of a matrix by orthogonal transformation; Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS 12
Curvature in cartesian, parametric and polar forms; Centre, radius and circle of curvature; Evolutes.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12
Partial derivatives; Total derivatives; Differentiation of implicit functions; Jacobians; Maxima and Minima - Method of Lagrangian multipliers.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 12
Higher order linear differential equations with constant coefficients; Method of variation of parameters; Cauchy’s and Legendre’s linear equations; Simultaneous first order linear equations with constant coefficients.

UNIT V PARTIAL DIFFERENTIAL EQUATIONS 12
Formation of partial differential equations; Lagrange’s linear equations; Solutions of standard types of first order partial differential equations; Linear partial differential equations of second and higher order with constant coefficients.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
SH102  APPLIED PHYSICS  
(Common to all B.E. / B.Tech., Degree Programmes)

L  T  P  C   3  0  0  3

COURSE OUTCOMES
The students will be able to
- gain knowledge on the properties of matter and hydrodynamics.
- study and apply the ultrasonic methods for industrial and medical field.
- understand Lasers and to identify the appropriate Laser technique for industrial and medical field.
- understand the different types, fabrication, losses of optical fibers and the applications of fiber optics in communication and instrumentation.
- understand the physical properties of photons and electrons and to study the different Electron Microscopes.

UNIT I    PROPERTIES OF MATTER AND HYDRODYNAMICS   9
Properties of Matter
Stress, Strain, Hooke’s law; Types of moduli of elasticity; Torsional pendulum – Determination of Rigidity modulus of a wire; Bending of beams – Expression for bending moment – Measurement of Young’s modulus by uniform and Non-uniform bending – I Shaped girders.

Hydrodynamics
Stream line flow, Turbulent flow, Poiseuille’s formula for flow of liquid through a capillary tube, Determination of coefficient of viscosity of a liquid.

UNIT II   ULTRASONICS   9

UNIT III  LASERS   9
Principle of spontaneous emission and stimulated emission, Population inversion, Pumping, Einstein’s A and B coefficients – derivation; Types of Lasers - CO₂ Laser, Nd-YAG Laser, Semiconductor Laser (Homojunction); Determination of wavelength of Laser using grating and Particle size; Applications of Lasers: Industrial applications – Welding, Cutting and Heat treatment; Medical applications; Holography (construction and reconstruction).

UNIT IV   FIBER OPTICS AND ITS APPLICATIONS   9
Principle and propagation of light in optical fibers; Numerical aperture and Acceptance angle; Types of optical fibers – material, refractive index and mode; Double crucible technique of fiber drawing; Splicing – fusion splicing; Loss in optical fiber – attenuation, dispersion and bending; Fiber optical communication system (Block diagram); Advantages and Applications of optical fiber; Fiber optic sensors – temperature and displacement; Endoscope.

UNIT V    QUANTUM PHYSICS AND MICROSCOPY   9
Black body radiation – Planck’s theory (derivation) – Deduction of Wien’s displacement law and Rayleigh Jean’s Law from Planck’s theory; Photoelectric effect – Law of Photoelectric effect – Photoelectric equation; Matter Waves – De Broglie wavelength - Schrodinger’s wave equation – time independent and time dependent equations – Particle in one dimensional box; Heisenberg’s Uncertainty principle; Linear Harmonic oscillator; Electron microscope – scanning electron microscope – transmission electron microscope.

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
SH103      ENGINEERING CHEMISTRY
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
The students will be able to

- select suitable water treatment techniques for industrial and domestic purpose.
- acquire knowledge of electrochemistry.
- apply the contextual knowledge of adsorption techniques for industrial applications.
- synthesize polymers for domestic and industrial applications.
- understand the knowledge of nano materials for their applications in Science and Engineering.

UNIT I      WATER TREATMENT  9

UNIT II    ELECTRO ANALYTICAL TECHNIQUES  9
Electrode potential: definition, measurement of electrode potential, Nernst equation – problems; EMF: definition, measurement of EMF – Poggendorff’s method; reference electrode: standard hydrogen electrode, calomel electrode, glass electrode – measurement of pH using glass electrode; CO₂ sensing electrode; conductometric titrations: acid-base titration (HCl vs NaOH); potentiometric titrations: redox titration (Fe²⁺ vs K₂Cr₂O₇), precipitation titration (Ag⁺ vs NaCl).

UNIT III    CATALYSIS AND SURFACE PHENOMENA  9
Types of catalysis – homogeneous catalysis – heterogeneous catalysis, mechanism of catalytic action - contact theory, catalytic promoters, catalytic poison; enzyme catalysis: Michaelis-Menton equation; adsorption: definition, types – physical adsorption – chemical adsorption – differences between physical and chemical adsorption; adsorption isotherms: definition, Freundlich and Langmuir adsorption isotherms, applications of adsorption.

UNIT IV     ENGINEERING POLYMERS  9

UNIT V     NANO MATERIALS  9
Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – fullerene; synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.

TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES
SH104   FUNDAMENTALS OF COMPUTING AND PROGRAMMING IN C  
(Common to all B.E. / B.Tech., Degree Programmes) 

L T P C  
3 0 0 3  

COURSE OUTCOMES  
• Learn the major components of a computer system.  
• Formulate the algorithms and analyze their complexity.  
• Identify the correct and efficient ways of solving problems.  
• Acquire knowledge about dynamic memory allocation, modular programming and data organization.  
• Develop real time applications using the power of C language features.  

UNIT I  COMPUTER FUNDAMENTALS  
Classification of Computers – Basic Computer organization – Number Systems – Problem Analysis – 

UNIT II  BASIC C PROGRAMMING  
Structure of C Program – Keywords, Constants, Variables and Data Types – Operators and 

UNIT III  FUNCTIONS, ARRAYS AND POINTERS  
Functions: User-defined functions – Definitions – Declarations - Call by reference – Call by value.  
Arrays: Declaration – Definition – Multidimensional Arrays – Functions with array as arguments.  
Pointers: Initialization – Pointers as Arguments – Pointers to Pointers – Dynamic Memory Management Functions.  

UNIT IV  STRUCTURES AND UNIONS  

UNIT V  FILE HANDLING  

TOTAL: 45 PERIODS  

TEXT BOOKS  

REFERENCES  
SH105                    ENGINEERING GRAPHICS
                      (Common to all B.E. / B.Tech., Degree Programmes)  L T P C
                                                                  2 3 0 4

COURSE OUTCOMES
• Students will be able to use the drawing instruments effectively.
• An ability to draw the basic engineering curves and problems related to projections of points, straight lines, planes and solids.
• Able to apply the knowledge acquired on practical applications of sectioning and development of solids.
• Able to draw simple solids and its sections in isometric view and projections and also to draw its perspective views.

Drawing Instruments – IS specifications on lines – drawing sheets – Printing letters and dimensioning – scales (not for examination) – First angle projection should be followed.

UNIT I  PLANE CURVES  12
Conies – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloids – Epi and Hypo cycloids - construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES  12
Projection of points and straight lines located in the first quadrant – Traces – Determination of true lengths and true inclinations.
Projection of regular polygonal surfaces and circular lamina inclined to any one reference plane.

UNIT III  PROJECTION OF SOLIDS  12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV  SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES  12
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – obtaining true shape of section.
Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinder and cone – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS  12
Perspective projection of prisms, pyramids and cylinders by visual ray method and vanishing point method.

TOTAL: 60 PERIODS

Note: In end semester examination from each unit one question with either or pattern may be asked.
No short questions.

TEXT BOOK
REFERENCES
SH106  C PROGRAMMING LABORATORY  
(Common to all B.E. / B.Tech., Degree Programmes)  
L T P C  
0 0 3 2  

COURSE OUTCOMES  
• Acquire logical thinking and problem solving skills.  
• Implement the algorithms and analyze their complexity.  
• Identify the correct and efficient ways of solving problems.  
• Acquire hands on practice in dynamic memory allocation, modular programming and data organization.  
• Implement real time applications using the power of C language features.  

LIST OF EXPERIMENTS  
1. Solve problems such as temperature conversion, student grading, interest calculation.  
2. Finding the 2’s complement of a binary number.  
3. Generation of the first ‘n’ terms of the Fibonacci sequence and prime sequence.  
5. Given distance traveled by a vehicle as \( d = ut + \frac{1}{2}at^2 \), where ‘u’ and ‘a’ are the initial velocity and acceleration. Calculate the distance traveled for different time intervals.  
6. Solving the roots of a quadratic equation.  
7. Designing a simple arithmetic calculator. (Use switch statement)  
8. Performing the following operations: (Use loop statement)  
   i. Generate Pascal’s triangle.  
   ii. Construct a Pyramid of numbers.  
9. Performing the following operations to a string:  
   i. To insert a sub-string into main string at a given position.  
   ii. To delete ‘n’ characters from a given position in a string.  
   iii. To replace a character of string either from beginning or ending or at a specified location.  
10. Performing the following operations: (Use arrays)  
   i. Matrix addition.  
   ii. Transpose of a matrix.  
   iii. Matrix multiplication by checking compatibility.  
11. Performing the following operations: (Use recursive functions)  
   i. To find the factorial of a given integer.  
   ii. To find the GCD (Greatest Common Divisor) of two given integers.  
   iii. To solve Towers of Hanoi problem.  
12. Performing the Student Information Processing using File Handling concepts.  

TOTAL: 45 PERIODS  

SOFTWARE REQUIREMENTS  
• Turbo C/ ANSI C Compiler  
• Gcc compiler
SH107 PHYSICS AND CHEMISTRY LABORATORY – I
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
At the end of the Laboratory classes, the students are able to

• develop collaborative learning skills and to add some of their own ideas to the experiments and their explanations.
• understand the optical properties, mechanical properties and electrical properties.

LIST OF EXPERIMENTS
1. (a) Particle size determination using Diode Laser.
   (b) Determination of Laser parameters – Wavelength, and angle of divergence.
   (c) Determination of Numerical aperture and acceptance angle of an optical fiber.
2. Determination of thickness of a thin wire – Air wedge method.
3. Determination of velocity of sound and compressibility of the liquid – Ultrasonic Interferometer.
5. Determination of Young’s modulus – Non-uniform bending method.
7. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge.

• A minimum of FIVE experiments shall be offered.

PART B - CHEMISTRY LABORATORY – I

COURSE OUTCOMES
The student

• can estimate the amount of hardness and acidity present in the water sample.
• gain knowledge about the estimation of nickel in an alloy.
• quantify the electrolyte by measuring the conductance and pH.

LIST OF EXPERIMENTS
1. Estimation of hardness of Water sample by EDTA method.
2. Estimation of acidity of Water sample.
3. Estimation of Nickel by EDTA method.
4. Conductometric titration (HCl Vs NaOH).
5. Conductometric titration (BaCl₂ Vs Na₂SO₄).
6. pH metric titration (HCl Vs NaOH).
7. Determination of molecular weight and degree of polymerization using Viscometry.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.

TOTAL: 45 PERIODS
### COURSE OUTCOMES

- Students will be able to prepare the pipe connections and identify the various components used in plumbing.
- An ability to prepare simple wooden joints using wood working tools.
- An ability to prepare simple lap, butt and tee joints using arc welding equipments.
- An ability to prepare simple components using lathe and drilling machine.

### PART A – MECHANICAL AND CIVIL ENGINEERING PRACTICES

#### I PLUMBING WORKS:
- Study of components related to plumbing.
- Hands-on-exercise:
  - Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

#### II CARPENTRY PRACTICES:
- Study of the joints in roofs, doors, windows and furniture.
- Hands-on-exercise:
  - Wood work, joints by sawing, planning and cutting.

#### III WELDING:
- Study of the tools used in welding Gas welding practice.
- Preparation of butt joints, lap joints and tee joints using arc welding.

#### IV BASIC MACHINING:
- (a) Simple Turning and Taper turning.
- (b) Drilling Practice.

### REFERENCES
PART B – ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES

COURSE OUTCOMES
• An ability to develop familiarity with rudimentary measurement equipment – signal generators, oscilloscopes, multimeters and power supplies.
• Ability to demonstrate and evaluate the parameters of basic electronic components (wires, resistors, capacitors, diodes etc.) based on their physical parameters and dimensions.
• Define, describe, and analyze fundamentals of Boolean algebra and digital logic gates.
• An ability to predict qualitatively and quantitatively compute the steady state AC responses of basic circuits using the phasor method.
• Gain experience in the documentation of measurements and procedures as well as the preparation of formal reports.

I ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
5. Measurement of energy using single phase energy meter.

II ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO
2. Study of logic gates AND, OR, XOR and NOT.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

REFERENCES
13D20 TECHNICAL ENGLISH – II  
(Common to all B.E. / B.Tech., Degree Programmes)  

COURSE OUTCOMES
The student will be able to
• apply correct form of language while Speaking and Writing.  
• prepare his own Professional letter writings.  
• interpret any passage after listening.  
• interact at different situations fluently.

UNIT I  
Language Focus: Homonyms, Different grammatical forms of the same word, correct usage of words / phrases.  
Writing: Recommendation writing.  
Listening: Interpreting Poetic lines.  
Speaking: Telephone English.

UNIT II  
Language Focus: Cause and Effect, Phrasal Verbs.  
Listening: Conversations.  
Speaking: Asking questions.

UNIT III  
Language Focus: Idioms and Phrases with animal names.  
Writing: Checklist, Process Description.  
Speaking: Presentations.

UNIT IV  
Language Focus: Technical Definitions, Transformation of Sentences.  
Writing: Job Application Letter, Curriculum Vitae, Bio-data, Resume.  
Speaking: Mock Interview.

UNIT V  
Language Focus: British and American Vocabulary, Numerical Expressions.  
Writing: E-mail Writing, Report Writing.  
Speaking: Group Discussion.

SUGGESTED ACTIVITIES
1. Making sentences using different grammatical forms of the same word.  
2. Exercises on combining sentences using Cause and Effect expressions.  
4. Writing exercises on Recommendations.  
5. Exercises on Idioms and Phrases.  
7. Exercises on British and American English words with meanings.

TOTAL: 45 PERIODS

BOOK SUGGESTED FOR READING
REFERENCES
COURSE OUTCOMES

- Ability to find area and volume of objects using double and triple integrals.
- Ability to analyze the concepts related to vector calculus and to apply them in engineering field.
- Ability to perform the ideas of Laplace transform and Z-transform in their respective engineering subjects.

UNIT I MULTIPLE INTEGRALS 12
Double integration – Cartesian and polar coordinates; Change of order of integration; Change of variables between cartesian and polar coordinates; Triple integration in cartesian coordinates; Area as double integral; Volume as triple integral.

UNIT II VECTOR CALCULUS 12
Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields; Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT III LAPLACE TRANSFORM 12

UNIT IV INVERSE LAPLACE TRANSFORM 12
Definition of Inverse Laplace transform – Convolution theorem – Solution of linear ordinary differential equations of second order with constant coefficients using Laplace transformation techniques and solution of simultaneous differential equations of first order with constant coefficients using Laplace transformation techniques.

UNIT V Z – TRANSFORM 12

TEXT BOOKS

REFERENCES
13D22 SOLID STATE PHYSICS
(Common to ECE, CSE, EEE, EIE and IT)

L T P C
3 0 0 3

COURSE OUTCOMES
The Student will be able to

• identify the crystal lattices, their structures and how the structure influences its major properties at different levels.
• choose the major functional and structural properties required for specific applications of conducting materials
• check the parameter that satisfies superconducting behaviour.
• relate technology to the physics of semiconductor devices.
• classify the magnetic materials and their storage applications.
• design optical materials that are able to be manufactured and measured using the state of art optical fabrication technologies.

UNIT I CRYSTAL PHYSICS
9
Lattice, Unit cell, Bravais lattice, Lattice planes; Miller indices – d-spacing in cubic lattice; Calculation of number of atoms per unit cell, Atomic radius, Coordination number and Packing factor for SC, BCC, FCC and HCP structures; Crystal defects – point, line and surface defects; Burger vector.

UNIT II CONDUCTING MATERIALS AND SUPERCONDUCTORS
9
Conductors

Superconductors
Superconductivity: Properties – Meissner effect – Isotopic effect; Types of superconductors – Type I and Type II superconductors; Applications of superconductors – Magnetic levitation.

UNIT III SEMICONDUCTORS
9
Intrinsic semiconductor – carrier concentration derivation – Fermi level – variation of Fermi level with temperature – electrical conductivity – bandgap determination; Extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level – with temperature and impurity concentration; Hall effect – Determination of Hall coefficient – Applications.

UNIT IV MAGNETIC MATERIALS AND STORAGE DEVICES
9
Origin of magnetic moment, Bohr magneton, Dia and Para magnetism, Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials; Anti-ferromagnetic materials; Ferrites – structure and applications; magnetic recording and readout – storage of magnetic data – tapes, floppy, Hard disk and CD ROM.

UNIT V OPTICAL MATERIALS
9
Optical properties of metals, insulators and semiconductors; Phosphorescence and fluorescence; Excitons traps and colour centre and their importance; Different phosphors used in CRO screens, liquid crystal display, LED – working of LED; Thermography and its applications; Solar cell – PN junction solar cell – Conversion efficiency and solar concentration – Hetero junction solar cell.

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
13D23 CHEMISTRY OF ELECTRICAL AND ELECTRONIC MATERIALS
(Common to ECE, CSE, EEE, EIE and IT)

COURSE OUTCOMES
The students can
• apply the knowledge in designing new energy storing devices.
• identify the types of corrosion and to design a method to control the corrosion.
• apply the knowledge of photochemistry in designing the various electronic materials.
• choose proper analytical technique for analyzing the synthesized electronic materials.

UNIT I ENERGY SOURCES AND STORAGE DEVICES

UNIT II CORROSION AND ITS CONTROL

UNIT III PHOTOCHEMICAL PROCESSES

UNIT IV ELECTRONIC MATERIALS

UNIT V ANALYTICAL INSTRUMENTATION

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
COURSE OUTCOMES

- Describe the basic concepts of electric circuits.
- Illustrate the network theorems for DC and AC circuits.
- Explain the concept of resonant circuits.
- Analyze the dynamic behavior of electric circuits
- Analyze the three phase electric circuits.

UNIT I       BASIC CIRCUITS ANALYSIS                              12

UNIT II    NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS           12
Network reduction: voltage and current division, source transformation – star-delta conversion. Thevenin’s and Norton’s Theorem – Superposition Theorem – Maximum Power Transfer Theorem – Reciprocity Theorem.

UNIT III   RESONANCE AND COUPLED CIRCUITS        12

UNIT IV   TRANSIENT RESPONSE FOR DC CIRCUITS       12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and AC with sinusoidal input.

UNIT V   ANALYSIS OF THREE PHASE CIRCUITS          12
Three phase balanced / unbalanced voltage sources – Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced and unbalanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TEXT BOOKS

REFERENCES
13D25 BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to ECE, CSE, EEE, EIE and IT)

COURSE OUTCOMES

- An ability to identify the various systems and its components of various power plants.
- An ability to state and differentiate the working principles of IC engines.
- Students will be able to identify the various systems and components of refrigeration and air conditioning systems.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

UNIT II BUILDING COMPONENTS AND STRUCTURES 15
Foundations: Types, Bearing capacity – Requirement of good foundations.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10

UNIT IV IC ENGINES 10
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10
Terminology of refrigeration and air conditioning – Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room air conditioner.

TOTAL: 60 PERIODS

REFERENCES
13D26 COMPUTER PROGRAMMING LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to:

- Demonstrate how to use the UNIX Shell commands.
- Use the Shell programming constructs.
- Learn tracing mechanisms (for debugging), user variables, Shell variables, read-only variables, positional parameters, reading input to a Shell script.
- Test on numeric values, test on file type, and test on character strings using shell scripts.
- Write moderately complex Shell scripts and make them executable.

Execute programs written in C under UNIX environment.

LIST OF EXPERIMENTS
1. Study of UNIX OS, vi Editor.
2. Use of Basic UNIX Shell Commands:
   - ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.
3. Shell Programming:
   i. Interactive shell scripts
   ii. Positional parameters
   iii. Arithmetic Operators
   iv. if-then-fi, if-then-else-fi, nested if-else
   v. Logical operators
   vi. if - elif, case structure
   vii. while, until, for loops, use of break
   viii. Metacharacters
4. Shell scripts for the following:
   i. Showing the count of users logged in
   ii. Printing column wise list of files in your home directory
   iii. To count lines, words and characters in its input (do not use wc)
5. C Programming on UNIX:
   i. Dynamic Storage Allocation
   ii. Pointers
   iii. Functions
   iv. File Handling

SOFTWARE REQUIREMENTS
- UNIX/LINUX OS
- Gcc compiler

TOTAL: 45 PERIODS
13D27 PHYSICS AND CHEMISTRY LABORATORY – II  
(Common to all B.E. / B.Tech., Degree Programmes)  

L T P C  
0 0 3 2  

PART A - PHYSICS LABORATORY – II

COURSE OUTCOMES
At the end of the Laboratory classes, the students
- demonstrate and report the elastic behaviour of materials
- demonstrate the interference property of light waves
- demonstrate the diffraction property of light waves
- measure the thermal properties of conducting materials
- identify the substance that deforms continuously when subjected to shearing stress.

LIST OF EXPERIMENTS
1. Determination of Young’s modulus – Uniform bending method.
2. Determination of Band Gap of a semiconductor material.
3. Determination of Hall Co-efficient.
5. Determination of wavelength of mercury spectrum using spectrometer and grating
7. Torsional pendulum – Determination of Moment of Inertia of the disc and Rigidity modulus of the material of the wire.

*A minimum of FIVE experiments shall be offered.*

PART B - CHEMISTRY LABORATORY – II

COURSE OUTCOMES
The student
- can estimate the amount of alkalinity and Dissolved Oxygen (DO) present in the water sample.
- gain knowledge in the estimation of copper in an alloy and iron in rust.
- quantify electrolyte and ion by measuring the conductance and emf.

LIST OF EXPERIMENTS
1. Estimation of copper in brass by EDTA method.
2. Determination of Dissolved Oxygen (DO) in water (Winkler’s method)
3. Estimation of alkalinity of Water sample
4. Estimation of Fe^{2+} ion in rust by Dichrometry
5. Conductometric titration (Mixture of acids vs NaOH)
6. Potentiometric Titration (Fe^{2+} vs K_{2}Cr_{2}O_{7})
7. Estimation of Fe^{3+} ion by spectrophotometry.

* A minimum of FIVE experiments shall be offered.*

*Laboratory classes on alternate weeks for Physics and Chemistry.*

TOTAL: 45 PERIODS
13D28  ELECTRIC CIRCUITS LABORATORY  
(Common to EEE and EIE)  

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COURSE OUTCOMES

- Illustrate the basic concepts of electric circuits.
- Relate the physical observations in network theorems of electrical circuits to theoretical principles.
- Examine the electric circuits using mesh and nodal analysis.
- Analyze the dynamic behavior of electric circuits using PSIM.
- Compute the frequency response of resonant and tuned circuits.

LIST OF EXPERIMENTS

1. Verification of Ohm’s laws and Kirchoff’s laws
2. Verification of Thevenin’s and Norton’s theorem
3. Verification of Superposition theorem
4. Verification of Maximum Power Transfer theorem
5. Verification of Reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis
8. Transient response of RL and RC circuits for DC input
9. Frequency response of series and parallel resonance circuits
10. Frequency response of single tuned coupled circuits

TOTAL: 45 PERIODS
13D29 ENGLISH LANGUAGE SKILL LABORATORY  
(Common to all B.E. / B.Tech., Degree Programmes)

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COURSE OUTCOMES
The Student will
- improve their pronunciation skill.
- gather information from any speech.
- imibe the stress and intonation of the native speakers’ accent.

1. Micro Skills
- Spotting the Homonyms / Silent letter words / mispronounced words
- Identifying the missing words in native speech
- Finding the cluster words
- Marking correct punctuation
- Marking word chunks
- Identification of sentences

2. Content Comprehension and making inferences
- Listening to audio files of Speech, Poetry, Recent Issues, News clippings, etc
  a. True / False
  b. Multiple Choice Questions
  c. Filling the blanks
  d. Filling the charts

3. Listen and Act
- Drawing the map using audio
- Picture completing task
- Transferring data to Graph

4. Interpreting the video clippings

5. Listening to Conversations

TOTAL: 30 PERIODS
13EE31        FOURIER TRANSFORMS AND COMPLEX ANALYSIS   L T P C
            3 1 0 4

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
- Perform Fourier series analysis of the functions.
- Implement the properties of Fourier transforms and Compute the Fourier transforms of
  various functions.
- Calculate the Fourier series solution of Wave and Heat equations.
- Grasp analytic functions and their properties and be introduced to the host of conformal
  mappings with suitable examples that have direct applications.
- Understand the basics of complex integration and the concept of contour integration
  encountered in practice.

UNIT I        FOURIER SERIES
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range Sine series –
Half range Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic analysis.

UNIT II       FOURIER TRANSFORMS
Fourier Integral theorem (without proof) – Fourier transform pair – Fourier Sine and Cosine
transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval’s
identity.

UNIT III      APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
Solutions of one dimensional wave equation – One dimensional equation of heat conduction– Steady
state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier
series solutions in Cartesian coordinates.

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

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

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS
   2007.

REFERENCES
   New Delhi, 2007.
COURSE OUTCOMES
Upon successful completion of course the student will be able to

- Understand the various ecosystem and biodiversity
- Classify the different types of natural resources and identify the role of individual in conservation of resources
- Identify and analyse the causes, effects and control measures of environmental pollution
- Identify the different types of environmental hazards and their management
- Analyse the social issues related to the environment and how human population affect the environment

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 – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) aquatic (pond) ecosystems. Field study of simple ecosystems –pond and forest. Introduction to biodiversity: definition - genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values –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. Field study of common plants, insects, birds.

UNIT II  NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water – 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, case studies – 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 III  ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Noise pollution (e) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – e-Waste: Definition-dimension of the problem - source-toxic Substances in e-waste - risks related to toxic substances–environmental problems-role of an individual in prevention of pollution.

UNIT IV  ENVIRONMENTAL HAZARDS
Environmental hazards: Definition – Hazard- Types-Natural and man-made hazards – Natural hazards: Causes, effect and management of Earthquake, Flood, Landslide, Cyclones and Tsunami; Man-made Hazards: Hazards due to dams and reservoirs, hazards due to nuclear power plant, Industrial hazards. Case study: Chernobyl disaster, Bhopal gas tragedy.

UNIT V  SOCIAL ISSUES, HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
13EE33 DC MACHINES AND TRANSFORMERS L T P C
3 1 0 4

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
- Describe the concepts of electromechanical energy conversion.
- Discuss the characteristics and applications of DC generators.
- Recognize the characteristics and speed control of DC motors.
- Analyze the performance of transformers.
- Estimate the efficiency of DC machines and transformers by conducting suitable tests.

UNIT I BASIC CONCEPTS OF ROTATING MACHINES 12

UNIT II DC GENERATORS 12

UNIT III DC MOTORS 12

UNIT IV TRANSFORMERS 12

UNIT V TESTING OF DC MACHINES & TRANSFORMERS 12
Losses and efficiency – Condition for maximum efficiency – Testing of DC machines: Brake test, Swinburne’s test, Retardation test, Hopkinson’s test – Testing of transformer: polarity test, load test, open circuit and short circuit test, Sumpner’s test – All day efficiency.

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE34 ELECTROMAGNETIC FIELD THEORY  L T P C
3 1 0 4

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
• Apply vector calculus for static electric and magnetic fields
• Analyze the concepts of electrostatic fields and magneto static fields
• Develop the boundary condition for different medium
• Formulate the Maxwell’s equations
• Employ the Maxwell equation for electromagnetic wave propagation

UNIT I INTRODUCTION  12
Sources and effects of electromagnetic fields – Vector fields – Different co-ordinate systems- vector calculus – Gradient, Divergence and Curl - Divergence theorem – Stoke’s theorem.

UNIT II ELECTROSTATICS  12

UNIT III MAGNETOSTATICS  12

UNIT IV ELECTRODYNAMIC FIELDS  12

UNIT V ELECTROMAGNETIC WAVES  12

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE35 RENEWABLE ENERGY SYSTEMS L T P C
3 0 0 3

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
- Apply the solar energy concept in various applications.
- Explain the fundamentals of wind energy.
- Indicate the essential of biomass energy.
- Describe the importance of geothermal energy.
- Discuss the concept of ocean energy

UNIT I SOLAR ENERGY COLLECTION, STORAGE AND APPLICATIONS 9
Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors - Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications - Solar heating / cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT II WIND ENERGY 9

UNIT III BIO-MASS 9

UNIT IV GEOTHERMAL ENERGY 9

UNIT V OCEAN ENERGY 9
Ocean Thermal Energy Conversion (OTEC) - Principles utilization - setting of OTEC plants - thermodynamic cycles - Tidal and wave energy: Potential and conversion techniques - mini-hydel power plants and their economics.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13EE36 ELECTRON DEVICES AND CIRCUITS L T P C
3 1 0 4

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
• Discuss the VI characteristics of diode and apply the diode concept in rectifiers.
• Analyze the VI characteristics of BJT and FET in different configurations.
• Analyze the different BJT Biasing Circuits and its applications.
• Describe the operation of amplifier and oscillators.
• Discuss the concepts of pulse circuits.

UNIT I PN DIODE AND ITS APPLICATIONS

UNIT II BJT AND FETS

UNIT III BJT BIASING AND AMPLIFIERS
Need for biasing - Fixed bias and Different types of biasing circuits - Classification of amplifiers - CE CB amplifier and small Signal analysis - frequency response - Class A, B, AB, C&D - RC and transformer coupled power amplifiers - Class B complementary - symmetry, push-pull power amplifiers - Darlington connection.

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS

UNIT V PULSE CIRCUITS

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE37  DC MACHINES AND TRANSFORMERS LABORATORY  L  T  P  C  
0  0  3  2

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
- Describe the performance of DC generators.
- Summarize the characteristics of DC motors under loaded conditions.
- Predetermine the performance of DC motors.
- Implement the speed control in DC shunt motor.
- Analyze the performance of transformers.

LIST OF EXPERIMENTS
1. Study of starters.
2. Open circuit and load characteristics of separately excited DC generators.
3. Open circuit and load characteristics of self excited DC shunt generators.
4. Load characteristics of DC compound generator.
5. Load characteristics of DC shunt and compound motor.
7. Swinburne’s test and speed control of DC shunt motor.
8. Hopkinson’s test on DC motor – Generator set.
9. Load test on single-phase transformer.
10. Open circuit and short circuit tests on single phase transformer.
11. Load test on three phase transformer.
12. Sumpner’s test on transformers.

TOTAL: 45 PERIODS
13EE38  ELECTRON DEVICES AND CIRCUITS LABORATORY  L T P C  0 0 3 2

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
- Describe the VI characteristics of PN diode and Zener diode and design the rectifier and regulator using PN and Zener Diode.
- Compute and Distinguish the VI characteristics of BJT, FET and UJT.
- Develop the Clipping and Clamping Circuits using PN Diode.
- Analyze the frequency response of Amplifiers.
- Illustrate the operation of Oscillators.

LIST OF EXPERIMENTS
1. Characteristics of PN diode and zener diode.
2. Diode Clippers and Clampers.
3. Single phase half wave and full wave rectifiers.
5. Characteristics of Transistor under CE, CC and CB configuration.
6. Characteristics of FET.
7. Characteristics of MOSFET.
8. Characteristics of UJT.
12. RC Phase Shift Oscillator.

TOTAL: 45 PERIODS
13EE41 NUMERICAL METHODS, MATHEMATICAL LOGIC, PROBABILITY AND STATISTICS

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
• Solve the algebraic equations and construct the interpolating polynomials.
• Develop skills in numerical integration and initial value problems.
• Use computational tools to solve ordinary differential equations and partial differential equations.
• Formulate and interpret statements presented in normal forms and determine their validity by applying the rules and methods of propositional calculus.
• Understand the mathematical basis and foundations of probability and statistics.

UNIT I SOLUTION OF ALGEBRAIC EQUATIONS AND INTERPOLATION 12

UNIT II NUMERICAL INTEGRATION AND INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

UNIT III BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12
Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation.

UNIT IV MATHEMATICAL LOGIC 12

UNIT V PROBABILITY AND STATISTICS 12
Probability – Basic concepts – Baye’S Theorem; Statistics – Concepts on mean, median, mode, standard deviation and expectation – Skewness – Kurtosis – Correlation and Regression.

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE42    AC ROTATING MACHINES    L T P C
            3 1 0 4

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
  • Analyze the performance of synchronous machines.
  • Examine the performance of three phase induction machines.
  • Discuss the starting and speed control methods of three phase induction motors.
  • Describe the performance of single phase induction motor.
  • Summarize the features of special machines.

UNIT I  SYNCHRONOUS GENERATOR    12
Constructional details – Types of rotors – EMF equation – Synchronous reactance – Armature
reaction – Voltage regulation – EMF, MMF, ZPF and ASA methods – Synchronizing and parallel
operation – Synchronizing torque – Change of excitation and mechanical input – Two reaction theory
– Determination of direct and quadrature axis synchronous reactance using slip test – Operating
characteristics – Capability curves.

UNIT II SYNCHRONOUS MOTOR    12
Principle of operation – Torque equation – Equivalent circuit – V-curves and Inverted V-curves –
Power input and power developed equations – Starting methods – Operation on infinite bus bars –
Hunting.

UNIT III THREE PHASE INDUCTION MOTOR    12
torque characteristics – Condition for maximum torque – Losses and efficiency – Load test – No load
and blocked rotor tests - Equivalent circuit – Phasor diagram – Circle diagram – Separation of no load

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 12
Need for starting – Types of starters – Cogging and Crawling – Speed control – Change of voltage,
rotor resistance, number of poles and slip – Cascaded connection – Slip power recovery scheme.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES    12
Constructional details of single phase induction motor – Double revolving field theory – Types –
operation – Equivalent circuit – No load and blocked rotor test– Performance analysis – Starting
methods of single-phase induction motors – Special machines – Universal motor, reluctance motor,
repulsion motor, hysteresis motor, stepper motor and AC series motor.

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE43 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION L T P C
3 0 0 3

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,

- Summarize the basic concept of measurement system.
- Recognize the measuring instruments for analog electrical quantities.
- Justify appropriate methods for measuring electrical and magnetic parameters.
- Choose appropriate transducers for measuring non electrical quantities
- Summarize the operations of various digital electronic instruments and display devices.

UNIT I  INTRODUCTION

UNIT II  MEASURING INSTRUMENTS

UNIT III  BRIDGES

UNIT IV  TRANSUCERS

UNIT V  DIGITAL INSTRUMENTS AND DISPLAY DEVICES

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
5. www.cwet.tn.nic.in
13EE44       LINEAR INTEGRATED CIRCUITS AND ITS APPLICATIONS       L T P C
                                         3 0 0 3

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
• Describe the IC fabrication procedure for basic electronic circuits.
• Infer the characteristics of Op-amp ICs.
• Design and construct the basic applications of Op-amp.
• Interpret the internal functional blocks and the applications of special ICs.
• Illustrate the operation of application ICs.

UNIT I       IC FABRICATION
IC classification - fundamental of monolithic IC technology, epitaxial growth, masking and etching,
diffusion of impurities - Realization of monolithic ICs and packaging - Fabrication of diodes,
capacitance, resistance and FETs.

UNIT II      CHARACTERISTICS OF OP-AMP
Ideal OP-AMP characteristics, DC characteristics, AC characteristics - offset voltage and current -
differential amplifier - frequency response of OP-AMP - Basic applications of OP-AMP – summer,
differentiator and integrator.

UNIT III     APPLICATIONS OF OP-AMP
Instrumentation amplifier - first and second order active filters - V/I & I/V converters - comparators,
multivibrators - clippers, clamppers, peak detector, S/H circuit, D/A converter - R-2R ladder and
weighted resistor types - A/D converter -Dual slope, successive approximation and flash types.

UNIT IV      SPECIAL ICs
Timer: Introduction to 555 timers and its functional diagram, monostable, astable and Schmitt Trigger
applications - Voltage Controlled Oscillator: Operation and Applications using IC 566 - Phase Locked
Loops: Introduction, Principles, Block Schematic and Description of IC 565, Applications of PLL:
Frequency multiplication and frequency translation.

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

TEXT BOOKS

REFERENCES
1. Jacob Millman, Christos C.Halkias, “Integrated Electronics - Analog and Digital circuits
13EE45  DIGITAL LOGIC CIRCUITS  L T P C
3 1 0 4

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,

- Devise the number systems and simplify Boolean functions
- Illustrate the various combinational circuits
- Design the synchronous and asynchronous circuits.
- Analyze the characteristics of digital ICs and memory devices.
- Develop VHDL coding for simple circuits.

UNIT I  BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS  12
Boolean algebra: switching functions and simplification using K-maps & Quine McCluskey method,
Parity checker - Design of adder, subtractor, comparators, code converters, encoders, decoders,
multiplexers and Demultiplexers.

UNIT II  ANALYSIS AND DESIGN OF SYNCHRONOUS SEQUENTIAL CIRCUITS  12
Realization of Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of
synchronous sequential circuits – Counters state diagram; state reduction; state assignment. Shift
Register, Sequence detector.

UNIT III  ANALYSIS AND DESIGN OF ASYNCHRONOUS SEQUENTIAL CIRCUITS  12
Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT IV  DIGITAL INTEGRATED CIRCUITS  12
Characteristics of digital ICs –Voltage and current ratings, Fan in-Fan out-propagation delay-Noise
Margin-power dissipation. Digital logic families: TTL, ECL, CMOS - Memories: ROM, PROM,
EPROM, PLD, PAL, PLA and FPGA - Trouble shooting.

UNIT V  VHDL  12
RTL Design – Behavior, Dataflow and Structural modeling – Data Types – Operators – Packages –
Sequential circuit – Sub programs – Test benches. (Examples: adders, counters, flipflops, FSM,
Multiplexers / Demultiplexers).

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
2005.
5. Avinashi Kapoor and Maheshwari, “Digital Electronics Principles and Practice”, Macmillan
13EE46         SIGNALS AND SYSTEMS    L T P C
            3 1 0 4

COURSE OUTCOMES
Upon successful completion of this course, students will be able to:
- Recognize, analyze and manipulate basic continuous time (CT) and discrete time (DT) signals.
- Classify continuous and discrete time systems as to their linearity, time invariance, causality and stability.
- Represent and analyze both CT and DT Signals using appropriate transforms.
- Analyze both CT and DT Linear Time Invariant systems using appropriate transforms.

UNIT I    CLASSIFICATION OF SIGNALS AND SYSTEMS          12
Continuous time signals (CT signals), Discrete time signals (DT signals), Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals, periodic and aperiodic, random signals, CT systems and DT systems, Basic properties of systems, Linear Time Invariant systems and properties.

UNIT II    ANALYSIS OF CONTINUOUS TIME SIGNALS                               12
Fourier series analysis, Spectrum of CT signals, Fourier Transform and Laplace Transform in Signal Analysis.

UNIT III    LINEAR TIME IN Variant - CONTINUOUS TIME SYSTEMS            12
Differential equation, Block diagram representation, Impulse response, Convolution integral, frequency response, LTI systems analysis using Fourier and Laplace transforms, State variable equations and matrix representation of systems.

UNIT IV    ANALYSIS OF DISCRETE TIME SIGNALS                                           12
Sampling of CT signals and aliasing, DTFT and properties, Z-transform and properties of Z-transform.

UNIT V    LINEAR TIME INVARIANT - DISCRETE TIME SYSTEMS                    12
Difference equation, Block diagram representation, Impulse response, Convolution sum, LTI systems analysis using DTFT and Z-transforms, State variable equations and matrix representation of systems.

L:  45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE47  AC ROTATING MACHINES LABORATORY  L T P C

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
- Compute the regulation of Three Phase Alternator using various methods.
- Evaluate the performance characteristics of AC motors.
- Explain the various starting methods of AC motors.
- Predict the performance characteristics of AC motors.

LIST OF EXPERIMENTS

2. Regulation of Three Phase Alternator by EMF methods.
3. Regulation of Three Phase Alternator by MMF methods.
4. Regulation of Three Phase Alternator by ZPF methods.
5. Regulation of Three Phase Alternator by ASA methods.
6. Regulation of Three Phase Salient Pole Alternator by Slip test.
7. Parallel operation of two Alternators.
8. V and Inverted V curves of Three Phase Synchronous Motor.
9. Load test on Three Phase Induction Motor.
10. No load and blocked rotor test on Three Phase Induction Motor.
12. Load test on Single Phase Induction Motor.
13. No load and blocked rotor test on Single Phase Induction Motor

TOTAL: 45 PERIODS
13EE48 INTEGRATED CIRCUITS LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES
On the successful completion of the course, the student should be able to,
- Realize adder, subtractor and code converters.
- Design and realize the basic applications of Op-amp and timer.
- Design and implement the 4-bit modulo counters as synchronous and asynchronous types.
- Illustrate the various combinational and sequential circuits.
- Examine the behavior of special ICs.

LIST OF EXPERIMENTS

1. Study of Basic Digital IC’s. (Verification of truth table for AND, OR, XOR, NOT, NOR, NAND, JK FF, RS FF, D FF).
2. Implementation of Boolean Functions, Adder/ Subtractor circuits.
3. (a) Code converters, Parity generator and parity checking, Excess-3, 2’sComplement, Binary to Gray Code using suitable IC’s.
   (b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.
4. Counters: Design and implementation of 4-bit modulo counters as synchronous and Asynchronous types using FF IC’s and specific counter IC.
5. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.
7. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
9. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC’s.
10. Study of VCO and PLL ICs:
   i. Voltage to frequency characteristics of NE/ SE 566 IC.
   ii. Frequency multiplication using NE/SE 565 PLL IC.

TOTAL: 45 PERIODS
COMMUNICATION SKILLS AND TECHNICAL SEMINAR

COURSE OUTCOMES

On the successful completion of the course, the student should be able to,

- Express themselves fluently and appropriately in social and professional contexts.
- Develop the sub-skills required for paper presentations and group discussions.
- Acquire the soft skills and interpersonal skills which will help them to excel in their workplace.

A) LANGUAGE FUNCTIONS

1. Compare and contrast
2. Giving reasons
3. Reporting
4. Expressing agreement and disagreement
5. Evaluating different standpoints
6. Analyzing a problem and giving solution.
7. Describing daily routines, events, and weather
8. Describing Objects
9. Defending a point of view
10. Talking about future plans and intentions

Language Functions:
The teacher should build micro activities to develop the use of language required to handle these Sub-functions of communication. In the process, the learners should get used to the linguistic Elements needed for these functions.

B) SPEECH PRACTICE

The themes are:

1. Cloning
2. Artificial satellites
3. Renewable sources
4. Telecommunication
5. Cyber Revolution
6. Space research
7. Polythene pollution
8. Fossil fuels
9. Safety measures in Automobiles
10. Ecological threats
11. Water resources
12. Nuclear technology
13. Scientific farming
14. Thermal power plants
15. Nano Technology
16. Robotics
17. Artificial intelligence
18. Role of Fibre Optics
19. Exploration of Mars
20. Gas turbines
21. Indian space missions
22. Converting agricultural wastes for useful purposes
23. Developments in transportation
24. Scientific farming
25. Impact of global warming
26. Desalination of water
27. Technology for national security
28. Industrial development and ecological issues
29. Recent trends in Automobiles
30. Hazards of E-waste
31. Mobile Jammer
32. Touch Screen Technology
33. Tidal Power
34. 3G Technology
35. Tsunami Warning System
36. Blue Tooth Technology

Seminar presentation on the themes allotted:
Each student should collect materials from Books, Internet, Journals and Newspapers for his/her theme and prepare a short Seminar Paper for 4 to 5 Pages. The presentation should be for 10 minutes using power point frames. It should be followed by a Viva Voce during which others should come forward to question, clarify, supplement or evaluate.

C) GROUP DISCUSSION / DEBATE
Grouping (each group consisting of 12 members)
Topics (12 topics – 3 topics to be selected by each group - to be practiced in cycles)

Group Discussion / Debate Topics:
1. Advertising is a legalized form of lying- Discuss.
2. Communicative competency in English is the golden key for success in the Global arena.
3. Is it just to force people to retire?
4. Attitude decides one’s altitude in life.
5. Should an aspiring student go for a course which is in demand or for a course which he/she likes?
6. Is westernization a cultural degradation or enrichment?
7. Is brain drain a threat to India?
9. Do mobile phones spoil the youth?
10. No two generations see eye to eye- Discuss.
11. Is scientific advancement a boon or a bane?
12. Does ragging develop friendship?

D) SPEAKING ON THE GIVEN PICTURE/DIAGRAM/CHART/TABLE
RECORD LAYOUT:
Every student has to maintain a record in which he/she has to incorporate the following details.
- First page containing learner details and the topic of specialization
- Use of appropriate Language used in Language Function should be listed.
- Three newspaper cuttings or journal or internet sources related to the specialized theme. (To be pasted on the pages)
- 10 Quiz questions of the specialized topic with expected answers.
- The seminar paper presented by the learner (to be pasted).
- Notes of observation - Lab. (Details about Interview skills – GD – Soft skills)
- The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practical.

TOTAL: 45 PERIODS

REFERENCES
13EE51  TRANSMISSION AND DISTRIBUTION  L T P C  3 1 0 4

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: Explain the principle and structure of various electric power systems.
CO2: Design the electrical parameters of Transmission line parameters.
CO3: Calculate the performances of different of transmission lines.
CO4: Calculate the voltage distribution and string efficiency of insulators and cables.
CO5: Explain substation and distribution system.

UNIT I    POWER SYSTEM STRUCTURE  12
Structure of electric power system – Generation, Transmission and distribution voltages – HVDC system – structure – Types - Comparison of AC and DC system - EHV AC transmission- need and environmental aspects – FACTS- TCSC – SVC – STATCOM – UPFC (qualitative treatment only) – Mechanical design of transmission line between towers – sag and tension- calculations using approximate equations taking into account the effect of ice and wind.

UNIT II    TRANSMISSION LINE PARAMETERS  12
Transmission line Resistance - Inductance and Capacitance calculations for - single and three phase transmission lines with single and double circuits lines - Symmetrical and unsymmetrical spacing - Transposition - Application of self and mutual GMD -Stranded and bundled conductors - Skin and proximity effects.

UNIT III    MODELLING AND PERFORMANCE OF TRANSMISSION LINES  12
Classification of lines – Short, medium and long transmission lines – Equivalent circuits Transmission efficiency and voltage regulation – Generalized constants of the transmission line- Surge impedance – Surge impedance loading- Real and reactive power flow in the line- Power angle diagram - Power circle diagrams – Ferranti effect -corona formation and loss.

UNIT IV    INSULATORS AND CABLES  12

UNIT V    SUBSTATION AND DISTRIBUTION SYSTEM  12
Neutral grounding- System and equipment grounding- grounded and ungrounded transmission system- Solid, Resistance, reactive, Peterson coil grounding systems –Distribution systems- types - Radial and ring main (qualitative treatment only).

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE52 DATA STRUCTURES AND ALGORITHMS L T P C

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: Implement various sorting and searching algorithms.
CO2: Implement basic ADTs like linked list, queue and stack using both static and dynamic memory allocations.
CO3: Recognize the data organization and applications of binary trees and binary search trees.
CO4: Identify suitable algorithms for solving hashing, shortest path, network link analysis, and minimum spanning tree.
CO5: Identify data structuring strategies that are appropriate to a given contextual problem.

UNIT I SORTING AND SEARCHING ALGORITHMS 9

UNIT II LINEAR STRUCTURES 9
Definition – Types – Applications of Data Structures - Abstract Data Types (ADT) – List ADT – Array-based implementation – Linked List implementation – Doubly-linked lists – Applications of lists – Stack ADT – Balancing Symbols – Infix to Postfix Conversion – Evaluation of Postfix Expression – Queue ADT.

UNIT III TREE STRUCTURES 9

UNIT IV HASHING AND HEAPS 9

UNIT V GRAPHS 9

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCE
13EE53  DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS  L T P C
3 1 0 4

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: Compute frequency spectrum of signals using DFT.
CO2: Design and realize IIR digital filters.
CO3: Design and realize FIR digital filters.
CO4: Recognize the effects of finite word length in DSP.
CO5: Apply DSP for motor control.

UNIT I   DISCRETE FOURIER TRANSFORM  12
DTFT and its properties, DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Inverse DFT using FFT algorithms, Use of FFT in linear filtering, Sectionalized convolution-overlap add and save procedure.

UNIT II   INFINITE IMPULSE RESPONSE DIGITAL FILTERS  12

UNIT III   FINITE IMPULSE RESPONSE DIGITAL FILTERS  12

UNIT IV   FINITE WORD LENGTH EFFECTS  12
Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error - Overflow error – Round off noise power - limit cycle oscillations due to product round off and overflow errors - signal scaling.

UNIT V   PROGRAMMABLE DSP CHIPS  12
Architecture and features of TMS 320C5X signal processor - Addressing Modes - Overview of instruction set – DSP based Stepper motor and DC motor control (Qualitative treatment only)

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE54  CONTROL ENGINEERING  L T P C
3 1 0 4

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: Model the dynamics of different physical systems.
CO2: Predict the time domain behavior of systems and location of roots.
CO3: Analyze the open loop and closed loop frequency responses of systems.
CO4: Apply the concepts of stability and design of compensator in frequency domain.
CO5: Analyze the system using state model.

UNIT I  SYSTEMS AND THEIR REPRESENTATION  12

UNIT II  TIME RESPONSE  12

UNIT III  FREQUENCY RESPONSE  12
Frequency response - Correlation between frequency domain and time domain specifications – Bode plot – Polar plot – Determination of closed loop response from open loop response - Effect of Lag, lead and lag-lead compensation on frequency response- Analysis.

UNIT IV  STABILITY AND COMPENSATOR DESIGN IN FREQUENCY DOMAIN  12
Nyquist stability criterion - Performance criteria – Lag, lead and lag-lead networks – Lag/Lead compensator design using bode plots – PID controller - Design using Ziegler-Nichols technique for I and II order system.

UNIT V  STATE VARIABLE ANALYSIS  12
Concept of state variables for linear time invariant Systems – State models from transfer function – State transition matrix - Solution of state and output equation in autonomous system – Concepts of controllability and observability – Kalman’s test (without proof).

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE55 PROFESSIONAL ETHICS AND HUMAN VALUES  L  T  P  C
(Common to all branches)  3  0  0  3

COURSE OUTCOMES
Upon completion of this course, the student will be able to
CO1: Understood the core values that shape the ethical behavior of an engineer
CO2: Exposed awareness on professional ethics and human values.
CO3: Known their role in technological development

UNIT I HUMAN VALUES  9
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for
Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS  9
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral
autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of
Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical
theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION  9
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced
outlook on law - the challenger case study

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS  9
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile
island and chernobyl case studies. Collegiality and loyalty - respect for authority - collective
bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee
rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES  9
Multinational corporations - Environmental ethics - computer ethics - weapons development -
engineers as managers-consulting engineers-engineers as expert witnesses and advisors -Moral
leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian
Institute of Materials Management, Institution of electronics and telecommunication engineers
(IETE),India, etc.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India,
   New Delhi, 2004.
3. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey,
   2004 (Indian Reprint)

REFERENCES
   and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: Explain the various causes of overvoltage phenomenon.
CO2: Choose appropriate method to generate HVAC, HVDC and Impulse voltage and Current.
CO3: Analyze the various breakdown mechanisms of different dielectric materials.
CO4: Identify exact method to measure HVAC, HVDC and Impulse voltage and current.
CO5: Summarize the various tests in power apparatus as per standards.

UNIT I OVER VOLTAGE PHENOMENON AND INSULATION COORDINATION 9
Natural causes for over voltages – Lightning phenomenon, overvoltage due to switching surges, system faults and other abnormal conditions – Principles of insulation coordination.

UNIT II GENERATION OF HIGH VOLTAGES AND CURRENTS 9
Generation of high direct current voltages– Generation of high alternating voltages– Generation of impulse voltages– Generation of impulse currents– Tripping and control of impulse generators

UNIT III BREAK DOWN IN SOLID, GASEOUS AND LIQUID DIELECTRICS 9
Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice - Breakdown in composite dielectrics - Solid dielectrics used in practice – Gases as insulating media, collision process, ionization process - Townsend’s criteria of breakdown in gases - Paschen’s law – Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND CURRENTS 9
Measurement of high direct current voltages– Measurement of high voltages alternating and impulse - Measurement of high currents–direct, alternating and Impulse - Oscilloscope for impulse voltage and current measurements.

UNIT V HIGH VOLTAGE TESTING 9

TEXT BOOKS

REFERENCES
13EE57 CONTROL AND INSTRUMENTATION LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO1: Construct transfer function models for electro - mechanical systems.
   CO2: Choose appropriate method for measurement of electrical and non electrical parameters
   CO3: Calibrate the energy meter by direct and phantom loading method.
   CO4: Evaluate time, frequency domain specifications and stability of system.
   CO5: Design the compensators

LIST OF EXPERIMENTS
1. Study of displacement and pressure transducers
2. AC bridges
3. DC bridges
4. Calibration of current transformer
5. Calibration of single phase energy meter direct loading and Phantom loading
6. Calibration of three phase energy meter direct loading
7. Speed torque characteristics AC servo motor
8. Frequency response analysis of armature and field controlled DC Servo motor
9. Design and implementation of Lag, Lead compensator
10. Stability analysis of linear system
11. Transfer function of AC Servo motor
12. Time Response analysis of First and Second order systems

P: 45 TOTAL: 45 PERIODS
13EE58 DATA STRUCTURES AND ALGORITHMS LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: Describe the basic concept of data structures.
CO2: Implement linked list using static and dynamic memory allocation.
CO3: Analyze the operations of stack and queue.
CO4: Implement the arithmetic expression using trees.
CO5: Distinguish the opened and closed hashing techniques.

LIST OF EXPERIMENTS
1. Implement insertion sort
2. Implement binary search
3. Implement singly and doubly linked lists.
4. Represent a polynomial as a linked list and write functions for polynomial addition.
5. Implement stack and use it to convert infix to postfix expression.
6. Implement a double-ended queue (dequeue) where insertion and deletion operations are possible at both the ends.
7. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
8. Implement binary search tree.
10. Implement hashing with open addressing.
11. Implement Prim's algorithm and Kruskal’s Algorithm using priority queues to find MST of an undirected graph.
12. Implement Dijkstra's algorithm to find the shortest path.

P: 45 TOTAL: 45 PERIODS

LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS (PER BATCH)
HARDWARE
• 30 Systems with core i5 Processor

SOFTWARE
• Turbo C++/GCC Compiler – to be installed in all PCs.
• OS – LINUX/ Windows 2000/ Windows XP/ NT
13EE61  POWER SYSTEM ANALYSIS  L T P C  3 1 0 4

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: Compute the per unit quantities for power system components.
CO2: Model equivalent circuit of a network using single line diagram.
CO3: Evaluate the parameters of power system using various methods of Load flow Analysis.
CO4: Estimate the fault current for different types of short circuits.
CO5: Analyze the concepts of power system stability.

UNIT I  POWER SYSTEM OVERVIEW  12
Power system components, Representation – Single line diagram – Per unit quantities – Per phase analysis of symmetrical three-phase system – Impedance and reactance diagram – sequence impedances and sequence networks.

UNIT II  NETWORK MODELLING  12

UNIT III  POWER FLOW ANALYSIS  12

UNIT IV  SHORT CIRCUIT ANALYSIS  12
Need for short circuit study – Symmetrical component transformation - Symmetrical fault analysis – Z bus in phase frame and in sequence frame fault matrices – unsymmetrical fault analysis.

UNIT V  STABILITY ANALYSIS  12

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE62  DESIGN OF ELECTRICAL APPARATUS       L T P C
                               3  1 0  4

COURSE OUTCOMES
Upon completion of this course, the student will be able to

CO1: Formulate Specific Electrical and Magnetic loadings for various electrical DC and AC machines.

CO2: Devise main dimensions (D, L) of armature and field systems for D.C. machines.

CO3: Design overall Dimensions of single and three phase transformers core, windings and cooling systems for transformers.

CO4: Design main dimensions of squirrel cage and Slip ring induction machines.

CO5: Estimate enhanced dimensions of stator of AC machines.

UNIT I  INTRODUCTION

UNIT II  DC MACHINES

UNIT III  TRANSFORMERS

UNIT IV  INDUCTION MOTORS

UNIT V  SYNCHRONOUS MACHINES

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EE63 MICROPROCESSOR AND MICROCONTROLLER AND ITS APPLICATIONS

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO1: Recognize the architecture of Microprocessor (8085/8086) and Microcontroller (8051).
   CO2: Develop simple programs based on the instruction sets of 8085 and 8051.
   CO3: Design and implement memory and peripheral device interfacing using 8085.
   CO4: Discriminate the different interrupt structures of 8085 and 8051.
   CO5: Implement various addressing modes and programming towards simple project development.

UNIT I INTRODUCTION TO MICROPROCESSORS

UNIT II PROGRAMMING OF 8085 PROCESSOR
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 III PERIPHERAL INTERFACING
Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Keyboard display controller and 8253 Timer/ Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT IV 8051 MICRO CONTROLLER

UNIT V MICRO CONTROLLER PROGRAMMING AND APPLICATIONS
Data Transfer, Manipulation, Control & I/O instructions – Simple programming exercises key board and display interface – Design of PID controller - Closed loop control of servo motor - Stepper motor control - Washing Machine Control.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: Distinguish various types of power semiconductor devices.
CO2: Analyze the operation of phase controlled rectifiers.
CO3: Discuss the basic topologies of DC-DC switching regulators.
CO4: Describe the different modulation techniques of pulse width modulated inverters.
CO5: Explain the operation of AC voltage controller and Cycloconverter.

UNIT I    POWER SEMI-CONDUCTOR DEVICES     \[9\]
Basic structure and characteristics of SCR, TRIAC, DIAC, Power BJT, Power MOSFET and IGBT – Driver, Snubber circuit and commutation circuit of switching devices.

UNIT II    PHASE-CONTROLLED CONVERTERS     \[9\]
2-pulse, 3-pulse and 6-pulse converters – Effect of source inductance – Performance parameters – Power factor control – Dual converters.

UNIT III    DC TO DC CONVERTER     \[9\]
Step-down and step-up chopper – Time ratio control and current limit control – Switching mode regulators -Buck, Boost, Buck-Boost and Cuk regulator - Concept of resonant switching.

UNIT IV    INVERTERS     \[9\]
Single phase and three phase (both 120º mode and 180º mode) inverters – PWM techniques: Single PWM- Multiple PWM - Sinusoidal PWM, modified sinusoidal PWM — Voltage and harmonic control – Series resonant inverter – Current source inverter- Uninterrupted power supply topologies.

UNIT V    AC TO AC CONVERTERS     \[9\]
Single phase AC voltage controllers - Introduction to Integral cycle control – Multistage sequence control - Single and three phase cycloconverters.

TEXT BOOKS

REFERENCES
13EE65  OBJECT ORIENTED PROGRAMMING          L  T  P  C
                                3 0  0  3

COURSE OUTCOMES
Upon completion of the course, the students will be able to
   CO1: Use pointers and dynamic memory allocation in C++ classes
   CO2: Recognize and use object oriented programming constructs to write object oriented programs
   CO3: Describe encapsulation, polymorphism and inheritance
   CO4: Create and modify objects using C++ classes
   CO5: Determine the appropriate objects required to solve a programming problem
   CO6: Practice exception handling mechanisms to handle runtime errors
   CO7: Differentiate function templates and class templates
   CO8: Explain about the namespaces

UNIT I  BASIC CONCEPTS                     9

UNIT II  FUNCTION OVERLOADING AND CONSTRUCTORS          9

UNIT III  INHERITANCE AND POLYMORPHISM              9

UNIT IV  TEMPLATES AND EXCEPTION HANDLING          9

UNIT V  I/O STREAMS                                 9

L:45 TOTAL: 45 PERIODS
**TEXT BOOKS**


**REFERENCES**

13EE67       POWER ELECTRONICS LABORATORY       L T P C
                      0 0 3  2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: Compare the characteristics of various power semiconductor devices.
CO2: Demonstrate the operation of phase controlled rectifiers based DC drives.
CO3: Analyze the basic topologies of DC-DC converters.
CO4: Employ the different modulation techniques of pulse width modulated inverters.
CO5: Compute the performance of AC voltage controller and Cycloconverter.

LIST OF EXPERIMENTS
1. Characteristics of SCR, TRIAC and DIAC
2. Characteristics of MOSFET and IGBT
3. AC to DC fully controlled converter
4. AC to DC half controlled converter
5. Step down and Step up chopper
6. IGBT based PWM inverter
7. Series and Parallel inverter
8. AC Voltage Controller
9. Cycloconverter
10. AC to DC converter based DC drive
11. DC to AC converter based AC drive

P: 45 TOTAL: 45 PERIODS
COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: Develop basic binary and mathematical operations like Addition, Subtraction, Multiplication, Division using microprocessor and microcontroller

CO2: Describe the fundamental features and operations of contemporary microcontroller and microprocessor

CO3: Develop Assembly Language Program that will provide solutions to real world control problems like Speed control, traffic light control.

CO4: Choose appropriate peripheral interfacing devices with 8085 for specific applications

8-bit Microprocessor
1. Simple arithmetic operations: Multi precision addition / subtraction / multiplication / division.


3. Interface Experiments:
   1. A/D Interfacing.
   2. D/A Interfacing.
   3. Traffic light controller.
   4. Simple experiments using 8251, 8279, 8254.

8-bit Microcontroller
4. Demonstration of basic instructions with 8051 Microcontroller execution, including:
   1. Conditional jumps, looping
   2. Calling subroutines.

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

6. Programming exercise on
   1. RAM Direct Addressing
   2. Bit Addressing

7. Programming Practice using simulation Tools and C Compiler
   1. Initialize Timer
   2. Enable Interrupts

8. Study of microcontroller with FLASH memory.

9. Programming Practice on Assembler and Simulator tools in 8051

P: 45 TOTAL: 45 PERIODS
13EE69 OBJECT ORIENTED PROGRAMMING LABORATORY  

COURSE OUTCOMES
Upon completion of this course, students will be able to
CO1: Design object oriented programs with static members and friend functions using C++
CO2: Implement C++ programs with operator overloading and type conversions
CO3: Develop class templates for various data structures like stack, queue and linked list.
CO4: Apply function templates concepts in standard sorting algorithms such as bubble sort,
insertion sort, merge sort and quick sort.
CO5: Create classes with necessary exception handling
CO6: Construct simple test applications using dynamic polymorphism.

LIST OF EXPERIMENTS
1. Design C++ classes with static members, methods with default arguments, friend functions.
   (For example, design matrix and vector classes with static allocation, and a friend function to
do matrix-vector multiplication).
2. Implement Matrix class with dynamic memory allocation and necessary methods. Give proper
   constructor, destructor, copy constructor, and overloading of assignment operator.
3. Implement complex number class with necessary operator overloading and type conversions
   such as integer to complex, double to complex, complex to double etc.
4. Overload the new and delete operators to provide custom dynamic allocation of memory.
5. Develop C++ class hierarchy for various types of inheritances.
6. Design a simple test application to demonstrate dynamic polymorphism and RTTI.
7. Develop a template of linked-list class and its methods.
8. Develop templates of standard sorting algorithms such as bubble sort, insertion sort and quick
   sort.
9. Design stack and queue classes with necessary exception handling.
10. Write a C++ program that randomly generates complex numbers (use previously designed
    Complex class) and writes them two per line in a file along with an operator (+, -, *, or /). The
    numbers are written to file in the format (a + ib). Write another program to read one line at a
time from this file, perform the corresponding operation on the two complex numbers read,
and write the result to another file (one per line).

P:45 TOTAL: 45 PERIODS

LIST OF EQUIPMENTS AND SOFTWARE FOR A BATCH OF 30 STUDENTS

HARDWARE
• 30 Systems with core i5 Processor

SOFTWARE
• Turbo C++/GCC Compiler – to be installed in all PC’s.
• OS – LINUX/ Windows 2000/ Windows XP/ NT
13EEAA    SWITCHED MODE POWER CONVERSIONS    L T P C

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to

CO 1: Design the reactive elements for power electronics systems.
CO 2: Discuss the basic concepts of switching converters.
CO 3: Analyze the operation of Resonant Converters.
CO 4: Analyze the operation of Transformerized Switching Converters.
CO 5: Describe the various control scheme and dynamic analysis of switching converters.

UNIT I       INTRODUCTION
Reactive elements in Power Electronic Systems-Design of Inductor-Design of transformer-Capacitors
for Power electronics applications.

UNIT II      BASIC SWITCHING CONVERTER TOPOLOGIES
Basic concepts of SMPS - DC-DC converters – characteristics - constituent elements - operating principles.

UNIT III     RESONANT CONVERTERS
Classification of resonant converters - basic resonant circuit concepts - load resonant converters - resonant switches converters - zero voltage switching.

UNIT IV      TRANSFORMERIZED SWITCHING CONVERTERS
Introduction- Forward converter - push-pull converter - Half-bridge switching converter - Full-bridge switching converter - Flyback converter - Zero-Current-Switching Quasi-Resonant Half-Bridge converter

UNIT V       CONTROL SCHEME AND DYNAMIC ANALYSIS OF SWITCHING CONVERTERS
Steady state analysis - stress and sizing of elements - control methods - duty ratio - current programmed - frequency programmed - sliding mode control - dynamic analysis - frequency domain models - Standard available controllers (76494 or SG3524).

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCE BOOKS:
13EEAB  POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS  L T P C
3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Explain the importance of renewable energy and different renewable energy resources.
CO 2: Analyze of wind electrical generators.
CO 3: Design different power converters namely AC to DC, DC to DC and AC to AC converters
for renewable energy systems.
CO 4: Analysis of grid integrated wind and pv systems.
CO 5: Develop maximum power point tracking algorithms.

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
ocean, Biomass, Hydrogen energy systems : operating principles and characteristics of: Solar PV, Fuel
cells, wind electrical systems-control strategy, operating area.

UNIT II  ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION
Review of 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
Stand alone operation of fixed and variable speed wind energy conversion systems and solar system-
Grid connection Issues -Grid integrated PMSG and 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).

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
1. S. Rao and Parulekar, Energy Technology – Non Conventional, Renewable and Conventional,
3. Ned Mohan, Tore M. Undeland and William P.Robbins, Power Electronics: Converters,
4. S.N.Bhadra, D. Kastha, & S. Banerjee, Wind Electrical Systems, Oxford University Press,
2009
NewDelhi

76
13EEAC CAD OF ELECTRICAL APPARATUS

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Compare the conventional and field analysis based design.
CO 2: Interpret the basic concepts of finite element method.
CO 3: Perceive the procedures of CAD packages.
CO 4: Devise the design of rotating machines.
CO 5: Analyze the design of transformers.

UNIT I INTRODUCTION

UNIT II PHILOSOPHY OF FEM

UNIT III CAD PACKAGES

UNIT IV DESIGN OF ROTATING MACHINES

UNIT V DESIGN OF TRANSFORMERS

TEXT BOOKS

REFERENCES

L: 45, TOTAL: 45 PERIODS
13EEAD      DESIGN OF POWER CONVERTERS      L   T   P   C
                                                      0   0   3   2

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
   CO 1: Construct a phase controlled rectifiers for various load
   CO 2: Demonstrate the operation of various types of DC choppers
   CO 3: Design a various types of Inverters
   CO 4: Design a AC voltage controller for various load
   CO 5: Construct a various types of cycloconverters

LIST OF EXPERIMENTS
   1. Single phase controlled rectifiers.
   2. Three phase controlled rectifiers.
   5. Single phase voltage source inverter.
   6. Three phase voltage source inverter.
   7. Ac voltage controllers.
   8. Two stage sequence control of ac voltage controller.
   9. Step up cycloconverter.
  10. Step down Cycloconverter.

  P: 45 TOTAL: 45 PERIODS
13EEBA      POWER PLANT ENGINEERING      L T P C
                        3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Outline the operations in thermal power plants.
CO 2: Identify the thermal cycles and performance improvements of diesel and gas power plants.
CO 3: Explain the different components of nuclear power plants.
CO 4: Discriminate renewable energy based power plants.
CO 5: Discuss about economics and environmental issues of power plants.

UNIT I  THERMAL POWER PLANTS
Rankine cycle – Improvisations; Layout of modern coal power plant – Super Critical Boilers –
Fluidized Bed Combustion Boilers – Turbines – Condensers – Subsystems of thermal power plants –
Fuel and ash handling, Draught system, Feed water treatment – Steam and Heat rate – Binary Cycles
and Cogeneration systems.

UNIT II  DIESEL, GAS AND COMBINED CYCLE POWER PLANTS
Otto, Diesel, Dual and Brayton Cycle – Analysis and Optimization - Layout and components of
diesel, gas and combined cycle power plants – Methods to improve the performance – Reheating,
inter cooling and regeneration.

UNIT III  NUCLEAR POWER PLANTS
Basics of nuclear engineering – Layout and subsystems of nuclear power plants – Nuclear reactors –
Breeder – Safety measures for nuclear power plants.

UNIT IV  RENEWABLE ENERGY BASED POWER PLANTS
Layout - Components and working of hydro, wind, tidal, solar photovoltaic, solar thermal,
geothermal, biogas and ocean energy power plants.

UNIT V  ECONOMICS AND ENVIRONMENTAL ISSUES OF POWER PLANTS
Comparison of site selection criteria - Relative merits & demerits – Capital & Operating Cost of
different power plants – Pollution control technologies including Waste Disposal Options for Coal
and Nuclear Power Plants.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
2008.
2006.
13EEE B POWER SYSTEM OPERATION AND CONTROL L T P C 3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Estimate the load characteristics of generating station.
CO 2: Analyze the load frequency control of single/multi area system.
CO 3: Illustrate different types of reactive power control.
CO 4: Formulate unit commitment and economic dispatch problem.
CO 5: Describe the computer based control of power system.

UNIT I INTRODUCTION
System load variation - System load characteristics - load curves - daily, weekly and annual, load duration curve, load factor, diversity factor - Reserve requirements - Installed reserves, spinning reserves, cold reserves, hot reserves - Overview of system operation - Load forecasting, unit commitment, economic dispatch and load dispatch.

UNIT II REAL POWER - FREQUENCY CONTROL
Fundamentals of speed governing mechanism and modelling – Speed load characteristics – Load sharing between two synchronous machines in parallel - concept of control area, LFC control of a single-area system - Static and dynamic analysis of uncontrolled and controlled cases - Multi-area systems - Two-area system modelling - static analysis, uncontrolled case - Tie line with frequency bias control of two-area system derivation, state variable model.

UNIT III REACTIVE POWER CONTROL
Generation and absorption of reactive power - Relation between voltage, power and reactive power at a node - Injection of reactive power - Tap changing transformer – Numerical problems - System level control using generator voltage magnitude setting – OLTC transformer. Typical Excitation system – Modelling – static and dynamic analysis – Stability compensation – Methods of voltage control.

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM
Statement of Unit Commitment (UC) problem - constraints in UC - UC solution methods – Priority list methods, forward dynamic programming approach, numerical problems only in priority list method using full load average production cost. Incremental cost curve - coordination equations without loss and with loss - solution by direct method and λ-iteration method (No derivation of loss coefficients) - Base point and participation factors.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS
Energy control centre- Functions – Monitoring, data acquisition and control- System hardware configuration – SCADA and EMS functions - Network topology determination, state estimation, security analysis and control - Various operating states - Normal, alert, emergency, inextremis and restorative - State transition diagram showing various state transitions and control strategies.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES

13EEBC POWER SYSTEM TRANSIENTS L T P C 3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to

- CO 1: Review the causes and effects of power system transients.
- CO 2: Explain the concept of switching transients.
- CO 3: Describe the mechanism of lightning strokes and its effects.
- CO 4: Discuss the reflection and refraction of travelling waves.
- CO 5: Analyze the impact of transients on integrated power system.

UNIT I INTRODUCTION
Review and importance of the study of transients - causes for transients - RL circuit transient with sine wave excitation - double frequency transients – basic transforms of the RLC circuit transients.

Different types of power system transients - effect of transients on power systems – role of the study of transients in system planning.

UNIT II SWITCHING TRANSIENTS
Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor current - load switching and equivalent circuit - waveforms for transient voltage across the load and the switch - Current suppression – current chopping - effective equivalent circuit - Capacitance switching - capacitance switching with a restrike, with multiple restrikes - ferro resonance.

UNIT III LIGHTNING TRANSIENTS
Charge cloud formation - rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke – factors contributing to good line design - tower footing resistance - Interaction between lightning and power system.

UNIT IV TRAVELLING WAVES ON TRANSMISSION LINE
Transient response of systems with series and shunt lumped parameters and distributed lines - Travelling wave concept – Bewely’s lattice diagram - reflection and refraction of travelling waves.

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM
Short line and kilometric fault - distribution of voltages in a power system - Line dropping and load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults - switching surges on integrated system - qualitative application of EMTP for transient computation.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13EEBD SOLAR PHOTOVOLTAIC FUNDAMENTALS AND APPLICATIONS  
L T P C  3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
   CO1: Understand the fundamentals of solar cells.
   CO2: Recognize the various solar PV technologies and their up gradations along with their benefits.
   CO3: Design and analyze on-grid and off-grid PV applications
   CO4: Realize cost benefit analysis of PV installations

UNIT I ESSENTIAL BASICS OF SOLAR CELL  9

UNIT II COMMERCIAL AND DEVELOPING TECHNOLOGIES  9
Commercial technologies - Mono crystalline and Multi crystalline, Silicon - Wafer based Solar cell, Thin film solar cells – A-Si, Cd-Te and CIGS, Concentrated PV cells, Developing technologies – Organic cells, Dye sensitized cells.

UNIT III SOLAR PV FOR ON-GRID APPLICATIONS  9

UNIT IV SOLAR PV FOR OFF-GRID APPLICATIONS  9
Off-Grid stand alone PV system - System sizing – Module and Battery - Storage – Batteries for PV systems – Sun Tracking mechanism – Types of tracking – One-axis, Two-axis - Maximum power point tracking – Design and analysis – Performance evaluation and monitoring - Field visit – Off-grid PV system

UNIT V COST BENEFIT ANALYSIS FOR SOLAR PV INSTALLATIONS  9

L:45 TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES
2. Solar Electricity: Engineering of Photovoltaic Systems” by Eduardo Lorenzo, PROGENSA.
4. www.pveducation.org
13EEBE ENERGY AUDITING AND MANAGEMENT L T P C

3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Analyze the energy economics with energy auditing
CO 2: Estimate the electrical energy calculation.
CO 3: Discuss about the energy conservation methods.
CO 4: Select the proper electrical utilities.
CO 5: Describe the concepts of energy management

UNIT I  INTRODUCTION

UNIT II  ELECTRICAL ENERGY SYSTEMS

UNIT III  ENERGY CONSERVATION

UNIT IV  PERFORMANCE EVALUATION AND SELECTION OF ELECTRICAL UTILITIES
Performance evaluation of transformers - Energy distribution – Selection of cable, capacitors, electric motors, electrical heating, lighting systems and their losses.

UNIT V  ENERGY MANAGEMENT

L:45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to

CO 1: Review the characterization of power quality in electric power system
CO 2: Categorize the causes of power quality problems
CO 3: Describe the estimation techniques and mitigation methods of voltage sag and interruptions
CO 4: Explain the concept of over voltages and harmonic controlling methods
CO 5: Outline the power quality monitoring and improvement techniques

UNIT I  INTRODUCTION                                                                                                                 9

UNIT II  SOURCES OF POWER QUALITY PROBLEMS                                            9
Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

UNIT III  VOLTAGE SAG AND INTERRUPTIONS                                                              9
Estimating voltage sag performance - Thevenin’s equivalent source - Analysis and calculation of various fault condition - Voltage sag due to induction motor starting - Estimation of sag severity - Mitigation of voltage sag using active series compensators - Static transfer switches and fast transfer switches.

UNIT IV  OVERVOLTAGES                 9
Sources of overvoltage - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swells - Surge arresters - Power conditioners - Devices for controlling harmonic distortion - Passive and active filters.

UNIT V  POWER QUALITY MONITORING & IMPROVEMENT                                   9
Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems- Power line disturbance analyzer – Quality measurement equipment - Harmonic spectrum analyzer - Flicker meters - Disturbance analyzer – Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13EEBG       ENERGY LABORATORY       L T P C
                   0 0 3 2

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
   CO 1: Analyze the performance characteristics study of solar water heater, solar photovoltaic devices, solar air heater, solar concentric collectors and solar still.
   CO 2: Demonstrate the refrigeration and air conditioning systems.
   CO 3: Compute testing performance of gasifier, biogas plant and fuels.
   CO 4: Compare energy consumption of different lighting systems.
   CO 5: Choose appropriate method for solar radiation measurement.

LIST OF EXPERIMENTS

1. Performance testing of solar water heater
2. Characteristics of solar photovoltaic devices
3. Testing of gasifier
4. Testing of biogas plant
5. Measurement of solar radiation
6. Performance testing of solar air heater
7. Performance testing of solar still
8. Performance study on concentric collectors
9. Properties of fuels
10. Energy consumption measurement of lighting systems
11. Study on refrigeration and air conditioning systems

P: 45 TOTAL: 45 PERIODS
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Describe the characteristics and design of electromagnetic compatibility.
CO 2: Discuss the methods of coupling and grounding.
CO 3: Summarize filtering, shielding and coating methods.
CO 4: Explain the digital logic noise and ground noise.
CO 5: List the standard and laboratory techniques.

UNIT I  INTRODUCTION
Sources of EMI - Conducted and radiated interference - Characteristics - Designing for electromagnetic compatibility (EMC) - EMC regulation - typical noise path - use of network theory - methods of eliminating interferences.

UNIT II  METHOD OF HARDENING

UNIT III  BALANCING, FILTERING AND SHIELDING
Power supply decoupling - decoupling filters-amplifier filtering – high frequency filtering shielding – near and far fields - shielding effectiveness - absorption and reflection loss - Shielding with magnetic material - conductive gaskets - windows and coatings - grounding of shields.

UNIT IV  DIGITAL CIRCUIT NOISE AND LAYOUT

UNIT V  ELECTROSTATIC DISCHARGE, STANDARDS AND LABORATORY TECHNIQUES

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13EECB INSULATION TECHNOLOGY  L T P C  3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Describe the properties of insulating materials.
CO 2: Explain the concept of various breakdown mechanism in gaseous dielectrics.
CO 3: Analyse the concept of various breakdown mechanism in solid dielectrics.
CO 4: Discuss the concept of various breakdown mechanism in liquid dielectrics.
CO 5: List out the application of different insulating materials in electrical equipments.

UNIT I GENERAL PROPERTIES OF INSULATING MATERIALS  9
Requirements of insulating materials – electrical properties – molecular properties of dielectrics –
dependence of permittivity on temperature, pressure, humidity and voltage, permittivity of mixtures,
practical importance of permittivity – behavior of dielectric under alternating fields – complex
dielectric constants – bipolar relaxation and dielectric loss - dielectric strength.

UNIT II BREAKDOWN MECHANISMS IN GASEOUS DIELECTRICS  9
Behavior of gaseous dielectrics in electric fields – gaseous discharges – different ionization Processes
– effect of electrodes on gaseous discharge – Townsend’s theory - Streamer theory – Electronegative
gases and their influence on gaseous discharge – Townsend’s criterion for spark Breakdown, gaseous
discharges in non-uniform fields – breakdown in vacuum insulation.

UNIT III BREAKDOWN MECHANISMS IN SOLID DIELECTRICS  9
Intrinsic breakdown of solid dielectrics – electromechanical breakdown-Streamer breakdown, thermal
breakdown and partial discharges in solid dielectrics - electrochemical breakdown – tracking and
treeing – classification of solid dielectrics, composite insulation and its mechanism of failure.

UNIT IV BREAKDOWN MECHANISMS IN LIQUID DIELECTRICS  9
Liquids as insulators - conduction and breakdown in pure and commercial liquids – Cryogenic
insulation. Characteristics of insulating fluids.

UNIT V APPLICATION OF INSULATING MATERIALS  9
Application of insulating materials in transformers, rotating machines, Insulators, Isolators/circuit
breakers, cables, power capacitors and bushings.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS
   Limited, New Delhi, 1979.

REFERENCES
   India Private Limited, 2005.
2. Dieter Kind and Hermann Karner, “High Voltage Insulation Technology”, (Translated from
   Company Limited, New Delhi, 2009.
5. Rod V. Latham, “High Voltage Vacuum Insulation: Basic Concepts and Technological
13EECC  FUNDAMENTALS OF NANO TECHNOLOGY  L T P C 3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Explain crystal lattice structures.
CO 2: Memorize the heterostructures and quantum structures.
CO 3: Discuss the fabrication of nano structures.
CO 4: Describe the characterization techniques.
CO 5: Apply the nano technology in science and engineering.

UNIT I  CRYSTALLINE PROPERTIES OF SOLID  9
Crystal lattice and seven crystal systems - Unit cell concept - Weigner-Seitz cell - Bravais lattices - Space and point groups - Miller indices - Reciprocal lattice - Brillouin zone.

UNIT II  SEMICONDUCTOR HETEROSTRUCTURES AND LOW DIMENSIONAL QUANTUM STRUCTURES  9
Energy bands, Application of model solid theory, Anderson model for hetero junctions, Multiple quantum wells (MQWs) and super lattices, Two-dimensional nanostructure: quantum well, One dimensional nanostructure: quantum wire, Zero-dimensional nanostructure: quantum dot, Optical properties of low-dimensional structures, Examples and applications in real world.

UNIT III  FABRICATION OF NANO STRUCTURES  9
Basic compound semiconductors, Bulk single crystal growth techniques, Epitaxial growth techniques, Physical vapour deposition and sputtering, Thermodynamics and kinetics of growths, Nano scale growth modes.

UNIT IV  CHARACTERIZATION TECHNIQUES (Qualitative Treatment only)  9
Structural X-ray diffraction, Electron microscopy, Energy dispersive analysis using X-rays, X-ray photoelectron spectroscopy, Scanning probe microscopy, Optical, Photoluminescence spectroscopy, Absorbance measurement, Raman spectroscopy, Fourier transform spectroscopy.

UNIT V  APPLICATIONS OF NANO TECHNOLOGY  9
Future of semiconductor device and research - Necessity of innovative technology and prospect for future - Applications in food, energy, transportation, communication, entertainment, health and medicine.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13EECD  FLEXIBLE AC TRANSMISSION  L  T  P  C  3  0  0  3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Explain the fundamental idea about FACTS controllers
CO 2: Design of SVC voltage regulator using TCR-TSC logic
CO 3: Describe Transient stability model of TCSC
CO 4: Explain about basic principle of operation of STATCOM
CO 5: Explain controller interactions & its type

UNIT I  INTRODUCTION  9
The concept of flexible AC transmission - reactive power control in electrical power transmission lines - uncompensated transmission line - series and shunt compensation. Overview of FACTS devices - Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified Power Flow controller (UPFC) - Integrated Power Flow Controller (IPFC).

UNIT II  STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS  9

UNIT III  THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS  9

UNIT IV  EMERGING FACTS CONTROLLERS  9

UNIT V  CO-ORDINATION OF FACTS CONTROLLERS  9
FACTs Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Control coordination using Genetic algorithm.

TEXT BOOK:

REFERENCES
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Explain the role of EHVAC Transmission and Mechanical considerations.
CO 2: Calculate the line parameters for multiconductor lines.
CO 3: Estimate the voltage gradients of conductors.
CO 4: Discuss the concepts of corona and radio interference.
CO 5: Illustrate the effect of electrostatic field on humans and vehicles.

UNIT I  INTRODUCTION  9
EHVAC Transmission - line trends and preliminary aspects - standard transmission voltages – power handling capacities and line losses – mechanical aspects.

UNIT II  CALCULATION OF LINE PARAMETERS  9
Calculation of resistance, inductance and capacitance for multiconductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return.

UNIT III  VOLTAGE GRADIENTS OF CONDUCTORS  9
Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

UNIT IV  CORONA EFFECTS  9

UNIT V  ELECTROSTATIC FIELD OF EHV LINES  9
Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines - effect of high field on humans, animals, and plants – electrostatic induction in un-energized circuit of a D/C line - induced voltages in insulated ground wires.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13EECF    HIGH VOLTAGE DC TRANSMISSION    L T P C
                 3  0 0  3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
  CO 1: Describe the DC power transmission technology
  CO 2: Analyze HVDC converters
  CO 3: Describe the various types, control and protection of MTDC systems
  CO 4: Analyze harmonics and filters
  CO 5: Discuss the simulation tools and Modelling of HVDC system

UNIT I    HVDC POWER TRANSMISSION TECHNOLOGY
Introduction – Comparison of AC and DC transmission – Application of DC transmission –
Description of DC transmission system – Planning for HVDC transmission – Modern trends in DC
transmission.

UNIT II  ANALYSIS OF HVDC CONVERTERS
Pulse number – Choice of converter configuration – Simplified analysis of Graetz circuit – Converter
bridge characteristics – Characteristics of a twelve pulse converter – Detailed analysis of converters.

UNIT III  MULTI TERMINAL DC SYSTEMS
Introduction – Potential applications of MTDC systems – Types of MTDC systems – Control and
Protection of MTDC systems – Current margin method – Voltage limiting control – Decentralized
current balancing – Two ACR method - Study of MTDC systems.

UNIT IV  HARMONICS AND FILTERS
Introduction – Generation of harmonics – Characteristics and non characteristics harmonics – Design
of AC filters – Single tuned filters – High pass filters – Protection of filters - Design of DC filters –
Carrier frequency and Radio Interference noise.

UNIT V  SIMULATION OF HVDC SYSTEMS
Introduction to system simulation – Philosophy and tools – HVDC system simulation – Modelling of
HVDC systems for digital dynamic simulation – Transient simulation of DC and AC systems.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
4. Sood V.K., “HVDC and FACTS controllers – Applications of Static Converters in Power
5. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, New Age
   Interantional (P) Ltd., New Delhi, 1990.
13EEDA ROBOTICS AND AUTOMATION L T P C
3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Explain the basics of the robotics
CO 2: Design the robot manipulator kinematics
CO 3: Analyze the robot trajectory control
CO 4: Analyze the robot motion and actuators
CO 5: Describe about the robot application

UNIT I INTRODUCTION

UNIT II MANIPULATOR KINEMATICS

UNIT III TRAJECTORY CONTROL
Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.

UNIT IV ROBOT ACTUATORS AND MOTION ANALYSIS

UNIT V ROBOT APPLICATION IN MANUFACTURING
Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection – Clean room robotics (SCARA).

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to

CO 1: Formulate the state model of system.
CO 2: Design of state feedback and observer
CO 3: Construct phase trajectory for nonlinear system
CO 4: Analyze the nonlinear control system using describing function.
CO 5: Apply Lyapunov stability theorem.

UNIT I FORMULATION AND SOLUTION OF STATE MODEL
Basic concepts of state, State variables and state model – State model for linear continuous time systems - State space representation using physical variable – Phase variable – Canonical variable – Transfer function from state model – Diagonalization – Solution of state equation - State variable for linear discrete time systems.

UNIT II DESIGN AND ANALYSIS OF STATE SPACE MODEL
Concept of Controllability – Controllable phase variable form – Concept of observability – Observable phase variable form – Gilbert’s test - Kalman’s test – Pole placement by state feedback for Single input Single output system – State observer.

UNIT III NONLINEAR SYSTEMS

UNIT IV DESCRIBING FUNCTION

UNIT V LYAPUNOV STABILITY

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Describe the functionality of various components of PLC
CO 2: Distinguish the functional difference between the relay and PLC
CO 3: Develop a Ladder program for a given industrial process
CO 4: Design the Input/output module of PLC
CO 5: Compare the different control architecture such as Central computer, Hybrid and DCS
CO 6: Recognize the operator and engineering interfaces
CO 7: Describe the functionality of SCADA

UNIT I  PROGRAMMABLE LOGIC CONTROLLER

UNIT II  INSTRUCTION IN PLC
Instructions in PLC – Program control instructions, math instructions, Data manipulation instructions, sequencer instructions – Use of PC as PLC – PLC to PC interfacing – PLC to PLC interfacing - Application of PLC, traffic light control system, bottle filling system - PLC in Cement industry - Programming concept in Allen Bradely PLC and Siemens PLC.

UNIT III  DISTRIBUTED CONTROL SYSTEM

UNIT IV  INTERFACES IN DCS
Operator interface requirement - Low level and high level operator interfaces – Operator displays - Engineering interfaces – Low level and high level engineering interfaces – Computer interface design issue.

UNIT V  SCADA

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

WEB RESOURCES
13EEDD MEDICAL INSTRUMENTATION

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to

CO 1: Outline the function of human physiology system.
CO 2: Make use of electrodes, amplifiers & transducers in biomedical measurement system.
CO 3: Describe the various non electrical parameter measurements.
CO 4: Summarize the imaging techniques and therapeutic devices.
CO 5: Illustrate the electrical safety measures in bio medical measurement.

UNIT I PHYSIOLOGY AND TRANSDUCERS


UNIT II ELECTRO-PHYSIOLOGICAL MEASUREMENT


UNIT III NON-ELECTRICAL PARAMETER MEASUREMENT


UNIT IV MEDICAL IMAGING AND THERAPEUTIC DEVICES


UNIT V PATIENT SAFETY AND ELECTROMEDICAL EQUIPMENT

Physiological effects of electrical currents, macro shock and micro shock - preventive measures to reduce shock hazards - Leakage current - Isolation of patient circuit - Safety of electrically susceptible patients - Radiation hazards and safety – Shielding - Open ground problem and earthing methods.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

5. Biomedical Instrumentation & Measurement by Carr & Brown-Pearson
13EEDE ADVANCED CONTROL THEORY L T P C
3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Construct discrete model of system
CO 2: Design of digital compensator
CO 3: Develop optimal control law
CO 4: Design robust controller for simple application
CO 5: Apply model reference adaptive control

UNIT I SAMPLED DATA SYSTEM

UNIT II DESIGN OF DIGITAL CONTROL ALGORITHMS

UNIT III OPTIMAL CONTROL

UNIT IV ROBUST CONTROL
Robust control system and system sensitivity – Analysis of robustness – Systems with uncertain parameters – Design of robust control systems – PID controller - Design of robust PID controller – Design of robust internal model control system – Pesudo quantitative feedback system.

UNIT V ADAPTIVE CONTROL

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13EEDF SOFT COMPUTING FOR ELECTRICAL ENGINEERING  L T P C
3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
- CO 1: Explain the components of fuzzy logic system.
- CO 2: Distinguish various structures of ANN.
- CO 3: Describe the basic concepts of genetic algorithms.
- CO 4: Apply ANN and FLC to various electrical applications.
- CO 5: Employ GA to power system optimization and control applications.

UNIT I Fuzzy Logic System 9
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning - Fuzzification, inferencing and defuzzification - Fuzzy knowledge and rule bases - Fuzzy logic modelling.

UNIT II Artificial Neural Networks 9

UNIT III Genetic Algorithm 9
Basic concept of Genetic algorithm and detail algorithmic steps - Adjustment of free parameters - Functional evaluation and constraint handling - Representation - Integer, Binary, Real and Gray coding - Cross over - Single point, multi point, uniform and arithmetic crossover - Mutation - Binary and real mutation - Selection schemes - Roulette wheel and Tournament selection - Stopping criteria.

UNIT IV Applications of FLC and ANN 9
Identification and control of linear and nonlinear dynamic systems using Neural Network - ANN application to short term load forecasting - Implementation of fuzzy logic controller for motor drives.

UNIT V Applications of GA 9
GA application to power system optimization problem - Economic dispatch, load scheduling and unit commitment problems - Solution of typical control problems using genetic algorithm - System Identification and PID controller tuning.

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO1: To describe the basic concepts of optical fibres and laser with their properties
CO2: To illustrate the applications of optical fibres and lasers in industries
CO3: To explain the applications of laser in Hologram and medical field

UNIT I  OPTICAL FIBRES AND THEIR PROPERTIES  9
Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics - Absorption losses - Scattering losses - Dispersion - Connectors and splicers - Fibre termination - Optical sources – Optical detectors.

UNIT II  INDUSTRIAL APPLICATION OF OPTICAL FIBRES  9

UNIT III  LASER FUNDAMENTALS  9

UNIT IV  INDUSTRIAL APPLICATION OF LASERS  9
Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V  HOLOGRAM AND MEDICAL APPLICATIONS  9

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13EEDH PLC AND DCS LABORATORY
(Common to EIE, EEE)  L  T  P  C
0 0 3 2

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
1. Demonstrate on-off controller using relay logic
2. Articulate the Ladder program for Industrial processes
3. Implement the performance of controller in DDC and DCS
4. Complete an analog and digital interfacing with DCS

LIST OF EXPERIMENTS
1. Design of Electronic On/Off controller with relay concept
2. Implementation of On Off controller using NI DAQ
3. Micro-processor based temperature control system
4. Batch process control by Programmable Logic Controller
5. PLC controlled level process
6. Reaction vessel control using Programmable Logic Controller
7. Traffic light control Using Programmable Logic Controller
8. Bottle filling system controlled by Programmable Logic Controller
9. Computer controlled Closed loop response of Temperature process
10. Computer controlled Closed loop response of pressure process
11. Study of Distributed Control System – Simulation of analog and digital functions
12. Implementation of Controller for Pressure and Temperature process in Distributed Control system
13. Automation of the Cement Plant, Sugar and Beverage Plant using Distributed Control system

P: 45 TOTAL: 45 PERIODS
13EEDJ        SOFT COMPUTING FOR ELECTRICAL ENGINEERING    L T P C
 LABORATORY       0 0 3 2

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Write program to implement various structures of ANN.
CO 2: Develop program for fuzzy relationship.
CO 3: Demonstrate ANN to system identification and control of linear and nonlinear systems.
CO 4: Apply FLC to motor with electrical drives.
CO 5: Employ GA to power system optimization and control problems.

LIST OF EXPERIMENTS
1. Implement Discrete Hopfield Network and Test for Input Pattern.
2. Implement Adaline with Bipolar Inputs and Outputs
4. Implement Composition of Fuzzy and Crisp Relations.
5. Perform max-min composition of two matrices obtained from cartesian product.
6. System identification using neural network
7. Controlling linear and nonlinear dynamic systems using neural network
8. Short term load forecasting using neural network
9. Implement the fuzzy logic controller for motor drives
10. Economic dispatch problem using GA
11. Load scheduling problem using GA
12. Unit commitment problem using GA
13. PID controller tuning using GA
14. System identification using GA

P: 45 TOTAL: 45 PERIODS
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Describe the general principles of MOS Technology
CO 2: Describe the design process of MOS Technology
CO 3: Outline subsystem design and layout principles of VLSI circuits.
CO 4: Summarize basic Programming Concepts of HDL.
CO 5: Develop system design for various FPGA applications.

UNIT I  MOS TECHNOLOGY  9
Introduction to IC Technology- MOS and VLSI Technology -MOS transistors: Enhancement and Depletion mode transistor actions- Fabrication of NMOS, CMOS and BiCMOS transistors-Thermal aspects of processing - BiCMOS Technology- Production of E beam Masks-MOS electrical properties:IDSVsVDS relationships, Threshold voltage- Transconductance Vs Output conductance and Pull up to pull down ratio determination- BiCMOS Inverters-Latch up in CMOS circuits

UNIT II  DESIGN PROCESSES AND SCALING EFFECTS  9
MOS and BiCMOS circuit design: Stick diagrams- Lambda based design rules-Layout diagrams-Symbolic diagrams-Scaling models-Scaling factors for device parameters-Limitations of scaling-Limits due to sub threshold currents-Limits on logic levels and supply voltage due to noise

UNIT III  SUBSYSTEM DESIGN AND LAYOUT  9
Switch logic-GATA logic: Two input nMOS,CMOS and BiCMOS nand gates-Two input nMOS, CMOS and BiCMOS nor gates - Combinational logic: Parity generator- Multiplexers-Clocked sequential circuits: Two phase clocking-Charge storage-Register elements and Shift register-System considerations: Bus lines arrangements-Pre-charged bus concepts-Power dissipation and Power distribution buses.

UNIT IV  SPECIFICATION USING VERILOG HDL  9
Basic concepts- identifiers- gate primitives- gate delays- operators- timing controls-procedural assignments conditional statements-Data flow and RTL- structural ,gate level, switch level modeling-Design hierarchies-Behavioral and RTL modeling- Test benches-Structural, gate level description of decoder- equality detector- comparator- priority encoder- half adder- full adder- Ripple carry adder- D latch and D flip flop.

UNIT V  SYSTEM DESIGN AND FPGA  9
System Design Examples: Design of eight inputs signed parallel adder/multiplier-Traffic Light Controller- Real Time Clock-Digital Input/ Output Card-FPGA –System design applications using FPGA- Case Studies: FPGA technology for UAV communications and control- FPGA PID Controller

TEXT BOOKS

REFERENCES
2. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India, 2010

E-LEARNING RESOURCES
   http://www.embedded.com/design/configurable-systems/4212241/
   Case-Study-of-PID-Control-in-an-FPGA-
13EEE B  DSP BASED SYSTEM DESIGN         L T P C
                                                  3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
   CO 1: Summarize the instruction sets of C2xx DSP Controller.
   CO 2: Discuss the various peripheral functions of DSP Controller.
   CO 3: Explain the Event Managers in DSP Controller.
   CO 4: Demonstrate DSP Controllers based power electronics applications.
   CO 5: Employ DSP Controllers for electromechanical applications.

UNIT I  INTRODUCTION                  9
Overview of TMSL.F2407 DSP controller- Brief Introduction to Peripherals - Types of Physical
Memory - Software Tools - C2xx DSP Core and Code Generation- C2xx DSP CPU and Instruction
Set - Components of C2xx DSP Core - Mapping - Interface System Configuration Registers-Memory
- Memory Addressing Modes - Assembly Programming Using C2xx DSP Instruction Set.

UNIT II  PERIPHERALS                9
General purpose Input/output (GPIO) Functionality-Multiplexing and General Purpose I/O Control
Registers - Interrupts -Interrupt Hierarchy and Control Registers-Initializing and Servicing Interrupts
in Software - Interrupt Usage Exercise - A/D converter-Overview, Operation of the ADC- Analog to
Digital Converter Usage Exercise- PWM signal generation.

UNIT III  EVENT MANAGERS            9
Overview of the Event Manager (EV) - Event Manager Interrupts - General Purpose (GP) Timers -
Compare Units - Capture Units and Quadrature Encoded Pulse (QEP) Circuitry - General Event
Manager Information

UNIT IV  DSP BASED POWER ELECTRONICS APPLICATIONS     9
DC-DC Buck-Boost converters-Converter Structure - Continuous Conduction Mode - Discontinuous
Conduction Mode - Connecting the DSP to the Buck-Boost Converter - Controlling the Buck-Boost
Converter - Main Assembly Section Code Description - Interrupt Service Routine - Regulation Code
Sequences - Space Vector PWM Technique-Principle of constant V/f control of induction motor –
DSP implementation.

UNIT V  ELECTROMECHANICAL APPLICATIONS                 9
Stepper Motors – Implementation - Subroutine of Speed Control Module - Permanent Magnet
Brushless DC Machines - Torque Generation – Implementation - Switched Reluctance Motor Drives -
Open Loop & Closed Loop Torque Control - Closed Loop Speed Control - Algorithm for Running
SRM Drive using an Optical Encoder.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS
1. Hamid A.Toliyat, Steven Campbell, ‘DSP based electromechanical motion control’, CRC
2. Sen M Kuo, Woon .Seng. Gan, Digital signal Processors-Architecture, implementation and
   applications,  Pearson, 2005

REFERENCES
4. N. Mohan, T.M. Undeland, and W.P. Robbins, Power Electronics: Circuits, Devices, and
5. Digital Signal Processing: A practical approach, Ifeachor E. C., Jervis B. W Pearson-
   Education, PHI, 2002
13EEEC MEMS AND NEMS L T P C 3 0 0 3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
   CO 1: Outline the design concepts of MEMS.
   CO 2: Describe the processes in micromachining.
   CO 3: Summarize the various types of sensors and actuators.
   CO 4: Demonstrate the application of MEMS.
   CO 5: Discuss the processes of NEMS and its applications.

UNIT I INTRODUCTION TO MEMS 9
Microelectromechanical systems - Micro sensors - Micro actuation - Single crystal and Poly
crystalline silicon - Silicon compounds – Silicon Piezoresistor – Quartz – Piezoelectric crystal –
Polymers – SU8 photoresists - Scaling in Geometry - Scaling in Rigid-Body Dynamics - Scaling in
Electrostatic Forces - Scaling in Electromagnetic Forces - Scaling in Electricity.

UNIT II MICROMACHINING 9
Photolithography – Structural and Sacrificial Materials – Lithography methods - Thin Film
Deposition – Impurity Doping – Etching – Problems with Bulk Micromachining – Surface
Micromachining – Wafer Bonding – LIGA process.

UNIT III SENSORS AND ACTUATORS 9
Mechanical - Principle of sensing and actuation – Beam and Cantilever – Capacitive effect –
Piezoelectric – Pressure measurement by microphone – MEMS Gyroscopes – Thermal –
Micromachined thermocouple probe - Peltier effect Heat pumps – Thermal flow sensors thermally
activated MEMS relay – Shape Memory Alloys.

UNIT IV RF MEMS and MOEMS 9
RF based communication system – MEMS inductors –Varactors – Tuners – Filter – Resonator –

UNIT V NEMS 9
Nano electro mechanical systems - fabrication and process techniques - integration of nano systems

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
4. Chang Liu, “Foundations of MEMS”, Pearson education India limited, 2006,
   Press, 2002
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Review the processes of general Operating systems
CO 2: Describe the basics concepts of RTOS
CO 3: Explain the Real time models and scheduling
CO 4: Distinguish the various RTOS
CO 5: Demonstrate the applications of RTOS in various domains

UNIT I REVIEW OF OPERATING SYSTEMS

UNIT II OVERVIEW OF RTOS

UNIT III REAL TIME MODELS AND LANGUAGES

UNIT IV REAL TIME KERNEL

UNIT V RTOS APPLICATION DOMAINS

TEXT BOOKS

REFERENCES
13EEE       EMBEDDED SYSTEM LABORATORY       L T P C

Upon successful completion of this course, the students will be able to
   CO 1: Develop assembly language program to sort the numbers.
   CO 2: Write Embedded C Program to interface display devices.
   CO 3: Develop embedded C coding for keyboard interfacing.
   CO 4: Demonstrate Real Time Clock, ADC and DAC.
   CO 5: Practice stepper motor control and serial communication.

LIST OF EXPERIMENTS

1. Study of architecture and integrated development environment
2. Pick the smallest among a given set of numbers
3. Pick the largest among a given set of numbers
4. Arrange a given set of numbers in ascending order
5. Arrange a given set of numbers in descending order
6. Generate a rectangular wave form at a specified port terminal
7. Interface switches and LEDs
8. Interface seven segment LED
9. Interface keyboard and LCD
10. i. Interface real time clock
    ii. Interface ADC and DAC
11. Interfacing stepper motor and temperature sensor
12. Serial communication using UART to display “Hello World” in PC

P: 45 TOTAL: 45 PERIODS
COURSE OUTCOMES
Upon successful completion of the course, the students will be able to
CO 1: Understand the basic concepts of AM and FM radio transmission and reception.
CO 2: Understand the fundamental concepts of Digital Communication.
CO 3: Understand the fiber optic and Power line communications concepts.

UNIT I AMPLITUDE MODULATION
Principles of amplitude modulation – AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM power distribution, AM modulator circuits – low level AM modulator, medium power AM modulator, AM transmitters – low level transmitters, high level transmitters, Receiver parameters. AM reception: AM receivers – TRF, Superheterodyne receivers, Double Conversion AM receivers.

UNIT II ANGLE MODULATION
Angle Modulation – FM and PM waveforms, phase deviation and modulation index, frequency deviation, phase and frequency modulators and demodulators, frequency spectrum of a angle modulated waves, Bandwidth requirement, Broadcast band FM, Average power FM and PM modulators – Direct FM and PM, Direct FM transmitters, Indirect transmitters, Angle modulation Vs. amplitude modulation. FM receivers: FM demodulators, PLL FM demodulators, FM noise suppression, Frequency Vs. phase Modulation.

UNIT III PULSE MODULATION
Pulse modulations – concepts of sampling and sampling theorems, PAM, PWM, PPM, PTM, quantization and coding: PCM, DM, slope overload error. ADM, DPCM

UNIT IV DIGITAL MODULATION
Introduction, Binary PSK, DPSK, Differentially encoded PSK, QPSK, M-ary PSK, QASK, Binary FSK, MSK, Duobinary encoding – Performance comparison of various systems of Digital Modulation.

UNIT V OPTICAL FIBER-POWER LINE SCADA
Optical fibers – types: sources, detectors used, digital filters, optical link: power line carrier communications: SCADA

TEXT BOOKS

REFERENCES
13EEFB OPERATING SYSTEMS L T P C
3 0 0 3

COURSE OUTCOMES
Upon successful completion of the course, the students will be able to
CO 1: Identify the functions of Operating Systems.
CO 2: Discuss the concepts of process management.
CO 3: Predict and analyze deadlocks.
CO 4: Describe the importance of storage management.
CO 5: Understand the basics of file systems and I/O systems.

UNIT I PROCESSES
Introduction to operating systems – operating system structures – system calls – system programs –
Cooperating processes – Interprocess communication – Communication in client-server systems.

UNIT II THREADS, PROCESS SCHEDULING AND SYNCHRONIZATION
Threads: Multi-threading models – Threading issues - CPU Scheduling: Scheduling criteria –

UNIT III DEADLOCK

UNIT IV STORAGE MANAGEMENT
Memory Management: Background – Swapping – Contiguous memory allocation – Paging –
Segmentation – Segmentation with paging - Virtual Memory: Background – Demand paging –

UNIT V FILE SYSTEMS AND I/O SYSTEMS
Protection - File-System Implementation: Directory implementation – Allocation methods – Free
space management – efficiency and performance - I/O Systems – kernel I/O subsystem – streams –
management.

L: 45 TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
CO 1: Know the fundamentals of cloud computing
CO 2: Distinguish the various cloud services
CO 3: Explore some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.

UNIT I UNDERSTANDING CLOUD COMPUTING 9

UNIT II DEVELOPING CLOUD SERVICES 9

UNIT III CLOUD COMPUTING FOR EVERYONE 9
Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

UNIT IV USING CLOUD SERVICES 9

UNIT V OTHER WAYS TO COLLABORATE ONLINE 9

L: 45 TOTAL: 45 PERIODS

TEXT BOOK

REFERENCE
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
   CO 1: Recognize the role of instruction sets and assembly language programming.
   CO 2: Interpret the execution procedure.
   CO 3: Analyze the hardwired and programmed ALU design techniques.
   CO 4: Identify the factors that degrade pipeline performance and its counter measure.
   CO 5: Depict the role of each memory in the memory hierarchy.

UNIT I   INSTRUCTION SET ARCHITECTURE  9
Introduction to computer architecture - Review of digital design – Instructions and addressing –
   Procedures and data – Assembly language programs – Instruction set variations.

UNIT II  BASIC PROCESSING UNIT  9
Fixed point arithmetic- Addition and subtraction of signed numbers – multiplication of positive
   Numbers - signed operand multiplication and fast multiplication – Restoring and non restoring
division algorithm - floating point numbers and operations. Fundamental concepts – Execution of a
   complete instruction – Multiple bus organization – Hardwired control – Micro programmed control.

UNIT III  PIPELINING  9
Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets – Data path and
   control considerations – superscalar operations- Performance considerations.

UNIT IV  MEMORY SYSTEM  9
Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories –
   Improving cache performance – Virtual memory – Memory management requirements – Associative
   memories – Secondary storage devices.

UNIT V  MULTIPROCESSOR  9
Symmetric shared memory and Distributed shared memory multiprocessors – Performance issues of
   symmetric and distributed shared memory – Synchronization – Models of memory consistency: An

L:45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
   2002.
13EEFE  MOBILE COMPUTING  
(Common to IT, EEE and ECE)  

L T P C  
3 0 0 3  

COURSE OUTCOMES  
Upon Successful completion of this course, the students will be able to  
CO 1: Explain the specifications and functionalities of various protocols/standards of mobile networks  
CO 2: Explain the concepts and working principle of Wireless LANs, PAN, Mobile Networks, and Sensor Networks  
CO 3: Describe the important issues and concerns on security and privacy in mobile application development  
CO 4: Explain the structure and components for Mobile IP and Mobility Management.  

UNIT I  INTRODUCTION 9  

UNIT II  SATELLITE SYSTEMS & BROADCAST SYSTEMS 9  

UNIT III  MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER 9  

UNIT IV  MOBILE ADHOC NETWORKS &WIRELESS SENSOR NETWORKS 9  

UNIT V  MOBILE APPLICATION DEVELOPMENT AND OPERATING SYSTEMS 9  

L: 45 TOTAL: 45 PERIODS  

TEXT BOOKS  

REFERENCES  