Program Educational Objectives:

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

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

Program Outcome:

a) Ability to apply knowledge of mathematics, sciences and engineering
b) Ability to understand and apply basic theorems and postulate in circuit, field and control theories
c) Ability to identify, formulate and solve electrical power engineering problems
d) Ability to analyse and apply electronics in the field of electrical power apparatus and systems
e) Ability to understand and apply computational platforms and software tools for engineering applications
f) Ability to understand ethical and professional responsibilities
g) Ability to communicate effectively and work in interdisciplinary groups
h) Ability to review, comprehend and report technological development
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ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
REGULATIONS – 2017
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING (PART TIME)
CURRICULA AND SYLLABI I - VII SEMESTERS

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OBJECTIVES:

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

UNIT I  MATRICES


UNIT II  FUNCTIONS OF SEVERAL VARIABLES


UNIT III  ANALYTIC FUNCTION

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

UNIT IV  COMPLEX INTEGRATION


UNIT V  LAPLACE TRANSFORMS


TOTAL: 45 PERIODS

OUT COMES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.
TEXT BOOK:


REFERENCES:


PTGE7153  ENVIRONMENTAL SCIENCE AND ENGINEERING  LT P C

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

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

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

Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.
UNIT II ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES
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

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

TOTAL : 45 PERIODS

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

TEXTBOOKS:
REFERENCES:

PTEE7101 ELECTRIC CIRCUIT ANALYSIS

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

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

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

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

UNIT IV RESONANCE AND APPLICATIONS

UNIT V THREE PHASE CIRCUITS
Three phase balanced / unbalanced voltage sources phase sequence – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.
TOTAL : 45 PERIODS

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

TEXT BOOKS

REFERENCES

PTEC7104 ELECTRON DEVICES AND CIRCUITS L T P C
3 0 0 3

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

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

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

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

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

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Explain the structure of basic electronic devices.
- Design applications using basic *electronic devices

TEXT BOOKS:

REFERENCES:

PTGE7111 COMPUTER PRACTICES LABORATORY

OBJECTIVES
- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

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

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

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

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**PTEE7201 DIGITAL SYSTEMS AND MICROCONTROLLERS**

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

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

**UNIT II 8085 PROCESSOR AND ITS PERIPHERAL INTERFACING**

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

**UNIT IV MICRO CONTROLLER 8051**

**UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS**
Simple programming exercises - key board and display interface – Manipulation, Control of Temperature control system - stepper motor control.
OUTCOMES:
- Ability to analyse, comprehend, design and simulate microprocessor and microcontroller based systems used for control and monitoring.

TEXT BOOKS:

REFERENCES:

PTEE7202 ELECTROMAGNETIC THEORY LT P C 3 0 0 3

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

UNIT I ELECTROSTATICS I 9
Sources and effects of electromagnetic fields, Vector fields, Vector Calculus- Gradient, Divergence, Curl – theorems and applications. Coulomb’s Law – Electric field intensity – Field due to discrete and continuous charges – Gauss’s law and applications.

UNIT II ELECTROSTATICS II 9

UNIT III MAGNETOSTATICS 9
Lorentz force, magnetic field intensity (H) – Biot– Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, Scalar and vector potential, Poisson’s Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV ELECTRODYNAMIC FIELDS 9

UNIT V  ELECTROMAGNETIC WAVES  9

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

TEXT BOOKS:

REFERENCES:

PTEE7203  NETWORK ANALYSIS AND SYNTHESIS  3 0 0 3

OBJECTIVES
• To analyse the relationship between various two port parameters, ladder and lattice networks.
• To analyse the transients in electrical networks with DC and AC excitation
• To synthesise RL, RC & RLC networks by Foster and Cauer form
• To design different types of passive filters.

UNIT I  INTRODUCTION TO GRAPH THEORY  9
Linear Graphs in Electrical Networks, Basic Definitions, Incidence, Loop and cut-set matrices, Fundamental Loop and Fundamental Cut-Set Matrices, Graph Theoretic version of KCL and KVL, Loop Impedance and Node Admittance Matrices, Duality in Electrical Networks.

UNIT II  TWO PORT NETWORK  9
Network functions - Poles and Zeros of network functions - Complex frequency - Two port parameters Z,Y,H and ABCD - Scaling network functions -T and π equivalent circuits - Bridged
networks - Analysis of ladder and lattice networks - Coupled circuits as two port network - Tuned circuits.

UNIT III TRANSIENT RESPONSE OF RLC CIRCUITS

Transient response of RL,RC,RLC, circuit for DC input and AC input with sinusoidal excitation.

UNIT IV TRANSFER FUNCTION SYNTHESIS

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

UNIT V DESIGN OF FILTER

Design of filters -Low pass filters, high pass filters, band pass filters, band reject filters, Butterworth filters, m-derived filters, constant k-filters

TOTAL: 45 PERIODS

OUTCOMES

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

TEXT BOOKS


REFERENCES


UNIT IV RENEWABLE ENERGY POWER PLANTS

UNIT V ECONOMICS OF POWER GENERATION

TOTAL: 45 PERIODS

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

TEXT BOOKS:

REFERENCES:

PTEE7211 INTEGRATED CIRCUITS AND MICROCONTROLLER
LABORATORY

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

LIST OF EXPERIMENTS
1. Simple arithmetic operations: Multi precision addition / subtraction / multiplication / division.
3. Interface Experiments:
   • A/D Interfacing.
   • D/A Interfacing.
   • Traffic light controller.

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

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

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


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


11. Timer IC application, astable multi-vibrator and VCO circuit.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

1. 8085 – Microprocessor student trainer kit – 15 Nos
2. 8051 – Micro controller student trainer kit – 15 Nos
3. DAC, ADC interface cards – 5 Nos
4. Traffic light controller interface board – 5 Nos
5. Stepper motor drive interface – 5 Sets
6. Keypad – display interface card – 5 Nos
7. Oscilloscope (CRO) – 5 Nos
8. Regulated Power supply ± 12V, 0.5A and +5V, 2A along with Bread – board and analog digital IC, as per the above list – 5 sets
OUTCOMES:
The students are able to
- Understand and apply the fundamentals of assembly level programming of microprocessors/microcontrollers
- Work with standard microprocessor/microcontroller interfaces
  Implement real-time systems
- Design and conduct experiments using digital IC's and Op-Amp

PTEE7301 CONTROL SYSTEMS LT P C
3 0 0 3

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

- To introduce the classical way of modelling systems, commonly used control components and their mathematical models from physical laws
- To introduce the time domain analysis of transfer function models and understand the concepts of poles, zeros and movement of poles under feedback
- To introduce the various graphical methods available to analyse and assess systems in frequency domain
- To impart knowledge in the modern state variable approach, closed form solution methods and analysing system properties
- To educate on drawing of specification, choosing of control structures and methods of designing the controllers

UNIT I INTRODUCTION
Control system - Basic components - Open and closed Loop - Effect of feedback - System representations - Transfer functions of single input & single output and multivariable systems – Block diagrams – Signal flow graphs – Gain formula – Modelling of control components – Mechanical and electrical systems

UNIT II TRANSFER FUNCTION MODEL AND ANALYSIS

UNIT III FREQUENCY DOMAIN ANALYSIS

UNIT IV STATE VARIABLE MODEL AND ANALYSIS

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

TOTAL: 45 PERIODS

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

TEXTBOOKS

REFERENCES

PTEE7302 ELECTRICAL MACHINES I LT P C
3 0 0 3

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

UNIT I MAGNETIC CIRCUITS AND ELECTRO-MECHANICAL ENERGY CONVERSION

UNIT II TRANSFORMERS: THEORY

UNIT III TRANSFORMERS: PERFORMANCE
Auto-transformer – three phase connections – phasor group – parallel operation of transformers -
harmonics – three winding transformers – per unit system - tap changing - phase conversion –
instrument transformer - concept of rotating transformers.

UNIT IV 
INDUCTION MACHINES: THEORY 9
Rotating magnetic field - principle of operation - construction – types of rotors – EMF, torque and
power flow equations – equivalent circuit – Slip-torque characteristics – determination of
equivalent circuit parameters - circle diagram – losses and efficiency - harmonics, cogging and
crawling.

UNIT V 
INDUCTION MACHINES : PERFORMANCE 9
Three phase induction motor: starting methods - double cage rotors – Speed control - temperature
Double revolving field theory - equivalent circuit – No load and blocked rotor test - starting

TOTAL: 45 PERIODS

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

TEXT BOOKS:
2. Nagrath, I.J. and Kothari.D.P., Electric Machines’, T.M.H. publishing Co. Ltd., New Delhi,

REFERENCES:
1. Say M.G “Performance and Design of Alternating Machines ’ CBS Publishers and
2. Irving L.Kosow, “Electric Machinery and Transformers”, Prentice Hall of India Private Ltd.,
OBJECTIVES

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

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

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

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

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

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

OUTCOMES:

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

TEXT BOOKS:


REFERENCES:

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

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

UNIT II TRANSMISSION LINE PARAMETERS
Parameters of single and three phase transmission lines with single and double circuits—Resistance, inductance and capacitance of solid ,stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition-application of self and mutual GMD; skin and proximity effects-interference with neighbouring communication circuits—Typical configurations, conductor types and electrical parameters of 765 kV, 400kV, 220 kV, 110kV, 66kVand33kVlines, corona discharges.

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

UNIT IV INSULATORS AND CABLES

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

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand transmission line models, insulations types and distribution schemes.

TEXTBOOKS:

REFERENCES:

PTEE7311 CONTROL AND INSTRUMENTATION LABORATORY LT P C 0 0 4 2

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

LIST OF EXPERIMENTS

CONTROL SYSTEMS:

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

INSTRUMENTATION:

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


REQUIREMENT FOR A BATCH OF 30 STUDENTS

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

INSTRUMENTATION:

7. R, L, C Bridge kit (with manual)

8. a) Electric heater – 1No.
   Thermometer – 1No.
   Thermistor (silicon type)
   RTD nickel type – 1No.

   b) 30 psi Pressure chamber (complete set) – 1No.
   Current generator (0 – 20mA)
   Air foot pump – 1 No. (with necessary connecting tubes)

   c) LVDT 20mm core length movable type – 1No.
   CRO 30MHz – 1No.

   d) Optical sensor – 1 No.
   Light source

   e) Strain Gauge Kit with Handy lever beam – 1No.
   100gm weights – 10 Nos

   f) Flow measurement Trainer kit – 1 No.
      (1/2 HP Motor, Water tank, Digital Milli ammeter, complete set)

10. Watt hour meter (energy meter) – 1No. Ammeter
Voltmeter Rheostat
Stopwatch
Connecting wires (3/20)

11. IC Transistor kit – 1No.

TOTAL: 60 PERIODS

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

PTEE7401 ELECTRICAL MACHINES II LT P C
3 0 0 3

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

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

UNIT II SYNCHRONOUS MACHINES: THEORY

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

UNIT IV DC MACHINES: THEORY

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

TEXT BOOKS:

REFERENCES:

PTEE7402 POWER ELECTRONICS LT P C
3 0 0 3

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

UNIT I SWITCHING POWER SUPPLIES 9
SCR and MOSFET dynamic behaviour - driver and snubber circuits - low power high switching frequency switching Power supplies, buck, boost, buck-boost converters – Isolated topologies – resonant converters - switching loss calculations and thermal design.
UNIT II INVERTERS
IGBT : Static dynamic behaviour - single phase half bridge and full bridge inverters - SCR based:
six step three phase VSI, ASCI - PWM (both unipolar and Bipolar) – third harmonic injected 
sine PWM - space vector PWM – selective harmonic elimination.

UNIT III UNCONTROLLEDRECTIFIERS
Power Diode – half wave rectifier – mid-point secondary transformer based full wave rectifier –
bridge rectifier – voltage doubler circuit – distortion factor – capacitor filter for low power rectifiers
– LC filters – Concern for power quality – three phase diode bridge.

UNIT IV CONTROLLEDRECTIFIERS
Two transistor analogy based turn- ON – turn ON losses – thermal protection – controlled
converters (1 pulse, 2 pulse, 3 pulse, 6 pulse) - displacement factor – ripple and harmonic factor -
power factor mitigation, performance parameters – effect of source inductance - inverter angle
limit.

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

TOTAL : 45 PERIODS

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

TEXT BOOKS:
2. Rashid M.H., Power Electronics Circuits, Devices and Applications, Prentice Hall India,

REFERENCES:
UNIT II  POWER FLOW ANALYSIS  9

UNIT III  FAULT ANALYSIS–BALANCED FAULTS  9

UNIT IV  FAULT ANALYSIS–UNBALANCED FAULTS  9
Introduction to symmetrical components-sequence impedances-sequence circuits of synchronous machine, transformer and transmission lines-sequence networks analysis of single line to ground, line to line and double line to ground faults using Thevenin’s theorem and Z-bus matrix.

UNIT V  STABILITY ANALYSIS  9
Importance of stability analysis in power system planning and operation-classification of power system stability-angle and voltage stability-Single Machine Infinite Bus (SMIB) system: Development of swing equation-equal area criterion-determination of critical clearing angle and time-solution of swing equation by modified Euler method and Runge-Kutta fourth order method.

TOTAL: 45 PERIODS

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

TEXTBOOKS

REFERENCES
AIM
To study the performance characteristics of DC machines, Transformers, synchronous machines and induction machines

OBJECTIVES
To experimentally verify the principle of operation, performance and characteristics of DC machines, Transformers, Synchronous machines and Induction machines using load tests and predetermination tests.
To study DC motor and three phase induction motor starters.

LIST OF EXPERIMENTS
1. Open circuit and load characteristics of separately excited and self excited D.C. generator
2. Load test on D.C shunt motor
3. Swinburne’s test
4. Speed control of D.C shunt motor
5. Load test on single phase transformer
6. Open circuit and short circuit test on single phase transformer (Determination of equivalent circuit parameters)
7. Regulation of three-phase alternator by EMF and MMF methods.
8. V& Inverted V Curves of synchronous motor
9. Load test on three-phase induction motor
10. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
11. Load test on single-phase induction motor.
12. Study of D.C motor and induction motor starters

TOTAL : 60 PERIODS

OUTCOMES:
Ability to perform experiments on all conventional electrical machines
To study their complete performance characteristics under different operating conditions.

OUTCOMES:
1. Complete performance characteristics of AC machines and transformers are obtained.
2. AC motor starters and three phase transformer connections are studied.
OBJECTIVES
• To impart knowledge about causes, effects of over voltages, dielectric breakdown mechanism and to emphasize the need for generation, measurement and testing of High voltages and currents.

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9
Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages – Reflection and Refraction of Travelling waves - Protection against over voltages.

UNIT II DIELECTRIC BREAKDOWN 9
Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and composite dielectrics.

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

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9
High voltage testing of electrical power apparatus as per International and Indian standards– Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination.

TOTAL: 45 PERIODS

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

TEXT BOOKS

REFERENCES
OBJECTIVES

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

UNIT I  INTRODUCTION  9

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

UNIT II  REALPOWER-FREQUENCYCONTROL  9

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

UNIT III  REACTIVEPOWER–VOLTAGECONTROL  9

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

UNIT IV  UNIT COMMITMENT AND ECONOMIC DISPATCH  9

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

UNIT V  COMPUTERCONTROLOFPOWERSYSTEMS  9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXTBOOKS

PTEE7503 PROTECTION AND SWITCH GEAR

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

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

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

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

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

UNIT V CIRCUIT BREAKERS

TOTAL : 45 PERIODS

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

REFERENCES:

PTEE7511 POWER ELECTRONICS AND DRIVES LABORATORY LT P C
0 0 4 2

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

LIST OF EXPERIMENTS
1. Characteristics of SCR, TRIAC, MOSFET and IGBT
2. AC to DC half controlled converter and fully controlled Converters
3. Step down and step up MOSFET based choppers
4. IGBT based single phase PWM inverter and three phase PWM inverter
5. AC Voltage controller
6. Switched mode power converter.
7. Simulation of PE circuits (1Φ&3Φ semiconverter, 1Φ&3Φ full converter, dc-dc converters, ac voltage controllers).
8. Speed control of converter fed DC motor
9. Speed control of chopper fed DC motor
10. V/F control of three phase induction motor

TOTAL: 60 PERIODS

REQUIREMENT FOR A BATCH OF 30 STUDENTS
1. Device characteristics(for SCR, MOSFET, TRIAC and IGBT kit with built in power supply and meters) - 2 each
2. Single phase SCR based half controlled converter and fully controlled converter along with built-in/separate/firing circuit/module and meter – 2 each
3. MOSFET based step up and step down choppers –1 each
4. IGBT based single phase PWM inverter module–2
5. IGBT based three phase PWM inverter module-2
6. Switched mode power converter module–2
7. SCR&TRIAC based single phase ACcontrolleralongwithlampoorrheostatload-2
8. Cyclo-converter kit with firing module–2
9. Dual regulated DC power supply with common ground
10. Cathode Ray Oscilloscope– 10
11. Isolation Transformer –5
12. Single phase Autotransformer–3
13. Components (Inductance, Capacitance) 3set for each
14. Multimeters–5
15. LCR meter –3
16. Rheostats of various ranges –2sets of10 value, Worktables –10
17. DC and AC meters of required ranges - 20

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

PTEE7601 DESIGN OF ELECTRICAL APPARATUS LT P C

OBJECTIVES
To provide sound knowledge about constructional details and design of various electrical machines, in order
- To study magnetic circuit parameters and thermal rating of various types of electrical machines.
- To design armature and field systems for D.C. machines.
- To design core, yoke, windings and cooling systems of transformers.
- To design stator and rotor of induction machines and synchronous machines.
- To introduce the importance of computer aided design method.

UNIT I DESIGN OF FIELD SYSTEM AND ARMATURE 9

UNIT II DESIGN OF TRANSFORMERS 9
Construction - KVA output for single and three phase transformers – Overall dimensions – design of yoke, core and winding for core and shell type transformers – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers. Computer program: Complete Design of single phase core transformer
UNIT III  DESIGN OF DC MACHINES
Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field Computer program: Design of Armature main dimensions

UNIT IV  DESIGN OF INDUCTION MOTORS

UNIT V  DESIGN OF SYNCHRONOUS MACHINES

TOTAL : 45 PERIODS

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

TEXT BOOKS

REFERENCES
OBJECTIVES:

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

UNIT I  DRIVE CHARACTERISTICS

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

UNIT III  INDUCTION MOTOR DRIVES

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

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

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

REFERENCES:
OBJECTIVES

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

LIST OF EXPERIMENTS:

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

TOTAL: 60 PERIODS

LABORATORY REQUIREMENT FOR A BATCH OF 30 STUDENTS

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

OUTCOMES:

- Ability to develop algorithms to study load flow, short circuit and stability analysis.
PROJECT WORK

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

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

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

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

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

TOTAL: 135 PERIODS

DISCRETE MATHEMATICS

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

UNIT I LOGIC AND PROOFS

UNIT II  COMBINATORICS

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

UNIT IV  ALGEBRAIC STRUCTURES

UNIT V  LATTICES AND BOOLEAN ALGEBRA

TOTAL : 45 PERIODS

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

TEXT BOOKS :

REFERENCES :
OBJECTIVES:

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

UNIT I    RANDOM VARIABLES
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II    TWO – DIMENSIONAL RANDOM VARIABLES
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III    TESTS OF SIGNIFICANCE
Sampling distributions - Tests for single mean, proportion, difference of means (large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT IV    DESIGN OF EXPERIMENTS
Completely randomized design – Randomized block design – Latin square design - $2^2$ - Factorial design - Taguchi’s robust parameter design.

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

TOTAL : 45 PERIODS

OUT COMES:

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

TEXT BOOKS:


REFERENCES:

2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., “Probability and Statistics
PTGE7071   DISASTER MANAGEMENT   LT P C
3 0 0 3

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

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

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

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

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

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

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

TEXT BOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY


UNIT V GLOBAL ISSUES

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

OUTCOMES

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

TEXT BOOKS


REFERENCES

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

UNIT I

UNIT II

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

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

UNIT V

TOTAL : 45 PERIODS

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

REFERENCES:
AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

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

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY MANAGEMENT SYSTEM

TOTAL: 45 PERIODS

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

REFERENCES:

PTGE7075 INTELLECTUAL PROPERTY RIGHTS L T P C 3 0 0 3

OBJECTIVE:

• To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs 10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS 10


UNIT IV DIGITAL PRODUCTS AND LAW 9


UNIT V ENFORCEMENT OF IPRs 7

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.
OUTCOME:

- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS


REFERENCES


OBJECTIVES:

- To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, 92 Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dotspreparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques-AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation
UNIT V APPLICATIONS

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal,
 Nanobiotechnology: nanoprobes in medical diagnostics and biotechnology, Nano medicines,
 Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro
 Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition,
 Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery

TOTAL : 45 PERIODS

OUTCOMES:
Upon completing this course, the students
- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS
1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and
   Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES
2. Akhlesh Lakhtakia (Editor), “The Hand Book of Nano Technology, Nanometer Structure,

PTMG7001 MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

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

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

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

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

UNIT IV FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT)
Basics of accounting - Journal, Ledger trial balance - Final accounts with Adjustment -
Financial Ratio Analysis - Cash flow analysis - Fund flow analysis - Analysis and interpretation of
UNIT V  CAPITAL BUDGETING
Investments - Methods of capital budgeting and accounting for risk in capital budgeting

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

TEXT BOOKS

REFERENCES

PTMG7751  PRINCIPLES OF MANAGEMENT  LT P C
3 0 0 3

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

UNIT I  INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

UNIT II  PLANNING

UNIT III  ORGANISING

UNIT IV  DIRECTING
9

UNIT V  CONTROLLING
9

TOTAL: 45 PERIODS

OUTCOMES:
• The student would have gained the ability to learn the different principles and techniques of management in planning, organizing, directing and controlling.

TEXTBOOKS:

REFERENCES:

PTEE7001  ADAPTIVE CONTROL
3 0 0 3

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

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

UNIT II  PARAMETRIC METHODS
9
Least squares estimation – Analysis of the least squares estimate - Best linear unbiased estimate – Model parameterizations - Prediction error methods

UNIT III  RECURSIVE IDENTIFICATION METHODS  9
The recursive least square method - Model validation –Model structure determination - Introduction to closed loop system identification

UNIT IV  ADAPTIVE CONTROL SCHEMES  9

UNIT V  MRAC & STR  9
STR – Pole placement design – Indirect STR and direct STR – MRAC - MIT rule – Lyapunov theory – Relationship between MRAC and STR

TOTAL: 45 PERIODS

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

TEXTBOOKS

REFERENCES

PTEE7002  ADVANCED CONTROL SYSTEMS  LT P C
3 0 0 3

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

UNIT I  STATE VARIABLE DESIGN  9
Control law design – State feedback and pole placement - Estimator design – Regulator design - Combined control law and estimator – Introduction of the reference input – Integral control and disturbance estimation – Effect of delays
UNIT II PHASE PLANE ANALYSIS

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

UNIT IV STABILITY ANALYSIS

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

TOTAL: 45 PERIODS

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

TEXT BOOKS

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

PTEE7003 ANALYSIS OF ELECTRICAL MACHINES LT P C
3 0 0 3

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

UNIT I  PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION  9
General expression of stored magnetic energy, co-energy and force/ torque – example using single and doubly excited system – Calculation of air - gap mmf and per phase machine inductance using physical machine data.

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

UNIT III  REFERENCE FRAME THEORY  9

UNIT IV  INDUCTION MACHINES  9

UNIT V  SYNCHRONOUS MACHINES  9

TOTAL: 45 PERIODS

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

TEXT BOOKS

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

UNIT I  INTRODUCTION  9
Review on electromagnetic theory – Basic field equations, calculation of field distribution, inductance, capacitance, force and torque, Review on conventional electrical machine design methodology – computer aided design aspects - advantages.

UNIT II  CAD PACKAGES  9

UNIT III  FINITE ELEMENT ANALYSIS  9

UNIT IV  FILED ANALYSIS USING FEA(PRACTICALS  9
Electrostatics, Magneto statics – linear and non-linear problems, permanent magnet, eddy current analysis, calculation of force/torque.

UNIT V  DESIGN EXAMPLES (PRACTICALS  9
Design of cylindrical magnetic devices, transformer, Rotating machines.

TOTAL: 45 PERIODS

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

TEXT BOOKS

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

UNIT I  INTRODUCTION AND BASIC DATA STRUCTURES  9
Problem solving techniques and examples-Abstract Data Type (ADT)-The list ADT Arrays-Stacks and Queues: Implementation and Application

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

UNIT III  SORTING AND HASHING  9

UNIT IV  ALGORITHM DESIGN TECHNIQUES  9
The role of algorithms in computing-Getting Started-Growth of functions. Divide and conquer-dynamic programming-Greedy Algorithm – Backtracking.

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

TOTAL:45 PERIODS

OUTCOMES:
• Fundamentals of data structures and algorithms are studied.
• Features of various algorithms for different applications are studied.

TEXT BOOKS

REFERENCES
OBJECTIVES:
- To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.
- To classify signals and systems & their mathematical representation.
- To analyze the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

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

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

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION

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

UNIT V DIGITAL SIGNAL PROCESSORS
Introduction – Architecture of one DSP processor– Features – Addressing Formats – Functional modes - Introduction to Commercial Processors

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

TEXT BOOKS:

REFERENCES:
OBJECTIVES

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

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

UNIT II  LINE AND GROUND PARAMETERS

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

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

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

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS


REFERENCES

OBJECTIVES

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

UNIT I  UNITS AND STANDARDS IN MEASUREMENT

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

UNIT II  ANALOG AND INDICATING INSTRUMENTS

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

UNIT III  DIGITAL INDICATING INSTRUMENTS


UNIT IV  NULL BALANCE METHODS OF MEASUREMENT


UNIT V  MISCELLANEOUS INSTRUMENTS


TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

REFERENCES:

PTEE7009 EMBEDDED AUTOMATION SYSTEMS LT P C 3 0 0 3

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

UNIT I INTRODUCTION TO SENSORS AND ACTUATORS

UNIT II AUTOMOTIVE SYSTEM AND CONTROL

UNIT III AUTOMOTIVE INSTRUMENTATION

UNIT IV BUILDING AUTOMATION

UNIT V ADVANCES IN AUTOMOTIVE ELECTRONIC SYSTEMS

TOTAL: 45 PERIODS

OUTCOMES:
- Able to design an efficient embedded automation system for vehicles.
TEXT BOOKS

REFERENCES

PTEE7010 EMBEDDED SYSTEM DESIGN LT P C 3 0 0 3

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

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

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

UNIT II EMBEDDED NETWORKING

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

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

Case Study: Washing Machine- Automotive Application-Embedded Product Development Life Cycle, Objective, Need, and different Phases & Modelling of the EDLC

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

TEXT BOOKS

REFERENCES

PTEE7011 ENERGY MANAGEMENT AND AUDITING

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

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

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

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

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

UNIT V LIGHTING SYSTEMS & COGENERATION 9
Concept of lighting systems - The task and the working space -Light sources - Ballasts - Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration: Forms of cogeneration - feasibility of cogeneration- Electrical interconnection.

TOTAL:45 PERIODS

TEXT BOOKS

REFERENCES

PTEE7012 FLEXIBLE AC TRANSMISSION SYSTEMS LT P C 3 0 0 3

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

UNIT I INTRODUCTION 9
Reactive power control in electrical power transmission lines-loads & system compensation- Uncompensated transmission line-shunt and series compensation. Basic concepts of Static Var Compensator (SVC)–Thyristor Controlled Series Capacitor (TCSC) –Unified Power Flow Controller (UPFC).

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

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

UNIT IV  VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS


UNIT V  CO-ORDINATION OF FACTS CONTROLLERS


TOTAL:45 PERIODS

OUTCOMES:

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

TEXTBOOKS


REFERENCES


PTEE7013  FUNDAMENTALS OF COMPUTER ARCHITECTURE  LT P C

3 0 0 3

OBJECTIVES

To understand the basic concepts and organization of Computers

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

UNIT I  BASIC STRUCTURE OF COMPUTING PROCESSORS

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

UNIT II  DIGITAL CIRCUIT DESIGN
Flip flops - SR, D, JK and T, shift registers, counters, state assignments analysis and design of synchronous sequential circuits, state diagram; state reduction-Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT III  CONTROL AND CENTRAL PROCESSING UNIT
Micro programmed control –design of control unit- Central processing unit – general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, execution of instruction set in computer—concepts in design of addition and subtraction, multiplication algorithms for arithmetic operations-Memory organization – ROM, PROM, EPROM, cache memory, need for memory management.

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

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

TOTAL: 45 PERIODS

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

TEXT BOOKS

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

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

UNIT I  INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING AND C++

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

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

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

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

TOTAL: 45 PERIODS

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

TEXT BOOKS

REFERENCES
5. Andrew S Tannenbaum 'Structured Computer Organization', 5th edition
   Pearson Education 2007

PTEE7015 HIGH VOLTAGE DIRECT CURRENT TRANSMISSION LT P C
3 0 0 3

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

UNITI INTRODUCTION 9
DC Power transmission technology–Comparison of AC and DC transmission–Application of DC
transmission–Description of DC transmission system–Planning for HVDC transmission–Modern
trends in HVDC technology–DC breakers–Operating problems– HVDC transmission based on
VSC –Types and applications of MTDC systems

UNITII ANALYSIS OF HVDC CONVERTERS 9
Line commutated converter - Analysis of Graetz circuit with and without overlap -
Pulse number– Choice of converter configuration– Converter bridge characteristics–
Analysis isofa 12 pulse converters– Analysis of VSC topologies and firing schemes

UNITIII CONVERTER AND HVDC SYSTEM CONTROL 9
Principles of DC link control– Converter control characteristics– System control hierarchy– Firing
angle control– Current and extinction angle control– Starting and stopping of DC link –Power
control –Higher level controllers –Control of VSC based HVDC link.

UNITIV REACTIVE POWER AND HARMONICS CONTROL 9
Reactive power requirements in steady state– Sources of reactive power– SVC and STATCOM–
Generation of harmonics –Design of AC and DC filters– Active filters

UNITY POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9
Per unit system for DC quantities– DC system model – Inclusion of constraints – Power flow
analysis– case study

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

TOTAL:45 PERIODS

70
**TEXTBOOKS**


**REFERENCES**


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**PTEE7016 INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN**

**OBJECTIVES**

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

**UNIT I MOTOR STARTING STUDIES**


**UNIT II POWER FACTOR CORRECTION STUDIES**

| Introduction-System Description and Modelling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Over voltages-Switching Surge Analysis-Back-to-Back Switching | 9 |

**UNIT III HARMONIC ANALYSIS**

| Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study | 9 |

**UNIT IV FLICKER ANALYSIS**

| Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects | 9 |

**UNIT V GROUND GRID ANALYSIS**


**OUTCOMES:**

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

**TEXT BOOKS**


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**TOTAL : 45 PERIODS**
REFERENCES
1. A.Shanmugasundara, G. Gangadharan, R. Palani “Electrical machine Design Date Book”

PTEE7017 MEDICAL INSTRUMENTATION LT P C
3 0 0 3

OBJECTIVES:
• To introduce Fundamentals of Biomedical Engineering
• To study the communication mechanics in a biomedical system with few examples
• To study measurement of certain important electrical and non-electrical parameters
• To understand the basic principles in imaging techniques
• To have a basic knowledge in life assisting and therapeutic devices

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

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

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

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

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES
Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano
Robots - Robotic surgery – Advanced 3D surgical techniques- Orthopaedic prostheses fixation.
OUTCOMES:
• Ability to understand and analyze instrumentation systems and their applications to various industries.

TEXT BOOKS:

REFERENCES

PTEE7018 MICRO ELECTRO MECHANICAL SYSTEMS LT P C

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

UNIT I INTRODUCTION

UNIT II MICROMACHINING
Bulk Micromachining - Surface micromachining and LIGA processes

UNIT III SENSORS AND ACTUATORS - I

UNIT IV SENSORS AND ACTUATORS - II

TOTAL : 45 PERIODS

UNIT V APPLICATIONS


TOTAL : 45 PERIODS

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

TEXT BOOKS.

REFERENCES

PTEE7019   NANO TECHNOLOGY   LT P C
3 0 0 3

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

UNIT I INTRODUCTION

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

UNIT II PREPARATION ENVIRONMENTS

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

Preparation of nanoscale materials: precipitation, mechanical milling, colloidal routes, self assembly; vapour phase deposition, CVD, sputtering, evaporation, molecular beam epitaxy, atomic layer epitaxy, lithography: optical/UV, electron beam and x-ray lithography, systems and processes, wet etching, dry etching

UNIT IV CHARACTERIZATION TECHNIQUES

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

UNIT V EVOLVING INTERFACES OF NANO

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

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS


REFERENCES

2. Charles P. Poole & Frank J. Owens, Introduction to nanotechnology, Wiley India.
OBJECTIVES

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

UNIT I  LINEAR PROGRAMMING  9
Introduction - formulation of linear programming model - Graphical solution – solving LPP using simplex algorithm – Revised Simplex Method

UNIT II  ADVANCES IN LPP  9
Duality theory - Dual simplex method - Sensitivity analysis — Transportation problems – Assignment problems- Traveling sales man problem - Data Envelopment Analysis

UNIT III  NON LINEAR PROGRAMMING  9
Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions – Reduced gradient algorithms – Quadratic programming method – Penalty and Barrier method.

UNIT IV  INTERIOR POINT METHODS  9

UNIT V  DYNAMIC PROGRAMMING  9

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS


REFERENCES

OBJECTIVES

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

UNIT I  INTRODUCTION

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

UNIT II  ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION

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

UNIT III  POWER CONVERTERS

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing

Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

UNIT IV  ANALYSIS OF WIND AND PV SYSTEMS

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

UNIT V  HYBRID RENEWABLE ENERGY SYSTEMS

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

OUTCOMES:

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

TEXT BOOK:


REFERENCES:

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

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

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

UNIT III HARMONICS
Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortion - Harmonic indices - Inter harmonics – Resonance - Harmonic distortion evaluation, IEEE and IEC standards

UNIT IV PASSIVE POWER COMPENSATORS

UNIT V POWER QUALITY MONITORING & CUSTOM POWER DEVICES

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

TEXT BOOKS
REFERENCES

PTEE7023  RESTRUCTURED POWER SYSTEMS  LT P C 3 0 0 3

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

UNIT I  INTRODUCTIONTO RESTRUCTURINGOFPOWER INDUSTRY  9
Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems–Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production– Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis–a–vis other commodities, Market architecture, Case study.

UNIT II  TRANSMISSIONCONGESTIONMANAGEMENT  9

UNIT III  LOCALMARGINALPRICESANDFINANCIAL TRANSMISSION RIGHT  9

UNIT IV  ANCILLARYSERVICEMANAGEMENTANDPRICINGOFTRANSMISSION NETWORK  9
Introduction of ancillary services – Types of Ancillary services Classification of Ancillary services–Load generation balancing related services Voltage control and reactive power support devices–Blackstart capability service–How to obtain ancillary service –Co-optimization of energy and reserve services- International comparison Transmission pricing –Principles– Classification– Rolled in transmission pricing methods–Marginal transmission pricing paradigm–Composite pricing paradigm–Merits and demerits of different paradigm.

UNIT V  REFORMSININDIAN POWER SECTOR  9
OUTCOMES

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

TEXT BOOKS


REFERENCES


COURSE OBJECTIVES

- To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- To familiarize the power quality management issues in Smart Grid.
- To familiarize the high performance computing for Smart Grid applications.

UNIT I INTRODUCTION TO SMART GRID
Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II SMART GRID TECHNOLOGIES (Transmission)
Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control.

UNIT III SMART GRID TECHNOLOGIES (Distribution)
DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNIT IV SMART METERS AND ADVANCED METERING INFRASTRUCTURE
Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS
Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband
over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS

OUTCOMES
- Students will develop more understanding on the concepts of Smart Grid and its present developments.
- Students will study about different Smart Grid technologies.
- Students will acquire knowledge about different smart meters and advanced metering infrastructure.
- Students will have knowledge on power quality management in Smart Grids.
- Students will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.

TEXT BOOKS

REFERENCES:

PTEE7025 SOFT COMPUTING TECHNIQUES

OBJECTIVES
- To study the basics of artificial neural network.
- To study the concepts of modelling and control of neural and fuzzy control schemes.
- To study the features of hybrid control schemes.

UNIT I ARTIFICIAL NEURAL NETWORK

UNIT II NEURAL NETWORKS FOR MODELING AND CONTROL

UNIT III FUZZY SET THEORY
UNIT IV  FUZZY LOGIC FOR MODELING AND CONTROL


UNIT V  HYBRID CONTROL SCHEMES


TOTAL: 45 PERIODS

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

TEXTBOOKS

REFERENCES

PTEE7026  SPECIAL ELECTRICAL MACHINES  LT P C

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

UNIT I  PERMANENT MAGNET BRUSHLESS DC MOTORS

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

UNIT II  PERMANENT MAGNET SYNCHRONOUS MOTORS

Principle of operation – EMF and torque equations - Phasor diagram - Power controllers– performance characteristics – Digital controllers – Constructional features, operating principle and
characteristics of synchronous reluctance motor.

UNIT III SWITCHED RELUCTANCE MOTORS 9

UNIT IV STEPPER MOTORS 9

UNIT V OTHER SPECIAL MACHINES 9

OUTCOMES:
• Need for special electrical machines are studied. Different features of special machines and converter circuits for special machines are obtained

TEXT BOOKS:

REFERENCES:

PTEE7027 VLSI DESIGN AND ARCHITECTURE LT P C 3 0 0 3

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

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

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

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

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

UNIT V  VHDL PROGRAMMING  9

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

TEXT BOOKS

REFERENCES

UNIT II PROCESS MANAGEMENT 9

UNIT III STORAGE MANAGEMENT 9

UNIT IV I/O SYSTEMS 9

UNIT V CASE STUDY 9

TOTAL: 45 PERIODS

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

TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES

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

UNIT I DATA NETWORK FUNDAMENTALS


UNIT II MODBUS AND HART


UNIT III PROFIBUS AND FF


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


UNIT V WIRELESS COMMUNICATION

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

TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)

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


REFERENCES:


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

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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