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**TOTAL CREDITS TO BE EARNED FOR THE AWARD THE DEGREE = 103**

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# ELECTIVES FOR ELECTRICAL AND ELECTRONICS ENGINEERING

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UNIT I  MATRICES  9

UNIT II  FUNCTIONS OF SEVERAL VARIABLES  9

UNIT III  ANALYTIC FUNCTION  9
Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions w = a + z , az, 1/z, - Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  9
Line Integral – Cauchy’s theorem and integral formula – Taylor’s and Laurent’s Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V  LAPLACE TRANSFORMS  9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
UNIT I  ULTRASONICS  9
Introduction – Production – magnetostriction effect - magnetostriction generator-
piezoelectric effect - piezoelectric generator- Detection of ultrasonic waves properties –
Cavitations - Velocity measurement – acoustic grating - Industrial applications – drilling,
welding, soldering and cleaning – SONAR - Non Destructive Testing – pulse echo
system through transmission and reflection modes - A, B and C -scan displays, Medical
applications - Sonograms

UNIT II  LASERS  9
Introduction – Principle of Spontaneous emission and stimulated emission. Population
inversion, pumping. Einstein's A and B coefficients - derivation. Types of lasers – He-
Ne, CO₂, Nd-YAG, Semiconductor lasers - homojunction and heterojunction
(Qualitative)- Industrial Applications - Lasers in welding, heat treatment and cutting –
Medical applications - Holography (construction and reconstruction).

UNIT III  FIBER OPTICS & APPLICATIONS  9
Principle and propagation of light in optical fibres – Numerical aperture and Acceptance
angle - Types of optical fibres (material, refractive index, mode) – Double crucible
 technique of fibre drawing - Splicing, Loss in optical fibre – attenuation, dispersion,
bending - Fibre optical communication system (Block diagram) - Light sources -
Detectors - Fibre optic sensors – temperature and displacement - Endoscope.

UNIT IV  QUANTUM PHYSICS  9
Black body radiation – Planck’s theory (derivation) – Deduction of Wien’s displacement
law and Rayleigh – Jeans’ Law from Planck’s theory – Compton effect - Theory and
experimental verification – Matter waves – Schrödinger’s wave equation – Time
independent and time dependent equations – Physical significance of wave function –
Particle in a one-dimensional box - Electron microscope - Scanning electron microscope
- Transmission electron microscope.

UNIT V  CRYSTAL PHYSICS  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 – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond
and graphite structures – Polymorphism and allotropy - Crystal defects – point, line and
surface defects- Burger vector.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

PTCY9111 APPLIED CHEMISTRY L T P C 3 0 0 3

UNIT I WATER TREATMENT AND POLLUTION CONTROL 9

UNIT II FUELS 9
Classification of fuels-Proximate and ultimate analysis of coal- coke manufacture-Otto Hoffman by product method-cracking-thermal and catalytic (fixed bed and fluidized bed)- petroleum-refining-factions-composition and uses synthetic petrol-fischer drops methods- Bergius process- knocking-octane number and cetane number-Preparation, composition and uses of producer gas, water gas and natural gas. Flue gas analysis- Orsat apparatus- gross and net calorific values- calculation of minimum requirement of air(simple calculations)- Explosive range –spontaneous ignition temperature

UNIT III THERMODYNAMICS AND SURFACE CHEMISTRY 9

UNIT IV ELECTROCHEMISTRY - CORROSION AND CATALYSIS 9

UNIT V POLYMERS-COMPOSITES AND NANO CHEMISTRY 9
Polymers-definition-classification-thermoplastics and thermosetting plastics differences Preparation, properties and uses of polystyrene, bakelite, PET, polyurethane, Teflon, ureafomaldehyde, polycarbonates-Elastomers-Preparation, properties of Buna-S, nitrile, neoprene and butyl rubber, silicon rubber. Composites-FRP. Nanochemistry-introduction to nanochemistry- preparation and properties of nonmaterial-nano rods, nano wires-nanotubes-carbon nanotubes and their applications.

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

PTEE 9151 ELECTRIC CIRCUIT ANALYSIS L T P C
3 0 0 3

AIM:
To introduce the concepts and investigate the behavior of electric circuits by analytical techniques

OBJECTIVES:
• To introduce the basic concepts of single phase, three phase and DC Electrical circuits
• To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
• To introduce the methods of circuit analysis using Network theorems

UNIT I BASIC CIRCUIT CONCEPTS

UNIT II TRANSIENT ANALYSIS OF FIRST AND SECOND ORDER CIRCUITS

UNIT III SINUSOIDAL STEADY STATE ANALYSIS
Concept of phasor and complex Impedance / Admittance – Analysis of simple series and parallel circuits – active power, reactive power, apparent power (volt ampere), power factor and energy calculations - concept of complex power – phasor diagram, impedance triangle and power triangle –series and parallel resonance circuits – Q factor, half-power frequencies and bandwidth of resonant circuits.
UNIT IV MULTIDIMENSIONAL CIRCUIT ANALYSIS & NETWORK THEOREMS

UNIT V COUPLED CIRCUITS AND THREE PHASE CIRCUITS

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTGE 9114 COMPUTER PRACTICE

AIM:
To provide hands on experience in Operating system, Application software and ‘C’ programming

OBJECTIVE:
At the end of the course, students will be able to
- have a clear understanding of basic commands used in Operating system
- Work in various application softwares like Word, Spreadsheet packages.
- Develop programmes in ‘C’.

UNIT I OPERATING SYSTEM AND OFFICE PACKAGES
UNIT II  C PROGRAMMING  

UNIT III  ADVANCED C PROGRAMMING  

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCE:

PTMA 9212  TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS  L T P C  
3 0 0 3

AIM:
To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES:
• To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems  
• To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic  
• To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes  
• To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems

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

UNIT II  FOURIER TRANSFORM  

UNIT III  PARTIAL DIFFERENTIAL EQUATIONS  
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.
UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9
Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT V Z–TRANSFORM AND DIFFERENCE EQUATIONS 9

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

PTEC 9215 ELECTRONIC DEVICES AND CIRCUITS L T P C
3 0 0 3

AIM:
To study the characteristics and applications of electronic devices.

OBJECTIVE:
• To acquaint the students with construction, theory and characteristics of the following electronic devices:
• P-N junction diode, Bipolar transistor, Field Effect transistor, LED, LCD and other photo electronic devices, Power control/regulator devices, Feedback amplifiers and oscillators

UNIT I PN JUNCTION DEVICES 9
PN junction diode –structure, operation and V-I characteristic-current equation of drift current density and diffusion current density-diffusion and transient capacitance –display devices- LED, Laser diodes Zener breakdown-zener reverse characteristic – zener as regulator

UNIT II IPOLAR JUNCTION TRANSISTORS 9
– structure, operation and V-I characteristic- MOSFET – structure, operation and V-I characteristic – types of MOSFET – JFET –structure, operation and V-I characteristic

UNIT III AMPLIFIERS 9

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9
UNIT V  FEEDBACK AMPLIFIERS AND OSCILLATORS  
Advantages of negative feedback – voltage ./ current, series , shunt feedback – positive feedback – condition for oscillations, phase shift – Wien bridge, Hartley, colpitts and crystal oscillators.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE 9202 ELECTROMAGNETIC THEORY

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AIM:
To introduce the fundamentals of electromagnetic fields and their applications in Engineering.

OBJECTIVE:
To impart knowledge on
- Vector fields
- Electrostatic and magnetostatic fields,
- Electrodynamics and electromagnetic waves.

UNIT I  INTRODUCTION

UNIT II  ELECTROSTATICS

UNIT III  MAGNETOSTATICS
UNIT IV  ELECTRO DYNAMIC FIELDS  9
Faraday’s law, induced emf – transformer and motional EMF, Maxwell’s equations (differential and integral forms) - Displacement current – Applications - Relation between field theory and circuit theory.

UNIT V  ELECTROMAGNETIC WAVES  9
Generation – electromagnetic wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors – skin depth, Poynting vector – Plane wave reflection and refraction - Applications

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE 9204  DIGITAL SYSTEM DESIGN  L T P C
3 0 0 3

AIM:
To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.

OBJECTIVES:
- To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
- To study implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits.
- To expose the students to various memory devices.
- To introduce digital simulation techniques for development of application oriented logic circuit.
UNIT I BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS 9
Boolean algebra: De-Morgan’s theorem, switching functions and simplification using K-maps & Quine McCluskey method, Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers.

UNIT II SYNCHRONOUS SEQUENTIAL CIRCUITS 9
Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Counters, state diagram; state reduction; state assignment.

UNIT III ASYNCHRONOUS SEQUENTIAL CIRCUIT 9
Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT IV PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES 9
Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

UNIT V VHDL 9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTGE 9261 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C 3 0 0 3

AIM: The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participates.

OBJECTIVE: At the end of this course the student will be able to understand
- What constitutes the environment
- What are precious resources in the environment
- How to conserve these resources
• What is the role of a human being in maintaining a clean environment and useful environment for the future generations
• How to maintain ecological balance and preserve bio-diversity.
• The role of government and non-government organization in environment managements.

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

UNIT II ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards (h) e-waste – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT
From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 06

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE 9201 CONTROL SYSTEMS L T P C
3 0 0 3

AIM:
To learn the basic concepts of linear control theory and its analysis.

OBJECTIVES:
To impart knowledge on
- Different system representation, block diagram reduction and Mason’s rule.
- Time response analysis of LTI systems and steady state error.
- The open loop and closed loop frequency responses of systems.
- Stability concept.
- State variable analysis.

UNIT I MATHEMATICAL MODELS OF PHYSICAL SYSTEMS 09
Definition & classification of system – terminology & structure of feedback control theory – Analogous systems - Physical system representation by Differential equations – Block diagram reduction– Signal flow graphs.
UNIT II  TIME RESPONSE ANALYSIS & ROOT LOCUS TECHNIQUE  09

UNIT III  FREQUENCY RESPONSE ANALYSIS  09
Correlation between Time & Frequency response – Polar plots – Bode Plots – Determination of Transfer Function from Bode plot.

UNIT IV  STABILITY CONCEPTS & ANALYSIS  09

UNIT V  STATE VARIABLE ANALYSIS  09
Concept of state – State Variable & State Model – State models for linear & continuous time systems – Solution of state & output equation – controllability & observability.

TEXT BOOKS:

REFERENCES:

TOTAL : 45 PERIODS

PTEE 9203  MEASUREMENTS AND INSTRUMENTATION  L T P C
3 0 0 3

AIM:
To provide adequate knowledge of measurements techniques using electrical and electronic instruments.

OBJECTIVE:
- Introduction to general instrument system, error, calibration etc.
- Emphasis is laid on analog and digital techniques used to measure voltage, current, energy, power and non-electrical parameters.
- To have an adequate knowledge of comparison methods of measurement.
- Elaborate discussion about storage & display devices.
- Exposure to various transducers and data acquisition system.
UNIT I  QUALITIES OF MEASUREMENT  09
Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

UNIT II  PRIMARY SENSING ELEMENTS AND SIGNAL CONDITIONING  09
Principles, Classification of sensors and transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, optical and digital transducers – Basic Instrumentation Amplifier, Sample and Hold Circuit, A/D and D/A converters

UNIT III  ELECTRICAL MEASUREMENTS AND INSTRUMENTS  09

UNIT IV  MEASUREMENT OF PASSIVE ELEMENTS  09

UNIT V  BASIC MEASUREMENT METHODS OF NON-ELECTRICAL PARAMETERS  09

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
To study the fundamental principles of Electrical machines and the characteristics of D.C Machines and Transformers.

OBJECTIVES:
- To study the fundamental principles of Electro-mechanical energy conversion
- To study the machine windings and the MMF pattern of armature and field windings.
- To study the theory, operation and characteristics of DC machines and Transformers.

UNIT I  ELECTRO-MECHANICAL ENERGY CONVERSION  6

UNIT II  TRANSFORMERS  12

UNIT III  BASIC CONCEPTS IN ELECTRICAL MACHINES  9

UNIT IV  D.C. MACHINES  11

UNIT V  DC MOTORS  7
Starting and speed control – testing and efficiency – braking – applications – Permanent Magnet DC Machines.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

PTEE 9251  TRANSMISSION AND DISTRIBUTION  L T P C
3 0 0 3

AIM:
To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

OBJECTIVE:
- To develop expression for computation of fundamental parameters of lines.
- To categorize the lines into different classes and develop equivalent circuits for these classes.
- To analyze the voltage distribution in insulator strings and cables and methods to improve the same.

UNIT I  INTRODUCTION
Structure of electric power system: generation, transmission and distribution; Types of AC and DC distributors – distributed and concentrated loads – interconnection - HVDC and EHV AC transmission

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

UNIT III  MODELLING AND PERFORMANCE OF TRANSMISSION LINES
Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, shunt and series compensation; Ferranti effect and corona loss.

UNIT IV  INSULATORS AND CABLES
UNIT V  MECHANICAL DESIGN OF LINES AND GROUNDING

Mechanical design of transmission line – sag and tension calculations for different weather conditions – Methods of grounding – Peterson coil - Substation layout - Tower Spotting.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE 9205  CONTROL AND INSTRUMENTATION LABORATORY

LIST OF EXPERIMENTS:
1. Determination of transfer function parameters of a DC servo motor
2. Determination of transfer function parameters of Ac servo motor
3. Analog simulation of type-0 and type – 1 system
4. Digital simulation of linear systems.
5. Design and implementation of compensators
6. Stability analysis of linear systems
7. Study of synchros.
8. Study of displacement and pressure transducers
10. Measurement of R using DC bridges
11. Calibration of single-phase energy meter
12. Measurement of three phase power and power factor

TOTAL: 45 PERIODS
AIM:  
To introduce Microprocessor Intel 8085, 8086 and the Micro Controller 8051

OBJECTIVE:
- To study the Architecture of 8085, 8086 & 8051.
- To study the addressing modes & instruction set of 8085, 8086 & 8051.
- To introduce the need & use of Interrupt structure.
- To develop skill in simple program writing.
- To introduce commonly used peripheral/interfacing ICs

UNIT I  8085 PROCESSOR  9

UNIT II  PROGRAMMING OF 8085 PROCESSOR  9
Instruction format and addressing modes — Assembly language format — Data transfer, data manipulation & control instructions — Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions stack.

UNIT III  PERIPHERAL INTERFACING  9
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  MICRO CONTROLLER 8051  9
Functional block diagram - Instruction format and addressing modes — Interrupt structure — Timer —I/O ports — Serial communication, Simple programming.

UNIT V  MICRO CONTROLLER PROGRAMMING & APPLICATIONS  9
Data Transfer, Manipulation, Control & I/O instructions — Simple programming exercises key board and display interface — Closed loop control of DC shunt motor- stepper motor control.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
To study the theory, operation and performance of AC machines.

OBJECTIVE:
- To study the theory and performance characteristics of Induction machines.
- To study the theory and performance characteristics of Synchronous machines.
- To study theory of operation and performance characteristics of fractional horse power motors.

UNIT I  INDUCTION MACHINES: THEORY  9

UNIT II  INDUCTION MACHINES: PERFORMANCE  9

UNIT III  SYNCHRONOUS MACHINES: THEORY  9

UNIT IV  SYNCHRONOUS MACHINE: PERFORMANCE  9

UNIT V  FRACTIONAL HORSE POWER MOTORS  9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
To understand the various applications of electronic devices for conversion, control and conditioning of the electrical power.

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

UNIT I  POWER SEMI-CONDUCTOR DEVICES  9
Overview of switching devices – Driver and snubber circuit of SCR TRIAC, GTO, IGBT, MOSFET – Computer simulation of PE circuits.

UNIT II  PHASE CONTROLLED CONVERTERS  9

UNIT III  DC TO DC CONVERTERS  9

UNIT IV  INVERTERS  9

UNIT V  AC TO AC CONVERTERS  9
Single phase AC voltage controllers – Multistage sequence control – single phase and three phase cycloconverters – power factor control – Matrix converters.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
To become familiar with the modeling of various power system components and different methods of analysis for power system planning and operation.

OBJECTIVE:
- To model steady-state operation of large-scale power systems and to solve the power flow problems using efficient numerical methods suitable for computer simulation.
- To model and analyze power systems under abnormal (fault) conditions.
- To model and analyze the dynamics of power system for small-signal and large signal disturbances and design the systems for enhancing stability.

UNIT I  INTRODUCTION
Overview of Power System Analysis: Importance of system planning and operational analysis; Distinction between steady state, quasi steady state and transient analysis; Per phase analysis of symmetrical three phase system, single line diagram, per unit representation; different models for generator, load and transmission lines based on the analysis of interest – π equivalent circuit of transformer with off nominal-tap ratio.

UNIT II  BASICS OF ANALYSIS AND COMPONENT MODELLING
Primitive network and its matrices, bus admittance matrix formation by inspection method and singularity transformation method, bus impedance matrix formation by L-U factorization of bus admittance matrix and by building algorithm. Symmetrical component transformation, sequence impedances and sequence networks.

UNIT III  POWER FLOW ANALYSIS

UNIT IV  FAULT ANALYSIS

UNIT V  STABILITY ANALYSIS
Description of power system stability problem; importance of stability analysis in power system planning and operation; classification of power system stability. Single Machine Infinite Bus (SMIB) system: Development of swing equation; power-angle equation; Equal Area Criterion; determination of critical clearing angle and time; algorithm for numerical solution of swing equation using modified Euler method; usage of numerical algorithm for determination of critical clearing time by trial and error – digital simulation.

TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

PTEE9255  MICROPROCESSOR AND MICROCONTROLLER  L  T  P  C
LABORATORY  0 0 3 2

LIST OF EXPERIMENTS:
1. Simple arithmetic operations: Multi precision addition / subtraction / multiplication / division.
3. Interface Experiments:
   - A/D Interfacing.
   - D/A Interfacing.
   - Traffic light controller.
4. Interface Experiments:
   - Simple experiments using 8251, 8279, 8254.
5. Demonstration of basic instructions with 8051 Micro controller execution, including:
   - Conditional jumps, looping
   - Calling subroutines.
   - Stack parameter testing
6. Parallel port programming with 8051 using port 1 facility:
   - Stepper motor and D / A converter.
7. Study of Basic Digital IC’s.
   (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)
8. Implementation of Boolean Functions, Adder/ Subtractor circuits.
10. Sequential Logic: Study of Flip-Flop, Counters (synchronous and asynchronous), Shift Registers

TOTAL: 45 PERIODS

REFERENCES:

PTEE9353 POWER SYSTEM OPERATION AND CONTROL L T P C
3 0 0 3

AIM:
To become familiar with the preparatory work necessary for meeting the next day’s power system operation and the various control actions to be implemented on the system to meet the minute-to-minute variation of system load.

OBJECTIVE:
- To get an overview of system operation and control.
- To understand & model power-frequency dynamics and to design power-frequency controller.
- To understand & model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.

UNIT I INTRODUCTION 6
System load variation: System load characteristics, load curves - daily, weekly and annual, load- duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER - FREQUENCY CONTROL 12
Fundamentals of speed governing mechanism and modeling: 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, Economic Dispatch Control. Multi-area systems: Two-area system modeling; static analysis, uncontrolled case; tie line with frequency bias control of two-area system derivation, state variable model.

UNIT III REACTIVE POWER–VOLTAGE 9
Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; methods of voltage control - shunt reactors – shunt capacitors – series capacitors – synchronous condensers – static var systems- Tap-changing transformer - System level voltage control.
UNIT IV COMMITMENT AND ECONOMIC DISPATCH
Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list method, forward dynamic programming approach, Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. Base point and participation factors. Economic dispatch controller added to LFC control.

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

TEXT BOOKS:

REFERENCES:

PTEE9355 DESIGN OF ELECTRICAL APPARATUS

AIM:
To provide knowledge on the design aspects of Electrical machines.

OBJECTIVES:
- Have a good understanding on the design and applications of DC &AC machines
- To introduce the basic design concepts and cooling arrangement of transformers.
- To introduce computer aided machine design.

UNIT I FUNDAMENTALS OF ELECTRICAL MACHINE DESIGN
Standard specification of frame size, conductors and insulation. - Magnetization and loss curve – Choice of specific loadings- Heating and cooling of electrical machines.

UNIT II D.C MACHINES
Construction details – output equation – main dimensions- Choice of specific loadings – choice of number of poles- armature design – design of field poles and field coils – design of commutator and brushes.
UNIT III  TRANSFORMERS
Construction details of core and shell type transformers – output rating of single phase and three phase transformers – optimum design of transformers.- design of yoke, core and winding for core and shell type transformers-equivalent circuit parameter from designed data- Design of tank and cooling tubes of transformers.

UNIT IV  A.C. MACHINES
Construction details of A.C. machines – output equation – main dimensions- Choice of specific loadings –design of stator – design of squirrel cage and slip rind rotor-equivalent circuit parameter from designed data – Short circuit ratio- design of rotor of cylindrical pole and salient pole machines.

UNIT V  COMPUTER AIDED DESIGN
Need for computer aided design – Analysis method – Synthesis method - Introduction to analysis of Electric machine parameters using FEM.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
2. V.N mittle and A.Mittle, Design of Electrical Machines, Standard Publications and Distributors , Delhi , 2002.

PTEE 9352  HIGH VOLTAGE ENGINEERING  L T P C
3 0 0 3

AIM:
To learn about the high voltage breakdown mechanism, generation, measurement and testing.

OBJECTIVES:
To understand :
- the various types of over voltages in power system and protection schemes.
- the nature of breakdown mechanism in solid, liquid and gaseous dielectrics
- the generation of over voltages in laboratories
- the measurement of over voltages.
- the testing of power apparatus and insulation coordination
UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9
Causes of over voltages and their effects on power system – Lightning, switching and temporary over voltages – protection against over voltages - Insulation coordination – BIL.

UNIT II ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS 9

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9
Generation of high DC, AC, impulse voltages and currents, tripping and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9
Measurement of high voltages and high currents, digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING 9
High voltage testing of electrical power apparatus – power frequency, impulse voltage and DC testing – International and Indian standards.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE 9256 ELECTRICAL MACHINES AND DRIVES LABORATORY L T P C
0 0 3 2

LIST OF EXPERIMENTS
1. Open circuit and load characteristics of separately excited and self excite D.C. generator
2. Load test on D.C shunt motor
3. Load test on D.C series motor
4. Swinburne’s test and speed control of D.C shunt motor
5. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
6. Regulation of three-phase alternator by EMF and MMF methods.
7. Load test on three-phase induction motor
8. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
10. Study of D.C motor and induction motor starters
11. AC to DC half-controlled converter
12. IGBT based single-phase PWM inverter

TOTAL: 45 PERIODS

PTEE 9306 PROTECTION AND SWITCHGEAR L T P C

A I M:
To study the various faults and protection schemes in power systems.

O B J E C T I V E S:
- To discuss the need for the protection and various protection schemes.
- To study relays characteristics
- To Study apparatus protection
- To understand the method of circuit breaking, arcing phenomena – various arc theories -capacitive and inductive breaking.
- To understand the working of different types of circuit breakers.

UNIT I INTRODUCTION
Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – earthing – Zones of protection and essential qualities of protection – Protection schemes – CTs and PTs and their applications.

UNIT II PROTECTIVE RELAYS
Operating principles of relays, the universal relay, torque equation, relay characteristics, electromagnetic relays – over current, directional, distance and differential relays, negative sequence relays, static relays - amplitude and phase comparators, Introduction to numerical relays.

UNIT III APPARATUS PROTECTION
Apparatus protection – transformer, generator, motor – protection of bus bars and transmission lines.

UNIT IV THEORY OF CIRCUIT INTERRUPTION
Physics of arc phenomena and arc interruption. Restriking voltage and recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, interruption of capacitive current, DC circuit breaking.

UNIT V CIRCUIT BREAKERS
Types of Circuit Breakers – Air blast, air break, oil, SF₆ and Vacuum circuit breakers – Comparison of different circuit breakers.

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

PTEE 9401 SOLID STATE DRIVES

AIM:
To study and understand the operation of electrical machines controlled by a power electronic converter and to introduce the controller design concepts.

OBJECTIVES:
- To understand steady state operation and transient dynamics of a motor load system.
- To study and analyze the operation of the converter / chopper fed dc drive, both qualitatively and quantitatively.
- To study and understand the operation and performance of AC motor drives.
- To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS

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

UNIT III INDUCTION MOTOR DRIVES

UNIT IV SYNCHRONOUS MOTOR DRIVES
V/f control and self control of synchronous motor: Margin angle control and power factor control – permanent magnet synchronous motor.
UNIT V DESIGN OF CONTROLLERS FOR DRIVES

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

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

32
UNIT IV SPECIAL ICs
555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.

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

TEXT BOOKS:
2. David A Bell, Opamp and linear ICs, second edition, Prentice hall of India.

REFERENCES:

PTEE9356 POWER SYSTEM AND HIGH VOLTAGE LABORATORY

LIST OF EXPERIMENTS:
1. Computation of Parameters and Modeling of Transmission Lines
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
4. Fault Analysis
7. Demonstration of Generation and measurement of High Voltage DC using Co croft Walton circuit and measurement of ripple and voltage regulation.
8. Demonstration of generation and measurement of High Voltage AC using cascaded transformer.
9. Measurement of capacitance and loss tangent of High voltage equipment
10. electromagnetic field measurement using field meter
11. Measurement of power harmonics using energy analyser

TOTAL: 45 PERIODS
AIM:
To familiarise with various electrical systems and appliances in institutes, Industries and Residences.

OBJECTIVES:
- To learn about different types of electric drives and the systems employed in electric traction.
- To know about various lamps and design of illuminators schemes.
- To familiarize with the existing methods, used for heating and welding.
- To introduce the concepts of refrigeration and Air conditioning.
- To analyse the various energy saving methods.

UNIT I ELECTRIC DRIVES AND TRACTION
9

UNIT II ILLUMINATION
9

UNIT III HEATING AND WELDING
9

UNIT IV REFRIGERATION AND AIR CONDITIONING
9

UNIT V ECONOMICS OF ELECTRICAL ENERGY UTILIZATION
9

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

PTEE 9049 CONTROL SYSTEM DESIGN
L T P C
3 0 0 3

AIM:
To provide the concepts of linear and non linear system design.

OBJECTIVES:
To impart knowledge on
• System design using root locus method.
• Design using frequency response method.
• State space design.
• Conventional techniques for non linear systems.
• Process identification and PID tuning for the same.

UNIT I CONTROL SYSTEM DESIGN BY THE ROOT LOCUS METHOD
Preliminary of Design considerations – Lead – Lag – Lag Lead Compensation

UNIT II CONTROL SYSTEM DESIGN BY FREQUENCY RESPONSE
Lead Compensation – Lag Compensation – Lag Lead compensation

UNIT III DESIGN IN STATE SPACE

UNIT IV NON-LINEAR SYSTEMS

UNIT V CLASSICAL PID CONTROL & RELAY FEEDBACK
PID Control – Features and implementation – Direct and Model based Tuning – Shapes of Relay Response – Model structures and identification – Implications for Control.

TOTAL: 45 PERIODS
**TEXT BOOKS:**

**REFERENCES:**

**PTEE9022**  
**ADVANCED CONTROL SYSTEM**  
**L T P C**

**3 0 0 3**

**AIM:**
To introduce the concepts of optimal and digital control systems with system identification techniques to undergraduate students.

**OBJECTIVES:**
- To introduce the concepts of controllers and their design.
- To provide the concepts of state variable and output feedback for LTI systems.
- To provide the concepts of digital control systems.
- To provide the concepts of optimization in providing control solutions for LTI systems.
- To introduce the concepts of system identification and parameter estimation.

**UNIT I**  
**CONVENTIONAL DESIGN OF CONTROLLERS**
9

**UNIT II**  
**DESIGN USING STATE SPACE METHODS**
9

**UNIT III**  
**OPTIMAL CONTROL**
9
Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design – Optimal observers
UNIT IV  DIGITAL CONTROL  9

UNIT V  SYSTEM IDENTIFICATION  9

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE 9023  DIGITAL CONTROL AND INSTRUMENTATION  L T P C
3 0 0 3

AIM:
To learn Digital measurements using electronic circuits for electrical measurements and their applications.

OBJECTIVES:
- To study the conventional, state space and digital control techniques.
- To get familiar with the design and realization of circuits with automation and control in measuring instruments with electronic circuits and digital display.
- To study various digital techniques used to measure voltage, current, energy, power and non-electrical parameters.
- To introduce peripheral interfaces for data logging and transmission.
- To discuss on interfacing for PC Based instrumentation.
- To introduce latest trends in digital instrumentation.
UNIT I CONVENTIONAL AND STATE SPACE DESIGN


UNIT II DIGITAL CONTROL


UNIT III PERIPHERAL INTERFACES

9 Basic system components – Data Acquisition and conversion, Principle of ADCs and DACs clock generator, address decoder, 8-bit bus interface circuits, RS232/RS485, GPIB, USB instrument bus interface standards, digital data modulation and transmission. PC Based data acquisition system. Modems and LAN interface.

UNIT IV COMPUTER AIDED DESIGN OF INSTRUMENTS

9 Tools for modeling, design, testing and calibrating digital instrument using LABVIEW, HPVEE, case study for digital voltmeter and digital PID controller for temperature control.

UNIT V DIGITAL INSTRUMENTS

9 Digital – counters, period measurement, voltmeter, multimeter, frequency meter, LCR meter, phase meter, tachometer, Q meter. Digital storage CRO, spectrum analyser, digital data recorder.

TOTAL: 45 PERIODS

TEXT BOOKS:
2. Graham C. Goodwin, Stefan F. Gradbea and Mario E. Salgado, Control System Design, PHI

REFERENCES:
AIM:
To cater the knowledge of Neural Networks, Fuzzy Logic Control, Genetic Algorithm and Evolutionary Programming and their applications for controlling real time systems.

OBJECTIVES:
- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feed back neural networks.
- To teach about the concept of fuzziness involved in various systems. To provide adequate knowledge about fuzzy set theory.
- To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
- To provide adequate knowledge of application of fuzzy logic control to real time systems.
- To expose the ideas of GA and EP in optimization and control.

UNIT I ARCHITECTURES - ANN

UNIT II NEURAL NETWORKS FOR CONTROL

UNIT III FUZZY SYSTEMS AND FUZZY LOGIC CONTROL

UNIT IV OPTIMIZATION TECHNIQUES

UNIT V APPLICATION OF FLC
Fuzzy logic control – Inverted pendulum – Image processing – Home heating system – Blood pressure during anesthesia – Introduction to neuro fuzzy controller.

TOTAL: 45 PERIODS

TEXT BOOKS:
3. David Goldberg, Genetic Algorithms and Machine learning, PHI
REFERENCES:

PTEE9032 OPERATIONS RESEARCH

L T P C
3 0 0 3

AIM:
To learn the resource management concepts by Operation Research

OBJECTIVES:
- To learn the various OR models
- To study the dual problem concepts
- To acquire the knowledge of transportation model, network applications and diagram presentations

UNIT I OPERATION RESEARCH MODELS

UNIT II DEFINITION OF THE DUAL PROBLEM

UNIT III DEFINITION OF TRANSPORTATION MODEL

UNIT IV SCOPE OF NETWORK APPLICATIONS

UNIT V NETWORK DIAGRAM REPRESENTATION

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

PTEE 9033 PROGRAMMING IN JAVA L T P C
3 0 0 3

AIM:
To study the programming language JAVA in detail

OBJECTIVES:
At the end of this course students will be able to
• Appreciate the flavour of Java programming language
• Have a thorough understanding of OOP concept using Java
• Write programmes using AWT
• Have a detailed knowledge about Applets in Java

UNIT I INTRODUCTION
Java as programming tool - Advantages of Java - Java Buzzwords - Java Programming Environment - Compiling and running Java Programs - Fundamental Programming structure in Java - Data Types, Operators, Strings, Control Flow, Class Methods, Arrays.

UNIT II OBJECTS AND CLASSES

UNIT III GRAPHICS PROGRAMMING

UNIT IV SWINGS AND APPLETS
UNIT V  EXCEPTION HANDLING AND FILES

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE9034  ADVANCED TOPICS IN POWER ELECTRONICS    L T P C
3 0 0 3

AIM:
To study low power SMPS and UPS technologies

OBJECTIVE:
To provide conceptual knowledge in modern power electronic converters and its applications in electric power utility.

UNIT I  DC-DC CONVERTERS
Principles of stepdown and stepup converters – Analysis and state space modeling of Buck, Boost, Buck- Boost and Cuk converters.

UNIT II  SWITCHING MODE POWER CONVERTERS
Analysis and state space modeling of flyback, Forward, Luo, Half bridge and full bridge converters- control circuits and PWM techniques.

UNIT III  RESONANT CONVERTERS
Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS , Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control.

UNIT IV  DC-AC CONVERTERS
Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts - Types: Diode clamped- Flying capacitor- Cascaded types- Applications.
UNIT V  POWER CONDITIONERS, UPS & FILTERS

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
3. Philip T Krein, Elements of Power Electronics, Oxford University Press.

PTEE9035  POWER QUALITY  L T P C
3 0 0 3

AIM:
To introduce the concepts related to power quality and the mitigation techniques

OBJECTIVES:
• To introduce power quality terms and definitions
• To introduce the concepts of conventional and modern mitigation techniques
• To expose the students to various types of power monitoring equipment

UNIT I  INTRODUCTION TO POWER QUALITY
Terms and Definitions: Overloading, undervoltage, sustained interruption, sags and swells, waveform distortions, Total harmonic distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve, Harmonic Distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads.

UNIT II  VOLTAGE SAGS AND INTERRUPTIONS
Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III  OVERVOLTAGES
Sources of overvoltages: Capacitor switching, lighting, ferroresonance; Mitigation of voltage swells: surge arrestors, low pass filters, power conditioners – Lightning Protection, shielding, line arrestors, protection of transformers and cables, computer analysis tools for transients, PSCAD and EMTP
UNIT IV  HARMONICS
Locating harmonic sources: power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V  POWER QUALITY MONITORING
Monitoring considerations: Power line disturbance analyzer, power quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

TEXT BOOKS:

REFERENCES:

PTEE 9036  POWER SYSTEM TRANSIENTS  L T P C
3  0 0 3

AIM:
To understand the generation of switching and lightning transients, their propagation, reflection and refraction on the grid and their impact on the grid equipment.

OBJECTIVES:
- To study the generation of switching transients and their control using circuit – theoretical concept.
- To study the mechanism of lightning strokes and the production of lightning surges.
- To study the propagation, reflection and refraction of travelling waves.
- To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

UNIT I  INTRODUCTION AND SURVEY
Source of transients, various types of power systems transients, effect of transients on power systems, importance of study of transients in planning.

UNIT II  SWITCHING TRANSIENTS
UNIT III LIGHTNING TRANSIENTS
Causes of overvoltage, lightning phenomenon, charge formation in the clouds, rate of charging of thunder clouds, mechanisms of lightning strokes, characteristics of lightning strokes; factors contributing to good line design, protection afforded by ground wires, tower footing resistance. Interaction between lightning and power system: Mathematical model for lightning.

UNIT IV TRAVELLING WAVES ON TRANSMISSION LINE – COMPUTATION OF TRANSIENTS
Computation of transients: Transient response of systems with series and shunt lumped parameters and distributed lines. Travelling wave concept: step response, Bewely’s lattice diagram, standing waves and natural frequencies, reflection and refraction of travelling waves.

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM
The short line and kilometric fault, distribution of voltage 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; EMTP for transient computation.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE9037 SPECIAL ELECTRICAL MACHINES

AIM:
To explore the theory and applications of special machines.

OBJECTIVES:
- To review the fundamental concepts of permanent magnets and the operation of permanent magnet brushless DC motors.
- To introduce the concepts of permanent magnet brushless synchronous motors and synchronous reluctance motors.
- To develop the control methods and operating principles of switched reluctance motors.
- To introduce the concepts of stepper motors and its applications.
- To understand the basic concepts of other special machines.
UNIT I PERMANENT MAGNET BRUSHLESS DC MOTORS 9
Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis-EMF and Torque equations- Characteristics and control

UNIT II PERMANENT MAGNET SYNCHRONOUS MOTORS 9

UNIT III SWITCHED RELUCTANCE MOTORS 9
Constructional features –Principle of operation- Torque prediction –Characteristics- Power controllers – Control of SRM drive- Sensorless operation of SRM – Applications.

UNIT IV STEPPER MOTORS 9

UNIT V OTHER SPECIAL MACHINES 9
Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear motor – Permanent magnet DC and AC motors, Applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
To study the various types of EHV transmission systems.

OBJECTIVE:
To impart knowledge on
- EHV AC transmission trends and parameters calculation
- HVDC and FACTS
- Effect of EHV lines on living organisms

UNIT I  TRANSMISSION LINE TRENDS  9
Standard transmission voltages, average values of line parameters – Power handling capacity and line losses – number of lines.

UNIT II  LINE AND GROUND PARAMETERS  9
Calculation of line and ground parameters – R, C, L, Bundle conductors, Modes of propagation – Effect of earth.

UNIT III  HIGH VOLTAGE DIRECT CURRENT (HVDC)  9
HVDC system-Principle of operation, control and design consideration, HVDC circuit breaking

UNIT IV  FACTS  9
Basic concepts- Reactive power control, uncompensated transmission line, series compensation, SVC, thyristor control, series capacitor, static synchronous compensator, unified power flow controller and applications.

UNIT V  ELECTROSTATIC AND MAGNETIC FIELDS OF EHV LINES  9
Electric shock – threshold currents – Calculation of electrostatic fields and magnetic fields of AC and DC lines – Effect of fields on living organism – Electrical field measurement.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
aim:
to become familiar with modeling, operation of various FACTS controllers and their impact on AC transmission system.

objectives:
- to understand the need for reactive power compensation in AC transmission system.
- to become familiar with modeling and operation of thyristor and voltage source inverter based FACTS controllers.
- to study the effect of FACTS controllers on AC transmission system.

unit i introduction
reactive power control in electrical power transmission lines - uncompensated transmission line - series compensation - basic concepts of static VAR compensator (SVC) – thyristor switched series capacitor (TCSC) – unified power flow controller (UPFC).

unit ii static var compensator (SVC) and applications

unit iii thyristor controlled series capacitor (TCSC) and applications

unit iv emerging facts controllers

unit v co-ordination of facts controllers

total: 45 periods

text books:

references:
AIM:
To learn the recent trends in power system engineering.

OBJECTIVES:
- To model steady-state operation of large-scale power systems and to solve the power flow problems using efficient numerical methods suitable for computer simulation.
- To become familiar with modeling and operation of HVDC link and the principle of operation of FACTS.
- To become familiar with modeling aspects of synchronous machines and network for transient stability analysis of multi-machine power systems.
- To analyze voltage stability and sub-synchronous resonance phenomena of power system.

UNIT I   POWER FLOW ANALYSIS

UNIT II   ROTOR ANGLE STABILITY ANALYSIS

UNIT III   VOLTAGE STABILITY ANALYSIS

UNIT IV   SUBSYNCHRONOUS OSCILLATIONS
Turbine - generator - torsional characteristics - torsional interaction with power system controls – sub synchronous resonance - impact of network-switching disturbances - torsional counter measures to SSR problems.

UNIT V   HVDC AND FACTS
Review of six-pulse and twelve-pulse converter operation; equations for converter and inverter with simple HVDC link-Modes of operation- AC-DC load flow with a simple DC link, real and reactive power control in electrical power transmission line- SVC- TCSC- STATCOM- SSSC- UPSC -Basic operation --Applications.

TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

PTEE 9041 MICRO ELECTRO MECHANICAL SYSTEMS L T P C
3 0 0 3

AIM:
To study the fundamentals of fabrication, design and applications of Micro Electro Mechanical Systems (MEMS)

OBJECTIVES:
• To introduce the historical background of development of MEMS technology and micromachining.
• To study the process of surface micromachining.
• To study the principles of micro-sensors and their applications.
• To study the principles of micro-actuators and their applications.
• To study some of the applications of MEMS technology.

UNIT I MICRO FABRICATION AND BULK MICROMACHINING
Historical background of Micro Electro Mechanical Systems (MEMS) and micromachining – bulk micromachining – isotropic etching and anistropic etching, wafer bonding – high aspect ratio processes (LIGA).

UNIT II SURFACE MICROMACHINING

UNIT III PHYSICAL MICRO SENSORS
Classification of Physical sensors – Integrated, Intelligent or smart sensors – Sensor principles and examples: Thermal sensors, Electrical sensors, Mechanical sensors, Chemical and Biosensors.
UNIT IV MICROACTUATORS

UNIT V APPLICATION AREAS

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE 9042 VLSI DESIGN L T P C
3 0 0 3

AIM:
To understand the basic concepts of VLSI and CMOS design.

OBJECTIVES:
- To give clear idea about the basics of VLSI design and its importance
- To know about the operating principles of MOS transistor
- To study about construction of NMOS, CMOS and Bi-CMOS based logic gates.
- To analyze the CMOS circuits by layout Design.
- To understand the functioning of programmable and Reprogrammable devices.
- To learn about the programming of Programmable devices using Hardware description Language.

UNIT I BASIC MOS TRANSISTOR
Enhancement mode & Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – MOS Transistor model.

UNIT II NMOS & CMOS INVERTER AND GATES
UNIT III   SUB SYSTEM DESIGN & LAYOUT

UNIT IV   DESIGN OF COMBINATIONAL ELEMENTS AND REGULAR ARRAY LOGIC
NMOS PLA – Programmable logic devices – Finite state Machine PLA – Introduction to FPGA,CPLD.

UNIT V   VHDL PROGRAMMING

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

PTEE 9043   MOBILE COMMUNICATION
L T P C
3 0 0 3

AIM:
To introduce the mobile communication concepts using wireless medium for UG students.

OBJECTIVES:
- To introduce the basic concepts of mobile communication systems used under interference parameters
- To understand the concepts of medium to aid propagation in wireless medium.
- To introduce various modulation and mitigation techniques
- To introduce the concepts of noiseless transmission and enhancement of number of users.
- To introduce different systems and standards.
UNIT I  BASICS OF CELLULAR MOBILE  9
Evolution of mobile communication – mobile radio systems – cellular concept – mobility and frequency management of radio in vehicle traffic environment – frequency reuse – channel assignment – co-channel interference – hand off – interference & system capacity – trunking & GOS.

UNIT II  PROPAGATION FACTORS IN MOBILE RADIO  9

UNIT III  MODULATION TECHNIQUES & MITIGATION  9

UNIT IV  CODING & MULTIPLE ACCESS METHODS  9
Vocoder, LPC, CELP, HELP, RELP – selection of codes for mobile communication: GSM coders MA techniques: FDMA, TDMA, SDMA, CDMA power control - channel codes – (qualitative) comparison.

UNIT V  SYSTEMS AND STANDARDS  9
1G Analog systems, AMPS – 2G digital systems: GSM, NADC, JDC, IS-95, IS-136, Standards DECT, CDMA one, Bluetooth, GPRS, UMTS; FDD & TDD – 3G: WCDMA.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
3. Modern Wireless communication by Haykine & Maher, Pearson Education

PTEE9045  DYNAMIC MODELING AND ANALYSIS OF ELECTRICAL MACHINES  L T P C
AIM:
To study the dynamic modeling and analysis of electrical machines.

OBJECTIVES:
- To review the fundamentals of electro-mechanical energy conversion.
- To develop dynamic modeling and to perform analysis of Electrical Machines.
- To study the reference frame theory.
UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION 9
Magnetic circuits – stored magnetic energy, co-energy – force and torque – singly and
doubly excited system – MMF pattern for DC and AC machines – calculation of air gap
mmf and per phase machine inductance using physical machine data.

UNIT II DC MACHINES 9
Voltage and torque equations – dynamic characteristics of permanent magnet and shunt
DC motors – state equations – solution of dynamic characteristics by Laplace
transformation.

UNIT III REFERENCE FRAME THEORY 9
Static and rotating reference frames – transformation of variables – reference frames –
transformation between reference frames – transformation of a balanced set – balanced
steady state phasor and voltage equations – variables observed from several frames of
reference.

UNIT IV INDUCTION MACHINES 9
Voltage and torque equations in machine variables – transformation in arbitrary
reference frame – voltage and torque equation in reference frame variables – analysis of
steady state operation – free acceleration characteristics – dynamic performance for
load variations – computer simulation.

UNIT V SYNCHRONOUS MACHINES 9
Voltage and torque equation in machine variables – transformation in rotor reference
frame (Park's equation) – voltage and torque equation in reference frame variables – analysis of
steady state – dynamic performance for load variations – computer
simulation.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Paul C.Krause, Oleg Wasyczuk, Scott D.Sudhoff, Analysis of electrical machinery
2. R.Krishnan, Electrical Motor Drives, Modelling, Analysis and Control, Prentice Hall
   of India, 2002.

REFERENCES:
1. A.E.Fitzgearald, Charles Kingsley, Jr. and Stephen D.Umans, Electric Machinery
AIM:
To learn the HVDC modelling and control strategy.

OBJECTIVES:
• To study the performance of converters and modeling of DC line with controllers.
• To study about converter harmonics and its mitigation using active and passive filters.

UNIT I DC POWER TRANSMISSION TECHNOLOGY 9
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 9
Pulse number, choice of converter configuration-simplified analysis of Graetz circuit-
converter bridge characteristics – characteristics of a twelve pulse converter-detailed
analysis of converters.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9
General principles of DC link control-converter control characteristics-system control
hierarchy-firing angle control-current and extinction angle control-starting and stopping of
DC link-power control-higher level controllers-telecommunication requirements.

UNIT IV HARMONICS AND FILTERS 9
Introduction-generation of harmonics-design of AC filters-DC filters-carrier frequency
and RI noise.

UNIT V SIMULATION OF HVDC SYSTEMS 9
Introduction-system simulation: Philosophy and tools-HVDC system simulation-modeling
of HVDC systems for digital dynamic simulation.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Padiyar, K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi,
   Company Ltd., USA, 1994.
3. Arrillaga, J., High Voltage direct current transmission, Peter Pregrinus, London,
   1983.

REFERENCES:
2. Rakosh Das Begamudre, Extra high voltage AC transmission engineering New Age
   International (P) Ltd., New Delhi, 1990.
AIM:
To learn the various Artificial Intelligence Techniques and their application to Power Systems.

OBJECTIVES:
• To study about Artificial Neural Networks, Genetic Algorithm and Fuzzy Logic System.
• To apply AI techniques to Power Systems.

UNIT I INTRODUCTION

UNIT II ARTIFICIAL NEURAL NETWORKS

UNIT III GENETIC ALGORITHM
Basic concept of Genetic algorithm and detailed algorithmic steps – adjustment of free parameters – Solution of typical control problems using genetic algorithm – Concept on some other search techniques like tabu search and ant-colony search techniques for solving optimization problems.

UNIT IV FUZZY LOGIC SYSTEM
Introduction to crisp sets and fuzzy sets – basic fuzzy set operation and approximate reasoning – Introduction to fuzzy logic modeling and control – Fuzzification – inferencing and defuzzification – Fuzzy knowledge and rule bases – Fuzzy modelling and control schemes for nonlinear systems – Self-organizing fuzzy logic control – Fuzzy logic control for nonlinear time-delay system.

UNIT V APPLICATIONS TO POWER SYSTEMS
GA application to power system optimisation problems, Neural Network Application to Load Forecasting, Contingency Analysis, Application of Fuzzy Logic Controllers to Power System Stability.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

PTEE9048 DIGITAL SIGNAL PROCESSING

AIM:
To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.

OBJECTIVES:
• To classify signals and systems & their mathematical representation.
• To analyse the discrete time systems.
• To study various transformation techniques & their computation.
• To study about filters and their design for digital implementation.
• To study about a programmable digital signal processor & quantization effects.

UNIT I INTRODUCTION
Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation.

UNIT II DISCRETE TIME SYSTEM ANALYSIS
Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION

UNIT IV DESIGN OF DIGITAL FILTERS
FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.
UNIT V  DIGITAL SIGNAL PROCESSORS  9
Introduction – Architecture – Features – Addressing Formats – Functional modes -
Introduction to Commercial Processors.

TOTAL: 45 PERIODS

TEXT BOOKS:
   and Applications, Pearson Education, New Delhi, 2003 / PHI.

REFERENCES:
1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, Discrete – Time Signal
2. Emmanuel C Ifeachor and Barrie W Jervis, Digital Signal Processing – A Practical
3. Steven W. Smith, The Scientist and Engineer's Guide to Digital Signal Processing,
4. B. Venkataramani, M. Bhaskar, Digital Signal Processors, Architecture,

PTEE9050  DATA STRUCTURES AND ALGORITHMS  L T P C
3 0 0 3

AIM:
The aim of this course is to provide an introduction to computer algorithms and data
structures, with an emphasis on foundational material.

OBJECTIVES:
At the end of the course students should
• Have a good understanding of the fundamental data structures used in computer
  science
• Have a good understanding of how several fundamental algorithms work, particularly
  those concerned with sorting, searching and graph manipulation
• Be able to analyze the space and time efficiency of most algorithms
• Be able to design new algorithms or modify existing ones for new applications and
  reason about the efficiency of the result

UNIT I  INTRODUCTION AND BASIC DATA STRUCTURES  9
Problem solving Techniques and Examples - Abstract Data Type (ADT) - The List ADT -
Arrays - Stacks and Queues: Implementation and Applications.

UNIT II  ADVANCED DATA STRUCTURES  9
UNIT III  SORTING AND HASHING  9

UNIT IV  ALGORITHM DESIGN TECHNIQUES  9

UNIT V  GRAPHS ALGORITHMS  9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
1. R G Dromey, How to Solve it by Computers, Pearson Education Asia, 2005.