# ANNA UNIVERSITY, CHENNAI

## UNIVERSITY DEPARTMENTS

### B.E. CIVIL ENGINEERING (PART TIME)

**REGULATIONS – 2017**

**CURRICULUM AND SYLLABI I - VII SEMESTERS**

## SEMESTER I

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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  9

UNIT II  FUNCTIONS OF SEVERAL VARIABLES  9

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

UNIT IV  COMPLEX INTEGRATION  9

UNIT V  LAPLACE TRANSFORMS  9

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:

PTPH7101 PHYSICS FOR CIVIL ENGINEERING

OBJECTIVE:

- To introduce the principles of physics for civil engineering applications such as acoustical, thermal, air conditioning, etc. and also to introduce importance of new engineering materials.

UNIT I THERMAL APPLICATIONS


UNIT II VENTILATION AND REFRIGERATION

Requirements, principles of natural ventilation - ventilation measurements, design for natural ventilation - Window types and packaged air conditioners - chilled water plant - fan coil systems - water piping - cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems.

UNIT III ACOUSTICS AND LIGHTING DESIGNS

Methods of sound absorptions - absorbing materials - noise and its measurements, sound insulation and its measurements, impact of noise in multi-storeyed buildings. Visual field glare, colour - day light calculations - day light design of windows, measurement of day-light and use of models and artificial skies, principles of artificial lighting, supplementary artificial lighting.

UNIT IV NEW ENGINEERING MATERIALS

Composites - Definition and Classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys - Ceramics - Classification - Crystalline - Non Crystalline - Bonded ceramics, Manufacturing methods - Slip casting - Isostatic pressing - Gas pressure bonding - Properties - thermal, mechanical, electrical and chemical ceramic fibres - ferroelectric and ferromagnetic ceramics - High Aluminium ceramics.

UNIT V NATURAL DISASTERS

Seismology and Seismic waves - Earth quake ground motion - Basic concepts and estimation techniques - site effects - Probabilistic and deterministic Seismic hazard analysis - Cyclone and flood hazards - Fire hazards and fire protection, fire-proofing of materials, fire safety regulations and firefighting equipment - Prevention and safety measures.

TOTAL: 45 PERIODS

OUTCOME:

- The students will have the knowledge on physics related to civil engineering and that knowledge will be used by them in various applications.

REFERENCES:

OBJECTIVE:
• To develop an understanding about the chemistry of building materials.
• Brief elucidation on corrosion and its control.
• To develop sound knowledge about the water science and technology.
• To impart basic knowledge on adhesives, abrasives, refractories and composites.
• To understand the basic concepts of chemical and instrumental methods of analysis.

UNIT I CHEMISTRY OF BUILDING MATERIALS 9

UNIT II CORROSION AND ITS CONTROL 9
Introduction-chemical and electrochemical corrosions-mechanism of electrochemical and galvanic corrosions-concentration cell corrosion-passivity-soil, pitting, inter-granular, water line, stress and microbiological corrosions-galvanic series-factors influencing corrosion-measurement of corrosion rate. Corrosion control-material selection and design-electrochemical protection- sacrificial anodic protection and impressed current cathodic protection. Protective coatings- metallic coatings (hot dipping, metal cladding, galvanizing, tinning, electroplating, electroless plating), non-metallic inorganic coatings, organic coatings (paints).

UNIT III ADHESIVES AND COMPOSITES 9

UNIT IV ABRASIVES AND REFRACTORIES 9
Abrasives: Definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: Definition, characteristics, classification, properties-refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of Refractories- general method; acidic Refractories-fire clay, silica; basic refractories - magnetite, dolomite; neutral refractories-silicon carbide, zircon.
UNIT V    WATER AND INSTRUMENTAL ANALYSIS

Properties of water, sources, quality for different uses—significance of water quality parameter pH, EC, TDS, hardness, chloride, sulphate, iron, fluoride, nitrate, BOD, COD, and heavy metals (As, Hg, Cr, Pb) and their determination by titrimetry, electrometry, UV-visible, AAS, ICP-AES, softening of water by ion exchange method, municipal water treatment, principle, coagulations, filtration, and disinfection. Desalination by reverse osmosis method.

TOTAL: 45 PERIODS

OUTCOME:
- Will be familiar with corrosion and its control.
- Will know the characterization techniques.
- Will know the water quality analysis for industrial applications.

TEXTBOOKS:

REFERENCES:

PTGE7151    COMPUTING TECHNIQUES
(Common to all branches of Engineering and Technology)

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

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

UNIT II   C PROGRAMMING BASICS
UNIT III ARRAYS AND STRINGS

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

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL :45 PERIODS

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

TEXTBOOKS:

REFERENCES:

PTCE7101 STRENGTH OF MATERIALS I L T P C
3 0 0 3

OBJECTIVES:
• To learn fundamental concepts of stress, strain and deformation of solids with applications to bars, beams and thin shells.
• To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
• To understand the effect of torsion on shafts and springs.
• To analyse a computer two dimensional state of stress and plane trusses.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS
UNIT II  ANALYSIS OF PLANE TRUSSES
Stability and equilibrium of plane frames – Perfect frames - Types of trusses – Analysis of forces in truss members – Method of joints – Method of tension co-efficient – Method of sections.

UNIT III  BENDING OF BEAMS

UNIT IV  TORSION
Theory of simple torsion - Stresses and deformation in circular and hollow shafts – Stepped shafts – Shafts fixed at both ends – Stresses and deflection in helical springs - introduction to torsion of rectangular sections-warping

UNIT V  DEFLECTION OF BEAMS
Double Integration method – Macaulay’s method – Area moment method – Conjugate beam method for computation of slopes and deflections in determinate beams- deflection due to shear.

TOTAL: 45 PERIODS

OUTCOMES:
The students will have
- Thorough understanding of the fundamental concepts of stresses and strains in one dimensional and two dimensional states.
- The ability to analyse determinate beams and plane trusses.
- A sufficient knowledge in designing shafts to transmit required power and also springs for its maximum energy storage capacities.

TEXTBOOKS:

REFERENCES:
1. Irving H.Shames, James M.Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 2002
OBJECTIVES:
- To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

UNIT I  FOURIER SERIES  9

UNIT II  FOURIER TRANSFORM  9

UNIT III  PARTIAL DIFFERENTIAL EQUATIONS  9
Formation – Solutions of first order equations – Standard types and equations reducible to standard types – Singular solutions – Lagrange’s linear equation – Solution of homogenous linear equations of higher order with constant coefficients.

UNIT IV  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS  9
Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two dimensional heat equation.

UNIT V  Z – TRANSFORM AND DIFFERENCE EQUATIONS  9

TOTAL: 45 PERIODS

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

TEXT BOOK:

REFERENCES:
OBJECTIVES:

- At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies. The students of civil engineering will realize the importance of this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor. The knowledge of geophysical methods and remote sensing techniques are useful to know the various surface and subsurface features. Based on this, civil engineers can choose the types of foundations and other related aspects.

UNIT I  PHYSICAL GEOLOGY 9

UNIT II  MINEROLOGY 9

UNIT III  PETROLOGY 9
Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks. Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist.

UNIT IV  STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS 9

UNIT V  GEOLOGICAL INVESTIGATION 9
Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings. Coastal protection structures. Investigation of Landslides and earthquakes - causes and mitigation , seismic zonation – seismic zones of India.

TOTAL: 45 PERIODS

OUTCOMES:
The students completing this course

- Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.
- Will realize the importance of this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor
- Can choose the types of foundations and other related aspects.

TEXTBOOKS:
REFERENCES:

PTCE7201 FLUID MECHANICS L T P C 3 0 0 3

OBJECTIVES:
• To introduce the students to the mechanics of fluids through a thorough understanding of the properties of the fluids, behaviour of fluids under static conditions. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy.
• To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on vanes.

UNIT I FLUIDS PROPERTIES AND FLUID STATICS 9
Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Dimensions and units - viscosity, density, perfect gas, vapour pressure and surface tension - Basic equation of fluid statics - Pressure measurements - Manometers - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies - Relative equilibrium.

UNIT II BASIC CONCEPTS OF FLUID FLOW 9
(a) Kinematics – Methods of describing fluid motion - Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potentials - Flow nets; (b) Dynamics - Dimensional Concepts of System and Control volume - Application of control volume to continuity, energy and momentum - Euler’s equation of motion along a stream line - Bernoulli’s equation - Applications to velocity and discharge measurements - Linear momentum equation and moment-of-momentum equations and their applications.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9
Fundamental dimensions - dimensional homogeneity - Rayleigh’s method and Buckingham Pi-Theorem - Dimensionless parameters - Similitude and model studies - Distorted Models.

UNIT IV INCOMPRESSIBLE VISCOUS FLOW 9
Laminar flow between parallel plates, and pipes - Development of laminar and turbulent flows in pipes - Reynolds experiment - Darcy-Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V BOUNDARY LAYERS AND TRANSPORT BY ADVECTION AND DIFFUSION 9
Definition of boundary layers - Displacement, momentum and energy thickness - Laminar and turbulent boundary layers - Momentum integral equation – Steady molecular diffusion and conduction – Turbulent transport equations – Channel diffusion and Dispersions and Applications.

TOTAL : 45 PERIODS
OUTCOMES:
- The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- They will also gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.

TEXTBOOKS:

REFERENCES:

PTCE7202 PLANE AND GEODETIC SURVEYING L T P C
3 0 0 3

OBJECTIVES:
- To introduce the rudiments of plane surveying and geodetic principles to Geoinformatics Engineers.
- To learn the various methods of plane and geodetic surveying to solve the real world problems.
- To introduce the concepts of Control Surveying
- To introduce the basics of Astronomical Surveying

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING
Classifications and basic principles of surveying – Chain survey – Basic principles and applications of Plane Table and Compass - Levels and staves - Methods of levelling - Booking - Reduction - Curvature and refraction - Contouring.

UNIT II THEODOLITE SURVEYING
Horizontal and vertical angle measurements - Temporary and permanent adjustments – Heights and distances–Tacheometric surveying – Trigonometric levelling – Horizontal curves in route surveying – classification, functions and requirements - methods of setting out simple curves.

UNIT III CONTROL SURVEYING AND ADJUSTMENT

UNIT IV ASTRONOMICAL SURVEYING
Astronomical terms and definitions - Motion of sun and stars - Celestial coordinate systems – different time systems - Nautical Almanac - Apparent altitude and corrections - Field observations and determination of time, longitude, latitude and azimuth by altitude and hour angle method
UNIT V MODERN SURVEYING
Total Station : Advantages - Fundamental quantities measured – Parts and accessories – working principle – On board calculations – Field procedure - Errors and Good practices in using Total Station
GPS: System components – Signal structure – Selective availability and antispooﬁng – receiver components – Planning and data acquisition – Data processing - Errors in GPS - Applications

OUTCOMES:
At the end of the course the student will be able to understand
- The use of various surveying instruments in mapping
- The error and adjustments procedures associated with surveying and mapping
- The methods used for establishment of horizontal and vertical control
- Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth

TEXTBOOKS:

REFERENCES:

PTCE7203 STRENGTH OF MATERIALS II L T P C 3 0 0 3

OBJECTIVES:
- To learn the computation of deflection of beams and trusses using energy principles and to know the concept of analysis of indeterminate beams.
- To estimate the load carrying capacity of columns and analysis of three dimensional state of stress.
- To understand the concept of theories of failure of materials, unsymmetrical bending, shear center and fracture of materials.

UNIT I ENERGY PRINCIPLES
Strain energy and strain energy density – Strain energy in axial force - Shear, flexure and torsion – Castigliano’s and Engessor’s theorems – Principle of virtual work – Application of energy theorems for computing deflections in beams – Maxwell’s reciprocal theorem.

UNIT II INDETERMINATE BEAMS
Propped Cantilever and Fixed Beams – Fixed end moments reactions, slope and deflection for standard cases of loading — Continuous beams – support reactions and moments – Theorem of three moments – Shear Force and Bending Moment Diagrams.
UNIT III  
COLUMNS  
9  
Behaviour of short and long columns. Euler’s theory of long columns – Critical loads for prismatic columns with different end conditions - Rankine-Gordon Formula - Eccentrically loaded long columns - Eccentrically loaded short columns - middle third rule – Core of section.

UNIT IV  
STATE OF STRESS IN THREE DIMENSIONS  
9  
Determination of principal stresses and principal planes – Volumetric strain – Theories of failure – Principal stress, principal strain, shear stress, strain energy and distortion energy theories – Application in analysis of stress, load carrying capacity and design of members. Interaction problems - Interaction curves.

UNIT V  
ADVANCED TOPICS  
9  
Unsymmetrical bending of beams - symmetrical and unsymmetrical sections, shear centre – stresses on curved beams for simple solid sections – Winkler Bach Formula – Thick cylinders – Compound cylinders - residual stresses, stress concentration, fatigue. torsion of thin walled sections

TOTAL: 45 PERIODS

OUTCOMES:  
• Students will have thorough knowledge in analysis of indeterminate beams and use of energy method for estimating the slope and deflections of beams and trusses.  
• They will be in a position to assess the behaviour of columns, beams and failure of materials.

TEXTBOOKS:  

REFERENCES:  

PTGE7153  
ENVIRONMENTAL SCIENCE AND ENGINEERING  
L T P C  
3 0 0 3

OBJECTIVES:  
• To study the nature and facts about environment.  
• To finding and implementing scientific, technological, economic and political solutions to environmental problems.  
• To study the interrelationship between living organism and environment.  
• To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.  
• To study the dynamic processes and understand the features of the earth’s interior and surface.  
• To study the integrated themes and biodiversity, natural resources, pollution control and waste management.
UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
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:


PTCE7301 HIGHWAY ENGINEERING

OBJECTIVE:

- To give an overview / basis of highway engineering with respect to the development, planning, design, construction and maintenance of highways.

UNIT I HIGHWAY PLANNING AND ALIGNMENT 8
History of road development in India – Classification of highways – Institutions for Highway planning, design and construction at different levels – factors influencing highway alignment – Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 10
Typical cross sections of Urban and Rural roads — Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients, hairpin bends – Lateral and vertical clearance at underpasses - IRC standards-Road signs and safety.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9
Design principles – pavement components and their role - Design practice for flexible and rigid pavements (IRC methods only).

UNIT IV HIGHWAY CONSTRUCTION AND MAINTENANCE 10
Highway construction materials, properties, testing methods – Construction practice including modern materials and methods of concrete and flexible pavements, Highway drainage – Special considerations for hilly roads; Evaluation and Maintenance of pavements.
OUTCOMES:

- The students completing this course would have acquired knowledge on planning, design, construction and maintenance of highways as per IRC standards and other methods.

TEXTBOOKS:

1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, Scitech Publications (India), Chennai, 2010

REFERENCES:

1. Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHI Learning Pvt. Ltd., 2005
3. Indian Road Congress (IRC), Guidelines and Special Publications on Planning and Design of Highways.

PTCE7302 SOIL MECHANICS L T P C 3 0 0 3

OBJECTIVES:

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

UNIT II EFFECTIVE STRESS AND PERMEABILITY 9
Conductivity – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace’s equation – Introduction to flow nets – Simple problems. (Sheet pile and weir).

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

UNIT IV SHEAR STRENGTH 9
Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Cyclic mobility – Liquefaction.

UNIT V SLOPE STABILITY 9

TOTAL: 45 PERIODS

OUTCOME:
- Students are able to classify the soil and assess the engineering properties, based on index properties. Students understand the basic concepts soil mechanics and able to design both finite and infinite slopes.

TEXTBOOKS:

REFERENCES:

PTCE7303 STRUCTURAL ANALYSIS I L T P C
3 0 0 3

OBJECTIVES:
- To introduce the students to basic theory and concepts of classical methods of structural analysis and to find the deflection of determinate plane frames.

UNIT I DEFLECTION OF DETERMINATE FRAMES 9
Principles of virtual work for deflections - Deflections of pin-jointed plane frames and rigid plane frames –Williott’s diagram.
UNIT II  SLOPE DEFLECTION METHOD
Slope deflection equations- Analysis of continuous beams and rigid frames - Support settlements.

UNIT III  MOMENT DISTRIBUTION METHOD
Stiffness and carry over factors – Distribution and carry over of moments - Analysis of continuous Beams - Plane rigid frames with and without sway – Support settlement.

UNIT IV  MATRIX FLEXIBILITY METHOD
Equilibrium and compatibility - Determinate vs. indeterminate structures - Static and Kinematic Indeterminacy - primary structure - Compatibility conditions - Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames

UNIT V  MATRIX STIFFNESS METHOD

TOTAL: 45 PERIODS

OUTCOMES:
- Students will have the knowledge of analysing a structure using the classical methods and are able to draw the shear force and bending moment diagrams.

TEXTBOOKS:

REFERENCES:
1. William Weaver, Jr and James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Delhi, 1995

PTCE7311  PLANE AND GEODETIC SURVEYING LABORATORY  L T P C
0 0 4 2

OBJECTIVE:
- To familiarize with the various surveying instruments and methods.

EXCERCISES :
1. Determination of area of polygon by base line method using chain
2. Chain traversing
3. Fly levelling
4. Check levelling
5. Study of theodolite and its accessories
6. Measurement of horizontal and vertical angles using theodolite
7. Determination of tacheometric constants
8. Determination of elevation of an object using single plane method when base is accessible/ inaccessible
9. Determination of distance and difference in elevation between two inaccessible points using double plane method.
10. Heights and distances by stadia tacheometry
11. Heights and distances by tangential tacheometry
12. Study of Total station and GPS(demonstration only)

TOTAL : 60 PERIODS

OUTCOMES:
- At the end of the course the student will be able to use various surveying instruments like chain, level and theodolite for mapping.

REFERENCES:

PTCE7401  APPLIED HYDRAULIC ENGINEERING  L T P C
2 2 0 3

OBJECTIVES:
- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

UNIT I  UNIFORM FLOW  12
Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT II  VARIED FLOWS  12

UNIT III  RAPIDLY VARIED FLOWS  12
UNIT IV TURBINES

Turbines - Classification - Reaction turbines - Francis turbine, Radial flow turbines, draft tube and cavitation - Propeller and Kaplan turbines - Impulse turbine - Performance of turbine - Specific speed - Runaway speed - Similarity laws.

UNIT V PUMPS

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Rotary pumps: Gear pump.

TOTAL: 60 PERIODS

OUTCOMES:

- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic machineries (pumps and turbines).

TEXTBOOKS:


REFERENCES:


PTCE7402 DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES L T P C 3 0 0 3

OBJECTIVE:

- To introduce the various philosophies of R.C. design and to study in detail the limit state design of structural elements such as beams, columns and footings

UNIT I DESIGN CONCEPTS AND WORKING STRESS DESIGN OF BEAMS 10


UNIT II LIMIT STATE DESIGN OF BEAMS 10

Design of singly and doubly reinforced rectangular and flanged beams – use of design aids for flexure – Behaviour of R.C. beams in shear and torsion – Shear and torsional reinforcement – Limit State design of R.C. members for combined bending, shear and torsion – Use of design aids. Design requirement for bond and anchorage as per IS code. Serviceability requirements, importance of cracked and uncracked section.

UNIT III LIMIT STATE DESIGN OF SLABS 10

Behaviour of one way and two way slabs - design of one way simply supported, cantilever and continuous slabs. Design of two-way slabs for various edge conditions.-Introduction to flat slab - Types of staircases - design of dog-legged staircase.
UNIT IV  LIMIT STATE DESIGN OF COLUMNS AND FOOTING  
Types of columns – design of short columns for axial load, combined axial load with uniaxial and biaxial bending - use of design aids. Design of footing for masonry and reinforced walls – design of axially and eccentrically loaded square and rectangular footings – design of combined rectangular footings for two columns only- Introduction to strap footing, raft/mat foundation.

UNIT V  MASONRY MEMBERS
Determination of permissible stresses on masonry, load carrying capacity of masonry walls and pillars - Design of masonry walls, pillars and footings as per IS Codes.

OUTCOMES:
- The student shall be in a position to design the basic elements of reinforced concrete structures.

TEXTBOOKS:

REFERENCES:

PTCE7403  RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING  
OBJECTIVE:
- To introduce the students about Railways planning, design, construction and maintenance and planning design principles of airport and harbour

UNIT I  RAILWAY PLANNING AND CONSTRUCTION  
Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods--Geometric design of railway, gradient, super elevation, widening of gauge on curves- Level Crossings.

UNIT II  RAILWAY CONSTRUCTION AND MAINTENANCE  
Earthwork – Stabilization of track on poor soil - Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and yards and passenger amenities.
UNIT III  AIRPORT PLANNING  7
Air transport characteristics-airport classification-air port planning: objectives, components, layout
characteristics, socio-economic characteristics of the Catchment area, criteria for airport site
selection and ICAO stipulations, typical Airport Layouts, Case Studies, parking and Circulation
Area

UNIT IV  AIRPORT DESIGN  10
Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length,
Geometric Design, Configuration and Pavement Design Principles – Elements of Taxiway
Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.

UNIT V  HARBOUR ENGINEERING  10
Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and
Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour
Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties,
Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport –
Wave action on Coastal Structures and Coastal Protection Works – Environmental
concern of Port Operations – Coastal Regulation Zone, 2011

TOTAL: 45 PERIODS

OUTCOMES:
• On completing the course, the students will have the ability to Plan and Design
  various civil Engineering aspects of Railways, Airports and Harbour.

TEXTBOOKS:
1. Subramanian K.P., Highways, Railways, Airports and Harbour Engineering,
   Scitech Publications (India), Chennai, 2010
2. Saxena Subhash, C and Satyapal Arora, ACourse in Railway Engineering, DhanapatRai and
   Sons, Delhi, 1998
   Bros, Roorkee, 1994

REFERENCES:
1. C.Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and
   Harbours, Bridges and Tunnels., Universities Press (India) Private Limited, Hyderabad,
   2015.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education ( India) Private Ltd,
   New Delhi, 2013

PTCE7404  STRUCTURAL ANALYSIS II  L T P C 
3 0 0 3

OBJECTIVE:
• To learn the method of drawing influence lines and its uses in various applications like
  beams, bridges and plane trusses.
• To analyse the arches, suspension bridges and space trusses.
• Also to learn Plastic analysis of beams and rigid frames.

UNIT I  MOVING LOADS AND INFLUENCE LINES  9
Influence lines for reactions in statically determinate structures –Influence lines for shear force and
bending moment in beam sections – Calculation of critical stress resultants due to concentrated
and distributed moving loads - influence lines for member forces in pin jointed frames.
UNIT II  INFLUENCE LINES FOR INDETERMINATE STRUCTURES
Muller Breslau’s principle – Application of Muller Breslau’s principle to determinate beams and continuous beams.

UNIT III  ARCHES
Arches - Structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches - Parabolic and circular arches – Settlement and temperature effects- introduction to folded plates.

UNIT IV  SUSPENSION BRIDGES AND SPACE TRUSSES
Analysis of suspension bridges – Unstiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders - Introduction to analysis of space trusses using method of tension coefficients – Beams curved in plan.

UNIT V  PLASTIC ANALYSIS

TOTAL: 45 PERIODS

OUTCOMES:
• The student will have the knowledge of influence line and its uses in analysis of beams, stiffening girder in bridges and plane trusses.

TEXTBOOKS:

REFERENCES:

PTCE7405  WATER SUPPLY ENGINEERING  L T P C  3 0 0 3

OBJECTIVE:
• To equip the students with the principles and design of water treatment and distribution.

UNIT I  SOURCES OF WATER
UNIT II CONVEYANCE FROM THE SOURCE

UNIT III WATER TREATMENT
Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation –Clariflocculator-Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management –Construction, Operation and Maintenance aspects.

UNIT IV ADVANCED WATER TREATMENT

UNIT V WATER DISTRIBUTION AND SUPPLY
Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
- an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
- an understanding of water quality criteria and standards, and their relation to public health
- the ability to design and evaluate water supply project alternatives on basis of chosen selection criteria

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- To learn the limit state design of steel components subjected to tension, compression and bending and timber structures.

UNIT I SECTIONS AND JOINTS
Types of steel structures – Properties of rolled steel sections and Light gauge steel sections – Riveted and bolted connections – Failures of joints – Single and multiple bolted lap and butt joints under axial and eccentric loading – Strength of fillet and butt welded joints – Design of riveted, bolted and welded joints- HSFG bolts

UNIT II TENSION MEMBERS
Design of simple and built-up members subjected to tension –Effective area of angles connected to gussets – shear lag-lug angles.

UNIT III COMPRESSION MEMBERS
Maximum slenderness ratio of various compression members – IS code provision for compression members – Design of simple and built-up compression members with lacings and battens – Design of column bases.

UNIT IV BEAMS
Design of simple beams based on strength and stiffness as per IS code – Design of built-up beams and curtailment of flange plates –Flange splice and web splice- Design of plate girder and stiffeners- design of brackets

UNIT V TIMBER
Study of properties and strength of natural and laminated timber – Allowable stresses in compression, tension and flexure as per IS Code – Types of joints with nails and bolts – Design of simple compression members as per IS code– Design of beams for strength and stiffness as per IS code.

TOTAL: 45 PERIODS

OUTCOME:
- The students will have knowledge on the design of structural steel members subjected to compressive, tensile and bending forces, as per current code and also know to design Timber Members.

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- To impart knowledge to plan and execute a detailed site investigation programme, to select geotechnical design parameters and type of foundations. Also to familiarize the students for the geotechnical design of different types of foundations and retaining walls.

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION

UNIT II SHALLOW FOUNDATION

UNIT III FOOTINGS AND RAFTS
Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum depth for rigid behaviour – Applications – Floating foundation – Special foundations – Seismic force consideration – Codal provision

UNIT IV PILE FOUNDATION
Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity - Group capacity by different methods (Feld’s rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Codal provision.

UNIT V RETAINING WALLS
Plastic equilibrium in soils – Active and passive states – Rankine’s theory – Cohesionless and cohesive soil – Coulomb’s wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls – Codal provision.

TOTAL: 45 PERIODS

OUTCOME:
- Students are able to plan, execute a detailed site investigation programme, selection of appropriate geotechnical design parameters and type of foundations. Students are capable of carrying out geotechnical design for different types of foundations and retaining walls.

TEXTBOOKS:

REFERENCES:

PTCE7503 IRRIGATION ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
• To introduce the students to the concept of soil-plant characteristics and their water requirements.
• To understand the necessity of planning an irrigation system to provide water at the right time and right place.

UNIT I IRRIGATION PRINCIPLES
UNIT II  CROP WATER REQUIREMENT  8

UNIT III  DIVERSION AND IMPOUNDING STRUCTURES  9

UNIT IV  CANAL IRRIGATION  11

UNIT V  IRRIGATION WATER MANAGEMENT  8

TOTAL: 45 PERIODS

OUTCOMES:

• The students will have knowledge and skills on Planning, design, operation and management of reservoir system.

• The student will gain knowledge on different methods of irrigation including canal irrigation.

TEXTBOOKS:


REFERENCES:


PTCE7504  WASTEWATER ENGINEERING  L T P C
3 0 0 3

OBJECTIVE:

• The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants.

UNIT I  PLANNING AND DESIGN OF SEWERAGE SYSTEM  9
UNIT II PRIMARY TREATMENT OF SEWAGE 9

UNIT III SECONDARY TREATMENT OF SEWAGE 10

UNIT IV DISPOSAL OF SEWAGE 9

UNIT V SLUDGE TREATMENT AND DISPOSAL 8

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
• ability to estimate sewage generation and design sewer system including sewage pumping stations
• required understanding on the characteristics and composition of sewage, self-purification of streams
• ability to perform basic design of the unit operations and processes that are used in sewage treatment

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- The students will acquire knowledge in estimation, tender practices, contract procedures, and valuation and will be able to prepare estimates, call for tenders and execute works.

UNIT I  QUANTITY ESTIMATION
9

UNIT II  RATE ANALYSIS AND COSTING
9

UNIT III  SPECIFICATIONS AND TENDERS
9

UNIT IV  CONTRACTS
9

UNIT V  VALUATION
9

TOTAL: 45 PERIODS

OUTCOMES:
- The student will be able to estimate the quantity and cost for a typical structure and will be prepare the tender and contract document. The student will be able to perform valuation for building and land.

TEXTBOOKS:

REFERENCES:
2. Tamil Nadu Transparencies in Tenders Act, 1998
3. Arbitration and Conciliation Act, 1996
OBJECTIVE:
- Students will be exposed to various problems associated with soil deposits and methods to evaluate them. The different techniques will be taught to them to improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 8
Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II DEWATERING 10
Dewatering Techniques - Well points – Vacuum and electroosmotic methods – Seepage analysis for two dimensional flow for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 10

UNIT IV EARTH REINFORCEMENT 9
Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – Simple design - Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications.

UNIT V GROUTING TECHNIQUES 8

TOTAL: 45 PERIODS

OUTCOME:
- Based on the knowledge gained student will be in a position to identify and evaluate the deficiencies if any in the deposits of the given project area and capable of providing alternative methods to improve its quality so that the structures built on it will be stable and serve the intended purpose.

TEXTBOOKS:

REFERENCES:

OBJECTIVES:

- This course aims at providing students with a solid background on the principles of structural engineering design. Students will be acquire the knowledge of liquid retaining structures, bridges components, retaining wall and industrial structures.

UNIT I INTRODUCTION AND PLANNING 6

UNIT II LIQUID STORAGE STRUCTURES 6
RC Water Tanks- On ground – Circular, underground- Rectangular – Hemispherical Bottomed Steel Water Tank –Design and Drawing

UNIT III DESIGN OF BRIDGE COMPONENTS 6
IRC Specifications and Loading – Solid Slab RC Bridge – Steel Foot-over Bridge- Design and Drawing.

UNIT IV RETAINING WALLS 6
RC Cantilever and Counterfort Retaining Walls – Horizontal Backfill with Surcharge – Design of Shear Key- Design and Drawing.

UNIT V INDUSTRIAL STRUCTURES 6

OUTCOMES:

- At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

TEXTBOOKS:


REFERENCES:

4. SP34 Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.

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 9

UNIT II PLANNING 9

UNIT III ORGANISING 9

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:

PTCE7701 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING L T P C
3 0 0 3

OBJECTIVE:
• To understand the behaviour of dynamic loading. Study the effect of earthquake loading on the behaviour of structures. Understand the codal provisions to design the structures as earthquake resistant.

UNIT I SINGLE DEGREE OF FREEDOM SYSTEM 9

UNIT II MULTI DEGREE OF FREEDOM SYSTEM 9
INTRODUCTION TO EARTHQUAKE ENGINEERING


EARTHQUAKE EFFECTS ON STRUCTURES


CONCEPTS OF EARTHQUAKE RESISTANT DESIGN

Causes of damage – Planning considerations/Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings

OUTCOMES:
- The student will have the knowledge to analyse structures subjected to dynamic loading and to design the structures for seismic loading as per code provisions.

TEXTBOOKS:

REFERENCES:

PROJECT WORK

OBJECTIVE:
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

STRATEGY:
The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 135 PERIODS
OUTCOMES:
- On completion of the project work students will be in a position to take up any challenging practical problems and find solutions by formulating proper methodology.

PTGE7071 DISASTER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
- To provide students with 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 the 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
9
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)
9
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
9
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
9
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
9
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, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

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

PTGE7072 ENGINEERING ETHICS AND HUMAN VALUES L T P C
3 0 0 3

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

UNIT I HUMAN VALUES 3

UNIT II ENGINEERING ETHICS 9

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.

UNIT IV ENGINEER'S RIGHTS AND RESPONSIBILITIES ON SAFETY 12

UNIT V GLOBAL ISSUES 12
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 Periods
OUTCOMES:

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

TEXTBOOKS


REFERENCES


PTGE7073 HUMAN RIGHTS L T P C 3 0 0 3

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


OUTCOME:

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

PTGE7074 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

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

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

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

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II
Quality circles -- Quality Function Deployment (QFD) -- Taguchi quality loss function -- TPM -- Concepts, improvement needs -- Performance measures-- Cost of Quality - BPR.

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
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
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

UNIT IV DIGITAL PRODUCTS AND LAW

UNIT V ENFORCEMENT OF IPRs
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL : 45 PERIODS

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

TEXTBOOKS
REFERENCES

PTGE7076                  FUNDAMENTALS OF NANO SCIENCE  L  T  P  C  3 0 0 3

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

UNIT I  INTRODUCTION  8
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  9
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  12
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  9
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  7

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
OBJECTIVE:

- To introduce the student to the concept of hydrological aspects of water availability and requirements and should be able to quantify, control and regulate the water resources.

UNIT I  PRECIPITATION AND ABSTRACTIONS


UNIT II  RUNOFF

Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Runoff estimation using empirical - Strange’s table and SCS methods – Stage discharge relationships-flow measurements- Hydrograph – Unit Hydrograph – IUH

UNIT III  FLOOD AND DROUGHT

Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts-Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)

UNIT IV  RESERVOIRS

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve

UNIT V  GROUNDWATER AND MANAGEMENT

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas

TOTAL: 45 PERIODS

OUTCOMES:

- The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation.
- The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
- The students will know the basics of groundwater and hydraulics of subsurface flows

TEXTBOOKS:


REFERENCES:

OBJECTIVES:
- To introduce the students to the interdisciplinary analysis of water and design of intervention strategies.
- To develop knowledge base on capacity building on IWRM.

UNIT I  IWRM FRAMEWORK  9
Definition – meanings –objectives- evolution of IWRM- IWRM relevance in water resources management – Importance of paradigm shift in India: processes and prospective outcomes.

UNIT II  CONTEXTUALIZING IWRM  9
IWRM in Global and Regional water partnership - MDG goals - UN formulations-Institutional Transformation- bureaucratic reforms and inclusive development.

UNIT III  EMERGING ISSUES IN WATER MANAGEMENT  9

UNIT IV  IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA  9

UNIT V  ASPECTS OF INTEGRAL DEVELOPMENT  9
Capacity building - Solutions for effective Water Management. Case studies on conceptual framework of IWRM – IWRM and regional and global partnership – Emerging issues – IWRM and water resources development

TOTAL: 45 PERIODS

OUTCOME:
- At the completion of the course, the student will be able to apply appropriate management techniques different components of water resources under IWRM framework.

TEXTBOOKS:

REFERENCES:
OBJECTIVE:

- To gain an insight on local and global perceptions and approaches on participatory water resource management

UNIT I  FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH  6
Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process - Participatory concepts– Objectives of participatory approach - WUA

UNIT II  UNDERSTANDING FARMERS PARTICIPATION  10

UNIT III  ISSUES IN WATER MANAGEMENT  9

UNIT IV  PARTICIPATORY WATER CONSERVATION  10

UNIT V  PARTICIPATORY WATERSHED DEVELOPMENT  10
Concept and significance of watershed - Basic factors influencing watershed development — Principles of watershed management - Definition of watershed management – Identification of problems - Watershed approach in Government programmes — People’s participation – Entry point activities - Evaluation of watershed management measures.

TOTAL: 45 PERIODS

OUTCOMES:

- The students shall gain knowledge on the various processes involved in participatory water resource management.
- The students shall be aware of the issues related to water conservation.

TEXTBOOKS:


REFERENCE:

OBJECTIVE:

- To impart knowledge on the principle and design of control of Indoor/particulate/gaseous air pollutant and its emerging trends.

UNIT I INTRODUCTION
Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards – Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT II METEOROLOGY

UNIT III CONTROL OF PARTICULATE CONTAMINANTS

UNIT IV CONTROL OF GASEOUS CONTAMINANTS

UNIT V INDOOR AIR QUALITY MANAGEMENT
Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have

- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable standards.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To introduce Cartography as science and technology of Map making.
- The course also introduces its connections with Communication Science, Computer technology and IT.
- To outline the Cartography as a creative art.

UNIT I MAP – A SPECIAL GRAPHIC COMMUNICATOR 6

UNIT II ABSTRATION OF EARTH AND MAP PROJECTION 12

UNIT III MAP COMPILEATION AND DESIGN 9
Base map concepts – scanning and digitization – planimetric, topographic and thematic information – sample and census surveys – attribute data tables – Elements of a map - Map Layout principles – Map Design fundamentals – symbols and conventional signs - graded and ungraded symbols - color theory - colours and patterns in symbolization – map lettering

UNIT IV MAP MAKING 9

UNIT V MAP TRANSFORMATIONS 9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student shall
- Be familiar with appropriate map projection and co-ordinate system for production of maps.
- Be able compile and design maps for the required purpose.
- Be familiar with co-ordinate and datum transformations.

TEXTBOOKS:
REFERENCES:

PTCE7003 COASTAL ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- To provide an overview of the analysis and design procedures used in the field of coastal engineering
- To enable students to determine the characteristics of waves, coastal structures and shore protection and modeling in coastal engineering

UNIT I INTRODUCTION TO COASTAL ENGINEERING 9

UNIT II WAVE PROPERTIES AND ANALYSIS 9

UNIT III TYPES AND WAVE TRANSFORMATION 9
Tide analysis and prediction, storm surge, seiches and seasonal fluctuations - Long term water level fluctuations – Wave shoaling; wave refraction; wave breaking; wave diffraction

UNIT IV COASTAL STRUCTURES AND SHORE PROTECTION 9
Risk analysis – design wave – Break waters – Shore protection – groins, seal walls, offshore breakwaters, artificial nourishment

UNIT V MODELING IN COASTAL ENGINEERING 9
Physical modeling in Coastal Engineering – Limitations and advantages – Role of physical modeling in coastal engineering – Numerical modeling – Modeling aspects – limitations

TOTAL: 45 PERIODS

OUTCOME:
On successfully completing this course unit, students will be able to:
- Calculate the wave transformations
- Appreciate the multi-faceted nature of coastal problems and the techniques of coastal engineering analysis, modeling and design of coastal structures and shore protection.

TEXTBOOKS:
REFERENCES:

PTCE7004 COMPUTER AIDED DESIGN OF STRUCTURES

OBJECTIVES:
- To understand the design and analysis of structures using softwares and to optimize the structural components.

UNIT I INTRODUCTION
Fundamental reason for implementing CAD - Software requirements – Hardware components in CAD system – Design process - Applications and benefits.

UNIT II COMPUTER GRAPHICS
Graphic Software – Graphic primitives - Transformations - 2 Dimensional and 3 Dimensional transformations – Concatenation - Wire frame modeling - Solid modeling - Graphic standards - Drafting packages – Auto CAD.

UNIT III STRUCTURAL ANALYSIS

UNIT IV DESIGN AND OPTIMIZATION
Principles of design of steel and RC structures - Beams and Columns - Applications to simple design problems - Optimization techniques - Algorithms - Linear programming.

UNIT V EXPERT SYSTEMS
Introduction to artificial intelligence - Knowledge based expert systems – Applications of KBES- Rules and decision tables - Inference mechanisms - simple applications

OUTCOMES:
- Students acquire the knowledge in computer aided design of structures.

TEXTBOOKS:

REFERENCE:
OBJECTIVES:

- To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.

UNIT I CONSTITUENT MATERIALS
Cement-Different types-Chemical composition and Properties-Tests on cement-IS Specifications-Aggregates-Classification-Mechanical properties and tests as per BIS grading requirements-Water-Quality of water for use in concrete

UNIT II CHEMICAL AND MINERAL ADMIXTURES
Accelerators-Retarders-Plasticizers-Super plasticizers-Water proofers-Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline-Their effects on concrete properties

UNIT III PROPORTIONING OF CONCRETE MIX
Principles of Mix Proportioning-Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design-Design Mix and Nominal Mix-BIS and ACI Methods of Mix Design-Mix Design Examples

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE
Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS-Properties of Hardened concrete-Determination of Compressive and Flexural strength-Stress-strain curve for concrete-Determination of Young’s Modulus

UNIT V SPECIAL CONCRETES
Light weight and Heavy weight concretes-High strength concrete-Fibre reinforced concrete-Ferro cement-Ready mix concrete-SIFCON-Shotcrete-Polymer concrete-High performance concrete-Their production, properties and applications

TOTAL : 45 PERIODS

OUTCOMES:

- The student will possess the knowledge on properties of materials required for concrete tests on those materials and design procedures for making conventional and special concretes.

TEXTBOOKS:
1. Santhakumar, A.R; Concrete Technology , Oxford University Press, New Delhi, 2007
2. Shetty, M.S; Concrete Technology, S.Chand and Company Ltd, New Delhi, 2003

REFERENCES:
3. IS: 10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi
OBJECTIVE:

• To learn the design of plate and shell and spatial structures

UNIT I THIN PLATES WITH SMALL DEFLECTION
Laterally loaded thin plates - Governing differential equation, various boundary conditions.

UNIT II RECTANGULAR PLATES
Simply supported rectangular plates - Navier solution and Levy’s method – Loading.

UNIT III ANALYSIS OF THIN SHELLS
Shells of revolution – Spherical dome, Conical shell and ellipsoid of revolution – Shells of translation – Cylindrical shell and Hyperbolic paraboloid - Classification of shells - Types of shells - Structural action.

UNIT IV DESIGN OF SHELLS
Spherical dome, Conical shell and Cylindrical shell.

UNIT V SPACE FRAMES
Space Frames – Configuration – Node connector- Types – General principles of design philosophy – Behaviour.

OUTCOMES:

• The students will have indepth knowledge in the analysis and design of plates, shells and space frame structures

TEXTBOOKS:


REFERENCES:


OBJECTIVE:

• To understand the behaviour and performance of prestressed concrete structures. Compare the behaviour of prestressed concrete members with that of the normal reinforced concrete structures. Understand the performance of composite members. Finally to learn the design of prestressed concrete structures.

UNIT I INTRODUCTION
Historical developments – Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel, Lee-McCall and Gifford Udall anchorage systems – Analysis of sections of stresses by stress concept, strength concept and load balancing concept – Losses of prestress in post-tensioned and pre-tensioned members.
UNIT II  DESIGN FOR FLEXURE AND SHEAR  
Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III  DEFLECTION AND DESIGN OF ANCHORAGE ZONE  
Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnei’s method, Guyon’s method and I.S. 1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT IV  COMPOSITE BEAMS AND CONTINUOUS BEAMS  
Analysis and design of composite beams - Shrinkage strain and its importance – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V  MISCELANEOUS STRUCTURES  

OUTCOMES:
- Student will have knowledge on methods of prestressing and able to design various prestressed concrete structural elements.

TEXTBOOKS:

REFERENCES:

OBJECTIVES:
- To introduce the students to the cadastral survey Methods and its applications in generation of Land information system. Cadastral surveys are those classes of land surveys which are executed for the purpose of systematically recording the land rights, producing register of land holdings or an inventory of land areas, land use and determine land tax.

UNIT I  INTRODUCTION  
UNIT II  METHODS OF SURVEYING  

UNIT III  MAINTENANCE AND MEASUREMENTS  

UNIT IV  PHOTOGRAHAMETRIC METHODS  
Photogrammetry for cadastral surveying and mapping - Orthophoto map – Quality control measures - Organisation of cadastral offices – international scenario.

UNIT V  MAPPING PROCEDURES AND LIS  

OUTCOMES:
- The courses give the knowledge about Land Record System and computational procedure for modernization of the same.
- The students will be in position to understand the Government procedure in Land Record Management.

TEXTBOOKS:

REFERENCES:

OBJECTIVE:
- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects.

UNIT I  INTRODUCTION  
UNIT II ENVIRONMENTAL ASSESSMENT
Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction – Analysis of alternatives

UNIT III ENVIRONMENTAL MANAGEMENT PLAN

UNIT IV SOCIO ECONOMIC ASSESSMENT
Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis- Public Consultation

UNIT V CASE STUDIES

OUTCOMES:
The students completing the course will have ability to
- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

TEXTBOOKS:

REFERENCES:

PTCE7010 GEO-ENVIRONMENTAL ENGINEERING L T P C 3 0 0 3

OBJECTIVE:
- The student acquires the knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques thereby protecting environment.
UNIT I  GENERATION OF WASTES AND CONSEQUENCES OF SOIL POLLUTION  8
Introduction to Geo environmental engineering – Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals - Failures of foundation due to waste movement.

UNIT II  SITE SELECTION AND SAFE DISPOSAL OF WASTE  10

UNIT III  TRANSPORT OF CONTAMINANTS  8

UNIT IV  WASTE STABILIZATION  10

UNIT V  REMEDIATION OF CONTAMINATED SOILS  9
Exsitu and insitu remediation-Solidification, bio-remediation, incineration, soil washing, electro kinetics, soil heating, vetrification, bio-venting.

TOTAL: 45 PERIODS

OUTCOME:
- Students are able to assess the contamination in the soil and to select suitable remediation methods based on contamination. Also they are able to prepare the suitable disposal system for particular waste.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the fundamentals and components of Geographic Information System.
- To provide details of spatial data structures and input, management and output processes.

UNIT I  FUNDAMENTALS OF GIS

UNIT II  SPATIAL DATA MODELS

UNIT III  DATA INPUT AND TOPOLOGY

UNIT IV  DATA QUALITY AND STANDARDS
Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards –Interoperability - OGC - Spatial Data Infrastructure

UNIT V  DATA MANAGEMENT AND OUTPUT
Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS- distributed GIS.

TOTAL: 45 PERIODS

OUTCOME:
- This course equips the student to have basic knowledge about the GIS its structure, quality and standards.

TEXT BOOKS:

REFERENCE:
OBJECTIVE:
- To solve the Civil Engineering problems with the help of Geoinformatics technique.

UNIT I  LAND RESOURCE MANAGEMENT  6
Total Station and GPS Surveys – Topographic and Bathymetric Surveys – Cadastral Information – Soil and Land Use Surveys - Land Information System (LIS) – Real Estate Information System

UNIT II  STRUCTURAL STUDIES  6
Deformation studies of deflection - Dam deformation - structural movement - Pavement yield - shifting sand-bank and shoreline – Landslide Risk Analysis

UNIT III  SOIL CONSERVATION AND MANAGEMENT  9

UNIT IV  URBAN AND TRANSPORTATION MANAGEMENT  12

UNIT V  WATER RESOURCES PLANNING AND MANAGEMENT  12

TOTAL: 45 PERIODS

OUTCOME:
- The student shall be capable of solving Civil Engineering problems with Geoinformatics technology.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To introduce the student to the principles of Groundwater governing equations and characteristics of different aquifers
- To understand the techniques of development and management of groundwater.

UNIT I  HYDROGEOLOGICAL PARAMETERS

UNIT II  WELL HYDRAULICS

UNIT III  GROUNDWATER MANAGEMENT

UNIT IV  GROUNDWATER QUALITY
Ground water chemistry – Origin- Point Source, Non Point Source, movement and quality - Water quality standards – Health and aesthetic aspects of water quality - Saline intrusion – Environmental concern and Regulatory requirements

UNIT V  GROUNDWATER CONSERVATION
Artificial recharge techniques – Remediation of Saline intrusion– Ground water management studies – Protection zone delineation, Contamination source inventory, remediation schemes: Physical, Chemical, Biological- Ground water Pollution and legislation.

TOTAL: 45 PERIODS

OUTCOMES:

- Students will be able to understand aquifer properties and its dynamics after the completion of the course. It gives an exposure towards well design and practical problems of groundwater aquifers.
- Students will be able to understand the importance of artificial recharge and groundwater quality concepts.

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- To learn the layout, functional aspects and design of steel and R.C structures used in industries.

UNIT I  PLANNING
Classification of industries and industrial structures – General requirements of various industries – Planning and layout of buildings and components.

UNIT II  FUNCTIONAL REQUIREMENTS

UNIT III  DESIGN OF STEEL STRUCTURES
Industrial roofs – Crane girders – pre-engineered and Mills buildings – Bunkers and Silos – pipe/cable racks- Chimney.

UNIT IV  DESIGN OF R.C. STRUCTURES
Corbels, Brackets and Nibs - Silos and bunkers –Chimney - Principles of folded plates and shell roofs

UNIT V  PREFABRICATION
Principles of prefabrication – Prestressed precast roof trusses - Construction of roof and floor slabs - Wall panels- storage/transportation/handling in yard/site and erection –joints in precast structures.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of this course the student shall be able to design some of the structures used in industries.

TEXTBOOKS:

REFERENCES:

OBJECTIVE:
- To provide knowledge on sources and characteristics of Industrial Wastewaters, Techniques and approaches for minimizing the generation of wastewaters at the source and application of physico-chemical, biological and advanced treatment methods for recovery, reuse and disposal of wastewaters in Indian Industries.
UNIT I INTRODUCTION 8

UNIT II INDUSTRIAL POLLUTION PREVENTION 5
Prevention Vs Control of Industrial Pollution – Benefits and Barriers – Waste Minimization Strategies – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay back period.

UNIT III TREATMENT OF INDUSTRIAL WASTEWATERS 13

UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT 9

UNIT V CASE STUDIES 10
Industrial manufacturing process description, Wastewater characteristics , Pollution Prevention Options and Treatment Flow sheets for selected Industries – Tanneries- Textiles- Pulp and Paper – Metal finishing – Sugar and Distilleries.

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
- an insight into the pollution from major industries including the sources and characteristics of pollutants
- ability to plan minimization of industrial wastes
- ability to design facilities for the processing and reclamation of industrial waste water

TEXTBOOKS:

REFERENCES:
OBJECTIVE:

- To understand the basics of dynamics – dynamic behaviour of soils – effects of dynamic loads and the various design methods.

UNIT I THEORY OF VIBRATION

UNIT II WAVE PROPAGATION

UNIT III DYNAMIC PROPERTIES OF SOILS

UNIT IV FOUNDATION FOR DIFFERENT TYPES OF MACHINES

UNIT V INFLUENCE OF VIBRATION AND REMEDIATION

TOTAL: 45 PERIODS

OUTCOME:

- Students are able to design foundation for different machines, assess the influence of vibrations and selection of remediation methods based on the nature of vibration, properties and behaviour of soil.

TEXT BOOKS:

REFERENCES:

PTCE7017 MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES L T P C 3 0 0 3

OBJECTIVE:
- To acquire the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9
Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE 9
Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETES 9

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9
Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9
Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, earthquake. demolition techniques - Engineered demolition methods - Case studies.

TOTAL: 45 PERIODS

OUTCOMES:
- Students have the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.
TEXT BOOKS:

REFERENCES:
4. Hand Book on “Repair and Rehabilitation of RCC Buildings” – Director General works CPWD, Govt of India, New Delhi – 2002

PTCE7018 MUNICIPAL SOLID WASTE MANAGEMENT

OBJECTIVE:
- To make the students conversant with the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

UNIT I SOURCES AND CHARACTERISTICS
Sources and types of municipal solid wastes - waste generation rates - factors affecting generation, characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - Public health and environmental effects. Elements of solid waste management - Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management - Public awareness; Role of NGO’s Public Private participation.

UNIT II ON-SITE STORAGE AND PROCESSING

UNIT III COLLECTION AND TRANSFER
Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

UNIT IV OFF-SITE PROCESSING
Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT V DISPOSAL
Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation

TOTAL: 45 PERIODS
OUTCOMES:
The students completing the course will have

- an understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management
- ability to plan waste minimisation and design systems for storage, collection, transport, processing and disposal of municipal solid waste

TEXTBOOKS:

REFERENCES:

PTCE7019 PAVEMENT ENGINEERING

OBJECTIVE:
- Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, the student will be in a position to assess quality and serviceability conditions of roads.

UNIT I TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM
Introduction – Pavement as layered structure – Pavement types rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading.

UNIT II DESIGN OF FLEXIBLE PAVEMENTS

UNIT III DESIGN OF RIGID PAVEMENTS
Cement concrete pavements Factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE

UNIT V STABILIZATION OF PAVEMENTS

TOTAL: 45 PERIODS

OUTCOME:
- Students are able to design different new pavements and rehabilitate the existing roads using recent technology.
TEXTBOOKS:

REFERENCES:

PTCE7020 POWER PLANT STRUCTURES L T P C
3 0 0 3

OBJECTIVE:
• To study the layout, functional aspects and principles involved in the selection of different types of Power Plant Structures.

UNIT I FUNDAMENTALS OF POWER PLANTS 9

UNIT II HYDRO ELECTRIC POWER PLANTS 9
Elements of hydro-electric power plants – Advantages and disadvantages of water power – General and essential elements of Hydro electric Power Plant – Structural requirements – Selection of site for hydro electric plant – Penstocks and surge Tanks in Power Station.

UNIT III THERMAL POWER PLANTS 9
Planning, Analysis of thermal power plants – Layout – Ash handling – Dust collection – Induced draught and natural cooling towers – Air/water pollution by thermal power plants.

UNIT IV NUCLEAR POWER PLANTS 9

UNIT V NON CONVENTIONAL POWER PLANTS 9

TOTAL: 45 PERIODS

OUTCOMES:
• The student will be able to understand the operations of different types of power plants. The students will be able to analyse and design various power plant components like surge tanks, cooling towers and containment structures.

TEXTBOOKS:
REFERENCES:

OBJECTIVE:
• To understand the principles of prefabrication, behaviour and design of prefabricated components and structural connections.

UNIT I
INTRODUCTION

UNIT II
PREFABRICATED COMPONENTS
Behaviour of structural components – Large panel constructions – Construction of roof, floor slabs and Wall panels – Columns – Shear walls.

UNIT III
DESIGN PRINCIPLES
Design of Structural components – Beam, Column and Corbel - Stress limitations – Handling without cracking, handling with controlled cracking – Design for stripping forces

UNIT IV
JOINTS IN STRUCTURAL MEMBERS
Joints for different structural connections – Beam to Column, Beam to Beam, Column to Column, Column to Foundation, Connections between wall panels, Connections between floor panels - Dimensions and detailing – Design of expansion joints- Jointing Materials.

UNIT V
DESIGN FOR EARTHQUAKES AND CYCLONES
Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones etc. - Importance of avoidance of progressive collapse.

OUTCOMES:
• The student shall be able to design the prefabricated elements and also have the knowledge of the construction methods in using these elements.

TEXTBOOKS:
OBJECTIVE:
- To impart knowledge on fundamentals of rock mechanics and its application in solving simple problems associated with rock slopes and underground openings. Student gains the knowledge on the mechanics of rock and its applications in underground structures and rock slope stability analysis.

UNIT I CLASSIFICATION AND INDEX PROPERTIES OF ROCKS

UNIT II ROCK STRENGTH AND FAILURE CRITERIA
Modes of rock failure – Strength of rock – Laboratory measurement of shear, tensile and compressive strength. Stress - strain behaviour of rock under compression – Mohr -Coulomb failure criteria and empirical criteria

UNIT III INITIAL STRESSES AND THEIR MEASUREMENTS
Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – measurements of in-situ stresses – Hydraulic fracturing – Flat jack method – Over coring method

UNIT IV APPLICATION OF ROCK MECHANICS IN ENGINEERING

UNIT V ROCK STABILISATION

OUTCOME:
- Students are capable of classifying the rock. They can understand stresses-strain characteristics, failure criteria, and influence of insitu stress in the stability of various structures and also know various technique to improve the insitu strength of rocks.

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- To understand the design philosophy of tall buildings, the loading and behaviour of structural systems. To enlighten the students on modern techniques available for the analysis of tall buildings.

UNIT I  DESIGN CRITERIA AND MATERIALS  8
Design Philosophy - Modern concepts – Materials used - High Performance Concrete, Fibre Reinforced Concrete, Light weight concrete, Self Compacting Concrete, Glass, High strength steel.

UNIT II  LOADING  9

UNIT III  BEHAVIOUR OF STRUCTURAL SYSTEMS  9
Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, in filled frames, Shear walls, Coupled Shear walls, Wall – Frames, Tubular, Outrigger braced, Hybrid systems.

UNIT IV  ANALYSIS  10
Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for member forces, drift and twist. Computerized 3D analysis, Evaluation of frequency of vibration of structures – Buckling analysis of tall structures.

UNIT V  DESIGN PARAMETERS  9
Design for differential movement, Creep and Shrinkage effects, Temperature Effects and Fire Resistance.

TOTAL: 45 PERIODS

OUTCOMES:
- The student should have an understanding on the behaviour of tall buildings subjected to lateral building. The students should have knowledge about the principles of designing safer tall structures as per the existing codes.

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- To understand the working of total station equipment and solve the surveying problems.

UNIT I  FUNDAMENTALS OF TOTAL STATION AND GPS  9
Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion – Kepler’s Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept – GNSS

UNIT II  ELECTROMAGNETIC WAVES  9
Classification - applications of Electromagnetic waves, Propagation properties, wavepropagation at lower and higher frequencies- Refractive index (RI) - factors affecting RI- Computation of group for light and near infrared waves at standard and ambient conditions- Computation of RI for microwaves at ambient condition - Reference refractive index- Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index- Second velocity correction -Total atmospheric correction- Use of temperature - pressure transducers.

UNIT III  ELECTRO OPTICAL AND MICRO WAVE SYSTEM  9

UNIT IV  SATELLITE SYSTEM  9
GPS - Different segments - space, control and user segments - satellite configuration - GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers.

UNIT V  GPS DATA PROCESSING  9
GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation – downloading the data - data processing – software modules -solutions of cycle slips, ambiguities, RINEX format. Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods -basic constellation of satellite geometry & accuracy measures - applications- long baseline processing- use of different softwares available in the market.

TOTAL : 45 PERIODS

OUTCOME:
- The student shall acquire through working knowledge of modern surveying equipment such as Total Station and GPS so that they will be able to solve all surveying problem faced by our Country.

TEXTBOOKS:

REFERENCES:
OBJECTIVE:

- To give an overview of Traffic engineering, various surveys to be conducted, traffic regulation, management and traffic safety.

UNIT I TRAFFIC CHARACTERISTICS 10
Road Characteristics – Classification – Functions and standards – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India

UNIT II TRAFFIC SURVEYS 7

UNIT III TRAFFIC ENGINEERING REGULATION AND CONTROL 8

UNIT IV TRAFFIC SAFETY AND ENVIRONMENT 10
Road accidents – Causes, effect, prevention, and cost – street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, health effects and abatement measures.

UNIT V TRAFFIC MANAGEMENT 10
Area Traffic Management System – One way street system, exclusive traffic lanes, tidal flow operation, staggering of work hours and road pricing – Non road pricing options – Parking charges, Public transport, Subsidies, Vehicle License fees, Road Building, Permit system, Physical Traffic Management Transport System Management (TSM) and Transport Demand Management (TDM) - Introduction to Intelligent Transportation Systems (ITS)- ITS Applications in Traffic Management.

TOTAL: 45 PERIODS

OUTCOME

- Students would have gained knowledge on characteristics of traffic elements, traffic survey, traffic regulation and traffic management measures.

TEXTBOOKS:


REFERENCES:

1. Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHI Learning Pvt. Ltd., 2005
2. Indian Roads Congress (IRC) Specifications: Guidelines and special publications on Traffic Planning and Management.

PTCE7026 TRANSPORT AND ENVIRONMENT L T P C 3 0 0 3

OBJECTIVE:
- The objective of this course is to create an awareness / overview of the impact of Transportation Projects on the environment and society.

UNIT I INTRODUCTION 8
Environmental Inventory, Environmental Assessment, Environmental Impact Assessment (EIA), Environmental Impact of Transportation Projects, Need for EIA, EIA Guidelines for Transportation Project, Historical Development.

UNIT II METHODOLOGIES 8
Elements of EIA – Screening and Scoping – Methods of Impact Analysis – Applications – Appropriate methodology.

UNIT III ENVIRONMENTAL IMPACT, PREDICTION AND ASSESSMENT 10
Prediction and Assessment of Impact of Transportation Project at various stages on water, air, noise, land acquisition and resettlement, Socio economic impact, indigenous people, aesthetics, health and safety, energy studies, IRC guidelines.

UNIT IV ENVIRONMENTAL MITIGATION AND MANAGEMENT PLAN 10

UNIT V EIA CASE STUDIES 9
EIA Case Studies on Highway, Railway, Airways and Waterways Projects

TOTAL: 45 PERIODS

OUTCOME:
- Students would have understood the impact of Transportation projects on the environment, Environmental Laws on Transportation Projects and the mitigative measures adopted in the planning stage

TEXTBOOKS:

REFERENCES:
PTCE7027  TRANSPORTATION PLANNING AND SYSTEMS  L T P C
3 0 0 3

OBJECTIVE:
• To give an exposure on overview of the principles of the bus and rail transportation planning and evaluation of the transportation projects.

UNIT I  STUDY AREA AND SURVEYS  10
Importance of planning and integrated transport facilities in urban areas – Delineation of study area and zoning – Conducting various surveys – Travel patterns, transport facilities and planning parameters.

UNIT II  MODES  7
Basics of trip generation – Trip distribution – Trip assignment and modal split models – Validation of the model.

UNIT III  PLAN PREPARATION AND EVALUATION  8

UNIT IV  BUS TRANSPORTATION  10
Characteristics and bus transportation in urban areas – Fare policy – Route planning – Planning of terminals – Break even point and its relevance.

UNIT V  RAIL TRANSPORTATION  10
Characteristics of suburban, IRT and RRT systems – Planning of rail terminals – Fare policy – Unified traffic and transport authority.

TOTAL: 45 PERIODS

OUTCOME
• The students would have gained knowledge on comprehensive traffic and transport planning for cities with special emphasis on bus and rail system planning.

TEXTBOOKS:

REFERENCES:

PTCE7028  URBAN PLANNING AND DEVELOPMENT  L T P C
3 0 0 3

OBJECTIVES:
• To enable students to have the knowledge on planning process and to introduce to the students about the regulations and laws related to Urban Planning.
UNIT I BASIC ISSUES
Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri-urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level.

UNIT II PLANNING PROCESS

UNIT III DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION
Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones- Development of small town and smart cities-case studies

UNIT IV PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS

UNIT V LEGISLATION, DEVELOPMENT AND MANAGEMENT OF URBAN SYSTEM
Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.

TOTAL : 45 PERIODS

OUTCOMES:
The students completing the course will have the ability to
- describe basic issues in urban planning
- formulate plans for urban and rural development and
- plan and analyse socio economic aspects of urban and rural planning

TEXTBOOKS:
3. Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi, 2001

REFERENCES:
1. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai
4. CMDA, Second Master Plan for Chennai, Chennai 2008

PTCE7029 WATER RESOURCES SYSTEMS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
- To introduce the student to the concept of Mathematical approaches for managing the water resources system.
- To make the students apply an appropriate system approach to optimally operate a water resource system.
UNIT I SYSTEM APPROACH
Philosophy of modelling – Goals and Objectives – Basics of system analysis concept – scopes and steps in systems engineering.

UNIT II PHYSICAL AND SOCIO - ECONOMIC DATA
Collection, evaluation and processing – project appraisal – public involvement, master Comprehensive and integrated planning of water resources project.

UNIT III LINEAR PROGRAMMING
Operation research - introduction - Problem Formulation-graphical solution- Simplex method – Sensitivity analysis - simple applications

UNIT IV DYNAMIC PROGRAMMING
Optimality criteria Stage coach problem – Bellman’s optimality criteria Problem formulation and Solution - simple applications

UNIT V SIMULATION
Basic principles – Methodology and Philosophy – Model development – input and outputs – Deterministic simulation - simple applications

TOTAL: 45 PERIODS

OUTCOMES:
- The students will be exposed to the economical aspects and analysis of water resources systems by which they will get an idea of comprehensive and integrated planning of a water resources project.
- The students will develop skills in solving problems in operations research through LP, DP and Simulation techniques.

TEXTBOOK:

REFERENCES:
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<th>SL. NO.</th>
<th>COURSE CODE</th>
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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

- Characteristic equation
- Eigen values and Eigenvectors of a real matrix
- Properties of eigen values and eigenvectors
- Cayley Hamilton theorem
- Diagonalization of matrices
- Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II FUNCTIONS OF SEVERAL VARIABLES

- Partial derivatives
- Homogeneous functions and Euler’s theorem
- Total derivative
- Differentiation of implicit functions
- Change of variables
- Jacobians
- Partial differentiation of implicit functions
- Taylor’s series for functions of two variables
- Maxima and minima of functions of two 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

- Line Integral
- Cauchy’s theorem and integral formula
- Taylor’s and Laurent’s series
- Singularities
- Residues
- Residue theorem
- Application of Residue theorem for evaluation of real integrals
- Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS

- Existence conditions
- Transforms of elementary functions
- Basic properties
- Transforms of derivatives and integrals
- Inverse transforms
- Convolution theorem
- Transform of periodic functions
- Application to solution of linear ordinary differential equations with constant coefficients.

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 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:

PTGE7151 COMPUTING TECHNIQUES
(Common to all branches of Engineering and Technology)

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

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

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

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

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL: 45 PERIODS

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

REFERENCES:

PTCY7151 ENGINEERING CHEMISTRY L T P C

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

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

UNIT II SURFACE CHEMISTRY AND CATALYSIS

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

UNIT V NANOCHEMISTRY

TOTAL: 45 PERIODS

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

TEXTBOOKS:

REFERENCES:

PTGE7152 ENGINEERING MECHANICS

OBJECTIVES:
The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I STATICS OF PARTICLES
UNIT II  EQUILIBRIUM OF RIGID BODIES  9

UNIT III  DISTRIBUTED FORCES  9
Centroids of lines and areas –symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass -Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass-Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV  FRICTION  9

UNIT V  DYNAMICS OF PARTICLES  9

TOTAL: 45 PERIODS

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

TEXT BOOK

REFERENCES
OBJECTIVE:
- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I  PROPERTIES OF MATTER

UNIT II  ACOUSTICS AND ULTRASONICS

UNIT III  THERMAL AND MODERN PHYSICS

UNIT IV  APPLIED OPTICS

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

OUTCOME:
- The students will acquire knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.
TEXTBOOKS:

REFERENCES:

PTEE7204 BASIC ELECTRICAL ENGINEERING AND MEASUREMENTS L T P C

OBJECTIVES:
To impart knowledge on
- Electric circuit laws
- Principle of Electrical Machines
- Various measuring instruments

UNIT I ELECTRICAL CIRCUITS
Three phase balanced circuits-Three phase Power measurement.

UNIT II ELECTRICAL MACHINES

UNIT III SPECIAL ELECTRICAL COMPONENTS
Synchronous machine – Brushless DC Motor - Stepper motor – Switched reluctance motor - Electromechanical Relays.

UNIT IV ELECTRICAL MEASUREMENTS

UNIT V MECHANICAL MEASUREMENTS
Classification of transducers, strain, RTD, thermocouples, Piezo-electric transducer, LVDT, Turbine and electromagnetic flow meters, level transducers ultrasonic and fiber optic transducers, type of sensors, elastic sensors, viscosity, moisture and pH sensors, Digital transducers, vibrating wire instruments like load cells, stress meter, etc.

TOTAL : 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Explain different types of electrical machines and their performance.
TEXT BOOKS:

REFERENCES:

PTEC7204 ELECTRONICS ENGINEERING

OBJECTIVE:
- To provide knowledge in the basic concepts of Electronics Engineering including semiconductors, transistors, electronic devices, signal generators, transducers and digital electronics.

UNIT I SEMICONDUCTORS AND RECTIFIERS
P-N junction, VI Characteristics of PN junction diode, Zener diode, Zener diode Characteristics, Zener diode as a regulator, BJT and N-MOSFET working and V-I characteristics.

UNIT II AMPLIFIERS AND OSCILLATORS

UNIT III LINEAR INTEGRATED CIRCUITS
Operational amplifier –Inverting and Non-inverting amplifiers, Adder, integrator and differentiator, Instrumentation amplifier, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types, IC 555 based Astable and Monostable Multivibrators,

UNIT IV DIGITAL ELECTRONICS

UNIT V TRANSDUCERS AND DISPLAY DEVICES
Thermistors, Semiconductor strain gauges, LVDT, Tachometer, Ultrasonic and Thermal flow meter, pressure force and weight measurement, Seven segment display, LED and LCD

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

- Identify and apply electronics components to design circuits.

TEXT BOOK:

REFERENCES:
5. Transducers in Mechanical and Electronic Design by Trietley

PTME7201 ENGINEERING THERMODYNAMICS L T P C
3 0 0 3

OBJECTIVE:
- To train the students on the basics and applications of energy in Mechanical Engineering

UNIT I BASIC CONCEPTS AND FIRST LAW

UNIT II SECOND LAW

UNIT III PURE SUBSTANCES AND STEAM POWER CYCLE
Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Determination of dryness fraction. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart. Ideal and actual Rankine cycles.

UNIT IV IDEAL AND REAL GASES THERMODYNAMIC RELATIONS

UNIT V GAS MIXTURES AND PSYCHROMETRY
Mole and mass fractions – Dalton's and Amagat's laws, properties of ideal gas mixtures. Psychrometric properties – Property calculations using Psychrometric chart and expression Psychrometric processes and simple applications.

TOTAL : 45 PERIODS
OUTCOMES:
Upon completion of this course, the students will be able to:
- Thermodynamic principles to Engineering Applications.
- Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

TEXT BOOKS:

REFERENCES:

PTCE7204 FLUID MECHANICS AND MACHINERY

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OBJECTIVES:
- To study the applications of the conservation laws to flow through pipes and hydraulic machines.
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, capillarity and surface tension. Flow characteristics – concept of control volume - application of control volume to continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS

UNIT III DIMENSIONAL ANALYSIS
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.
UNIT IV  PUMPS

UNIT V  TURBINES

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Critically analyse the performance of pumps and turbines.

TEXT BOOKS:

REFERENCES:

PTMA7251  NUMERICAL METHODS  L T P C
3 0 0 3

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

UNIT I  SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS
UNIT II  INTERPOLATION AND APPROXIMATION  9
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  9

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  9

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  9
Finite difference methods for solving two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat - flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL : 45 PERIODS

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

TEXT BOOKS :

REFERENCES :
OBJECTIVES:
To the study of nature and the facts about environment.
- To find and implement 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 14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards– soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

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

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 environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

REFERENCES:

PTME7301 KINEMATICS OF MACHINES

OBJECTIVES:
- To understand the basic components and layout of linkages in the assembly of a system/machine.
- To understand the principles in analysing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
- To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
- To understand the basic concepts of toothed gearing and kinematics of gear trains.
UNIT I BASIC CONCEPTS

UNIT II MECHANISMS
Classification of mechanisms- Ratchets and Escapement mechanisms- Indexing mechanisms-
Analysis of Hooke’s joint – Double Hooke’s joint- Pantograph – Straight line motion Mechanisms (Exact and Approximate)- Steering gear mechanisms.

UNIT III KINEMATICS OF LINKAGE MECHANISMS
Displacement, velocity and acceleration analysis of mechanisms – Velocities and accelerations by relative velocity method -Velocity analysis using instantaneous centre method- Velocities and accelerations by Analytical method -Coriolis Acceleration.

UNIT IV KINEMATICS OF CAM MECHANISMS

UNIT V GEARS AND GEAR TRAINS

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
• Apply the fundamentals of mechanisms and analyze new mechanisms.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the students to the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

UNIT I METAL CASTING PROCESSES

UNIT II METAL JOINING PROCESSES

UNIT III BULK DEFORMATION PROCESSES

UNIT IV SHEET METAL PROCESSES

UNIT V MANUFACTURE OF PLASTIC COMPONENTS

OUTCOMES:
- Upon completion of this course, the students can able to apply the different manufacturing process and use this in industry for component production.
TEXT BOOKS:

REFERENCES:

PTCE7304 STRENGTH OF MATERIALS L T P C
3 0 0 3

OBJECTIVE:
- To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

UNIT III TORSION 9
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS 9
Double Integration method – Macaulay’s method – Area moment Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.
UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theory – Application of theories of failure.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

REFERENCES:

PTME7303 THERMAL ENGINEERING - I

OBJECTIVES:
- To apply the concepts and laws of thermodynamics for cycle analysis and performance of heat engines - Internal Combustion(IC) engines and Gas Turbines.
- To get an insight on the working and performance of air compressors
- To understand the working of various auxiliary systems present in IC engines.

UNIT I GAS AND STEAM POWER CYCLES

UNIT II RECIPROCATING AIR COMPRESSOR
UNIT III  INTERNAL COMBUSTION ENGINES AND COMBUSTION  9

UNIT IV  INTERNAL COMBUSTION ENGINE PERFORMANCE AND SYSTEMS  9

UNIT V  GAS TURBINES  9

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Analyse the theory and performance of air-standard cycles
- Understand functioning and performance of IC engines and its sub systems
- Understand the working of Gas turbines and their performance

TEXT BOOKS:

REFERENCES:

PTME7401  DYNAMICS OF MACHINES  L  T  P  C
3  0  0  3

OBJECTIVES:
- To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
- To understand the effects of unbalances resulting from prescribed motions in mechanisms.
- To understand the fundamentals of vibrations.
- To understand the principles in mechanisms used for governing of machines.

UNIT I  FORCE ANALYSIS  9
UNIT II BALANCING

UNIT III FREE VIBRATION

UNIT IV FORCED VIBRATION

UNIT V MECHANISMS FOR CONTROL

TOTAL:45 PERIODS

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

- Analyse the forces acting in a mechanical system and related vibration issues.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To impart knowledge on construction of phase diagrams and also the importance of iron-iron carbide phase diagram.
- To impart knowledge on different heat treatment processes used in industries and the basics behind the microstructure formation.
- To impart knowledge on the properties and applications of various engineering materials.
- To expose testing methods and procedures to find the mechanical properties of engineering materials.

UNIT I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS

UNIT II HEAT TREATMENT

UNIT III FERROUS AND NON-FERROUS METALS

UNIT IV NON-METALLIC MATERIALS

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the phase diagrams and relate to the heat treatment processes.
- Tailor structure-property correlations to engineering materials.
- Select proper engineering materials for various engineering applications.
- Perform various testing’s to find the properties of engineering materials.
TEXT BOOKS:

REFERENCES:

PTME7402 MANUFACTURING TECHNOLOGY – II L T P C
3 0 0 3

OBJECTIVES:
- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
- To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming.

UNIT I THEORY OF METAL CUTTING
Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal, oblique metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT II TURNING MACHINES

UNIT III RECIPROCATING, MILLING AND GEAR CUTTING MACHINES
Reciprocating machine tools: shaper, planer, slotter: Types and operations- Hole making: Drilling, reaming, boring, tapping, type of milling operations-attachments- types of milling cutter–machining time calculations - Gear cutting, gear hobbing and gear shaping – gear finishing methods.

UNIT IV ABRASIVE PROCESSES AND BROACHING

UNIT V COMPUTER NUMERICAL CONTROL MACHINE TOOLS
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre and part programming fundamentals – manual part programming and computer assisted part programming.

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

- Understand and compare the functions and applications of different metal cutting operations, machine tools and gain knowledge in programming of CNC machines.

TEXT BOOKS:

REFERENCES:

PTME7403 THERMAL ENGINEERING - II

OBJECTIVES:

- To apply the thermodynamic concepts for systems like Nozzles, Boilers, Turbines, and Refrigeration & Air Conditioning Systems.
- To understand the concept of utilising residual heat in thermal systems.

UNIT I STEAM NOZZLE
9
Types and Shapes of nozzles, Flow of steam through nozzles, Critical pressure ratio, Variation of mass flow rate with pressure ratio. Effect of friction. Metastable flow.

UNIT II BOILERS
9

UNIT III STEAM TURBINES
9
Types, Impulse and reaction principles, Velocity diagrams, Work done and efficiency – optimal operating conditions. Multi-staging, compounding and governing.

UNIT IV COGENERATION AND RESIDUAL HEAT RECOVERY
9
UNIT V  REFRIGERATION AND AIR – CONDITIONING


TOTAL: 45 PERIODS

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

- Understand the working of Nozzles, Boilers & Steam Turbines and their performance
- Understand cogeneration, its types, source of residual heat and their utilising techniques
- Understand the working of Refrigeration & Air-conditioning systems and perform cooling load calculations to determine heating loads

TEXT BOOKS:

REFERENCES:

PTME7411  THERMAL ENGINEERING LABORATORY  L  T  P  C
0  0  3  2

OBJECTIVES:
To understand the working of a thermal equipments like IC engines, compressor, and refrigeration

IC ENGINES LAB
1. Valve timing on a four stroke SI and CI engine
2. Port Timing of a Two stroke SI engine
3. Performance test on a CI engine with electrical loading
4. Performance test on a SI engine with electrical loading
5. Performance Test on a Multi-stage Reciprocating Air Compressor

HEAT TRANSFER LAB:
1. Determination of Thermal conductivity of a composite wall
2. Effectiveness of Parallel / counter flow heat exchanger
3. Determination of heat transfer coefficient under natural convection from a vertical cylinder.
4. Determination of heat transfer coefficient under forced convection from a tube.
5. Heat transfer from pin-fin apparatus (natural & forced convection modes)
6. Determination of COP of a vapour compression refrigeration system

TOTAL: 30 PERIODS
OBJECTIVES:

- To understand fundamental concepts of computer graphics and its tools in a generic framework.
- To provide clear understanding of CAD systems for 3D modeling and viewing.

UNIT I  FUNDAMENTALS OF COMPUTER GRAPHICS  9
Product cycle- Design process – Computer Aided Design – Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - graphic primitives (point, line, circle drawing algorithms) - Clipping- viewing transformation.

UNIT II  GEOMETRIC MODELING  9
Representation of curves - Hermite cubic spline curve, Bezier curve, B-spline curves, Surface Modeling – Surface Entities, Representation of Surface, Bezier Surface, B-Spline Surface and Coons Surface. Solid Modeling - Solid Entities, Solid Representation, Boundary Representation (B-Rep), Sweeps Representation, Constructive Solid Geometry (CSG).

UNIT III VISUAL REALISM  9

UNIT IV  PART ASSEMBLY  9
Mass properties - Assembly modeling – Inference of position and orientation –Geometric Dimensioning and Tolerancing – Functional importance of various types of fits, Geometrical dimensioning and Tolerancing, Tolerance stacking – types and remedies.

UNIT V  CAD STANDARDS  9
Standards for computer graphics- Graphical Kernel System (GKS) - Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, ACIS and DXF - communication standards.

TOTAL : 45 PERIODS

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

- Understand the various stages in the design process and the role of computer graphic communication process.
- Understand the mathematics behind the use of computer for modeling of mechanical components

TEXT BOOK:

REFERENCES:
OBJECTIVE:
- To understand the application of computers in various aspects of Manufacturing viz., Design, Planning, Manufacturing cost, Layout & Material Handling system.

UNIT I  INTRODUCTION  9

UNIT II  PRODUCTION PLANNING & CONTROL AND COMPUTERISED PROCESS PLANNING  9

UNIT III  CELLULAR MANUFACTURING  9

UNIT IV  FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)  9

UNIT V  INDUSTRIAL ROBOTICS  9

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Acquire the required capability to gradually convert Traditional Manufacturing environment to Computer Integrated Manufacturing environment.

TEXT BOOK:
REFERENCES:

PTME7503 DESIGN OF MACHINE ELEMENTS

OBJECTIVES
• To familiarize the various steps involved in the Design Process
• To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
• To learn to use standard practices and standard data
• To learn to use catalogues and standard machine components

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS
Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties – Stresses in members subjected to axial, shear, Bending, Torsional & Eccentric loading. Uniaxial, Biaxial & Triaxial stress state, Principal Stresses in members subjected to combination of static loads.
Theories of Failure Criterion - Types of variable/Cyclic loads, Fatigue Failure, Endurance Limit & Strength, S-N Diagram. Goodman and Soderberg criterion, Modifying factors: Size effect, surface effect, Reliability, stress concentration effects etc.

UNIT II CURVED BEAMS, SHAFTS AND COUPLINGS
Differences between Straight & curved beam, Stresses in curved Beams subjected to Direct and Bending loading of Standard cross sections (Circular, Rectangular, Trapezium, Triangle, I & T Sections) used in crane hook, punching presses & clamps, Closed rings & chain links
Types of shafts- Design of solid & hollow shaft on strength and rigidity basis - Design of shafts carrying pulleys & gears (Combined loading). ASME Code for shaft design.
Types of couplings -Design of muff and flange couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS
Design of Bolted and riveted joints for structures including eccentric loading- Design of Welded joints, Strength of Butt, parallel, transverse welds, eccentrically loaded welded joint subjected to torsion & bending moment.

UNIT IV ENERGY STORING ELEMENTS
Types and materials of Springs, Terms used in Compression Springs, Stresses in helical spring of circular wire, deflection of helical spring of circular wire, Energy stored in helical spring of circular wire, helical spring subjected to fatigue loading, spring, leaf spring, construction of leaf spring, equalized stresses in spring leaves, length of leaf spring leaves - Flywheels considering stresses in rims and arms for engines and punching machines.
UNIT V  BEARINGS

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
Upon completion of this course, the students can able to successfully design machine components

TEXT BOOK:

REFERENCES:

STANDARDS:

PTME7504  FINITE ELEMENT ANALYSIS  L  T  P  C
3  0  0  3

OBJECTIVES:
• To introduce the concepts of Mathematical Modeling and numerical solution of engineering problems.
• To appreciate the use of Finite Element Method to a range of engineering problems.

UNIT I  INTRODUCTION
UNIT II  ONE-DIMENSIONAL PROBLEMS  

UNIT III  TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS  

UNIT IV  TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS  

UNIT V  ISOPARAMETRIC FORMULATION AND ADVANCED TOPICS  

TOTAL:45 PERIODS

OUTCOMES: 
Upon completion of this course, the students will be able to:
• Understand the use of the FEM to solve problems in Mechanical Engineering.
• Use the Finite Element Method to solve Structural, thermal and Eigen value problems.

TEXT BOOKS:  

REFERENCES:  
OBJECTIVES:
- To provide student with knowledge on the application of fluid power in process, construction and manufacturing Industries.
- To provide students with an understanding of the fluids and components utilized in modern industrial fluid power system.
- To develop a measurable degree of competence in the design, construction and operation of fluid power circuits.

UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS

UNIT II HYDRAULIC ACTUATORS AND CONTROL COMPONENTS

UNIT III HYDRAULIC CIRCUITS AND SYSTEMS
Accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double-Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Hydrostatic transmission, Electro hydraulic circuits, Mechanical hydraulic servo systems.

UNIT IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS

UNIT V TROUBLE SHOOTING AND APPLICATIONS

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Identify hydraulic and pneumatic components and its symbol and usage.
- Ability to design hydraulic and pneumatic circuits.

TEXT BOOKS:
REFERENCES:

PTME7601 DESIGN OF TRANSMISSION SYSTEMS L T P C
3 0 0 3

OBJECTIVES
• To gain knowledge on the principles and procedures for the design of mechanical power transmission components.
• To understand the standard procedures available for design of transmission elements.

UNIT I DESIGN OF FLEXIBLE ELEMENTS 9
Design of Flat belts and pulleys - Selection of V belts and sheaves – Selection of wire ropes and pulleys – Design of Transmission chains and Sprockets.

UNIT II SPUR AND HELICAL GEARS 9
Gear materials - Design of straight tooth spur & helical gears based on speed ratios, number of teeth, Fatigue strength, Factor of safety, strength and wear considerations. Force analysis - Tooth stresses - Dynamic effects - Helical gears – Module - normal and transverse, Equivalent number of teeth - forces.

UNIT III BEVEL AND WORM GEARS 9
Straight bevel gear: Gear materials - Tooth terminology, tooth forces and stresses, equivalent number of teeth, estimation of dimensions of straight bevel gears.
Worm Gear: Gear materials - Tooth terminology, Thermal capacity, forces and stresses, efficiency, estimation of dimensions of worm gear pair.

UNIT IV GEAR BOXES 9

UNIT V CLUTCHES, BRAKES AND CAMS 9
Design of single and multi plate clutches, cone clutches, internal expanding rim clutches. Design of brakes: External shoe brakes - Single and Double Shoe, Internal expanding shoe brakes.
Design of Cams: Types- Pressure angle and under cutting, determination of base circle -forces and surface stresses.

TOTAL:45 PERIODS

Note: (Use of standard Design Data Book is permitted in the University examination)
OUTCOMES:
Upon completion of this course, the students will be able to:

- Appreciate the functions of various transmission elements and their assemblies
- Design different transmission components according to the requirement as per standards using data books.

TEXT BOOKS:

REFERENCES:

PTME7602 HEAT AND MASS TRANSFER L T P C
3 0 0 3

OBJECTIVES:
- To understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

UNIT I CONDUCTION

UNIT II CONVECTION
UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS

UNIT IV RADIATION

UNIT V MASS TRANSFER

TOTAL:45 PERIODS

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

• Understand and apply different heat and mass transfer principles of different applications.

TEXT BOOKS:

REFERENCES:

PTME7603 METROLOGY AND MEASUREMENTS

OBJECTIVE:
• To expose the science behind the measurements and their applications in manufacturing industries in quality control.

UNIT I BASICS OF METROLOGY
UNIT II  LINEAR AND ANGULAR MEASUREMENTS

UNIT III  METROLOGY OF SURFACES

UNIT IV  METROLOGY OF ASSEMBLY AND TRANSMISSION ELEMENTS

UNIT V  ADVANCES IN METROLOGY

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
• Make logical, rational and economical choice of measuring equipment / method to analyse and improve manufacturing processes.

TEXT BOOKS:

REFERENCES:
9. NPL Measurement good practice guides relevant to the syllabus – No. 40, No. 41, No. 42, No. 43, No. 80, No. 118, No. 130, No. 131.
OBJECTIVES:
- To give exposure to software tools needed to analyze engineering problems.
- To expose the students to different applications of simulation and analysis tools.

UNIT I  SIMULATION
LIST OF EXPERIMENTS
1. MANUAL PART PROGRAMMING:
   (i) Part Programming - CNC Machining Centre
       a) Linear Cutting.
       b) Circular cutting.
       c) Cutter Radius Compensation.
       d) Canned Cycle Operations.
   (ii) Part Programming - CNC Turning Centre
       a) Straight, Taper and Radius Turning.
       b) Thread Cutting.
       c) Rough and Finish Turning Cycle.
       d) Drilling and Tapping Cycle.
2. COMPUTER AIDED PART PROGRAMMING
   e) CL Data and Post process generation using CAM packages.
   f) Application of CAPP in Machining and Turning Centre.
3. STUDY OF CNC EDM, CNC EDM WIRE-CUT AND RAPID PROTOTYPING.

UNIT II  ANALYSES
LIST OF EXPERIMENTS
Use of any finite element analysis software for following problems:
1. Force and Stress analysis using link elements in Trusses, cables and bars.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of flat plates and simple shells.
5. Thermal stress and heat transfer analysis of fins, plates and cylinders.
6. Vibration analysis of spring-mass systems.
7. Modal analysis of Beams.
8. Harmonic, transient and spectrum analysis of simple systems

OUTCOME:
Upon completion of this course, the students will be able to:
- Understand the use of analysis and simulation software to solve problems in Mechanical Engineering.
OBJECTIVE:
- To impart knowledge about the elements and techniques involved in Mechatronics systems in understanding the concept of automation.

UNIT I  INTRODUCTION

UNIT II  8085 MICROPROCESSOR

UNIT III  PROGRAMMABLE PERIPHERAL INTERFACE

UNIT IV  PROGRAMMABLE LOGIC CONTROLLER
Introduction – Architecture – Input / Output Processing – Programming with Timers, Counters and Internal relays – Data Handling – Selection of PLC.

UNIT V  ACTUATORS AND MECHATRONICS SYSTEM DESIGN

OUTCOME:
Upon completion of this course, the students will be able to:
- Design Mechatronics systems with the help of Microprocessor, PLC and other Electrical and Electronics Circuits.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

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

UNIT I  HYDRO POWER PLANTS

UNIT II  COAL, OIL AND GAS TURBINE POWER PLANTS

UNIT III  NUCLEAR POWER PLANTS

UNIT IV  RENEWABLE ENERGY POWER PLANTS

UNIT V  ECONOMICS OF POWER GENERATION

TOTAL: 45 PERIODS

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

- Understand the working of different power plants
- Arrive at cost of power generation, electricity billing and rate of return on power plant investments

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.
- A project topic must be selected by the students in consultation with their guides.
- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and fabrication of a device for a specific application, a research project with a focus on an application needed by the industry/society, a computer project, a management project or a design project.
- The progress of the project is evaluated based on a minimum of three reviews.
- The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

TOTAL: 135 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Take up any challenging practical problems and find solution by formulating proper methodology.

OBJECTIVES:
- To know the principle, methods, possibilities and limitations as well as environmental effects of Additive Manufacturing technologies.
- To be familiar with the characteristics of the different materials those are used in Additive Manufacturing technologies.

UNIT I INTRODUCTION

UNIT II DESIGN FOR ADDITIVE MANUFACTURING
UNIT III PHOTO POLYMERIZATION AND POWDER BED FUSION PROCESSES


UNIT IV EXTRUSION BASED AND SHEET LAMINATION PROCESSES


UNIT V PRINTING PROCESSES AND BEAM DEPOSITION PROCESSES


TOTAL: 45 PERIODS

OUTCOME:
- On completion of this course, students will learn about a working principle and construction of Additive Manufacturing technologies, their potential to support design and manufacturing, modern development in additive manufacturing process and case studies relevant to mass customized manufacturing.

TEXT BOOKS:

REFERENCES:

UNIT I SPARK IGNITION ENGINES

UNIT II  COMPRESSION IGNITION ENGINES

UNIT III  POLLUTANT FORMATION AND CONTROL

UNIT IV  ALTERNATIVE FUELS
Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits - Engine Modifications.

UNIT V  RECENT TRENDS
Air assisted Combustion, Homogeneous charge compression ignition engines – Variable Geometry turbochargers – Common Rail Direct Injection Systems - Hybrid Electric Vehicles – NO\textsubscript{x} Adsorbers - Onboard Diagnostics.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to
- Understand the combustion process, and the fuel injection techniques adopted in modern day IC engines
- Adopt potential alternative fuel systems and exposed to recent developments in engine technology.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To provide a first course of teaching such that the learners are able to visualise the scope of Automobile Engineering.

UNIT I  INTRODUCTION TO AUTOMOTIVES  9
An overview of different types of automobiles and their power sources. Specifications, Performance Parameters, Quality standards, Trends in automobile design.

UNIT II  POWER SOURCE FEATURES  9
Reciprocating Engine systems, Rotary Engine systems, Gas Turbine systems, Hybrid systems. Pollutant emissions and their control; Catalytic converter systems, Electronic Engine Management systems.

UNIT III  TRANSMISSION, SUSPENSION AND BRAKING SYSTEMS  9
Clutch system, Gear box system, propeller shafting, differential, axles, wheels and tyres and preliminaries of suspension systems.

UNIT IV  AUXILIARY SYSTEMS  9
Electrical and electronic systems, safety systems, Heating, Ventilation, and Air Conditioning (HVAC) systems, Vehicle Thermal Management System and vehicle body design features.

UNIT V  TESTS, SERVICE AND MAINTENANCE  9
Engine Tuning, vehicle maintenance, engine and Chassis Dynamometry Pollutants and emissions check, Wind Tunnel Tests, preliminaries of engine and vehicle testing.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Identify the different components in an automobile.
- Clearly understand different auxiliary and transmission systems.

TEXT BOOK:

REFERENCES:
OBJECTIVE:

- To impart knowledge on Design of Gating system for Castings, Foundry Practice of Ferrous, Non Ferrous alloys, Foundry Mechanisation, Welding Processes and Welding Metallurgy.

UNIT I DESIGN OF GATING SYSTEM


UNIT II FERROUS AND NON FERROUS CASTINGS

Steel Casting – The family of cast iron – melting of steels and cast irons – Grey iron foundry practice – Ductile iron – Malleable Iron casting design – Aluminium, Magnesium, Copper, Zinc, Duplex Stainless Steel and Titanium alloys foundry practice.

UNIT III FOUNDRY MECHANISATION

Mechanical equipments in foundry – plant site location, layout – Plant Engineering – Maintenance – Services – Practical aspects.

UNIT IV WELDING PROCESS AND TECHNOLOGY


UNIT V WELDING METALLURGY


OUTCOMES:

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

- Design gating system for castings, understand the foundry practices of ferrous and non ferrous metals.
- Understand the various aspects of foundry mechanization, welding metallurgy and certain welding processes.

TEXT BOOK:


REFERENCES:

OBJECTIVES:
To understand:
- The fundamentals of composite material strength and its mechanical behavior
- Fibre reinforced Laminate design for different combinations of plies with different orientations of the fibre.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
- Implementation of Classical Laminate Theory (CLT) and analysis for residual stresses in an isotropic layered structure such as electronic chips.

UNIT I  INTRODUCTION TO COMPOSITE MATERIALS  9

UNIT II  MANUFACTURING OF COMPOSITES  9
Manufacturing of Polymer Matrix Composites (PMCs)-handlay-up, spray technique, filament winding, Pultrusion, Resin Transfer Moulding (RTM)-, bag moulding, injection moulding, Sandwich Mould Composites (SMC) - Manufacturing of Metal Matrix Composites (MMCs) - Solid state, liquid state, vapour state processing, Manufacturing of Ceramic Matrix Composites (CMCs) –hot pressing-reaction bonding process-infiltration technique, direct oxidation- interfaces.

UNIT III  INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS  9

UNIT IV  LAMINA STRENGTH ANALYSIS AND ANALYSIS OF LAMINATED FLAT PLATES  9

UNIT V  THERMAL ANALYSIS  9

TOTAL:45 PERIODS
OUTCOME:
- The students will be able to understand the mechanics and design related to layered components such as fiber reinforced polymer composites, isotropic layered structures (example electronic chips) etc and its manufacturing methodologies.

TEXT BOOKS:

REFERENCES:

PTME7005 COMPUTATIONAL TECHNIQUES FOR FLUID DYNAMICS

OBJECTIVES:
- To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
- To create confidence in solving complex problems in the field of fluid flow and heat transfer by using high speed computers.

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS

UNIT II FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION
UNIT III  FINITE VOLUME METHOD FOR CONVECTION DIFFUSION  9
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes properties of discretization schemes – Conservativeness, Boundedness, Transportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT IV  FLOW FIELD ANALYSIS  9

UNIT V  TURBULENCE MODELS AND MESH GENERATION  9

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Create numerical models and their role in the field of fluid flow and heat transfer
- Use the various discretization methods, solution procedures and turbulence models to solve flow and heat transfer problems.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To understand the design constraints in manufacturing and assembly operations.

UNIT I INTRODUCTION AND CASTING
Introduction - Economics of process selection - General design principles for manufacturability; Design considerations for: Sand cast – Die cast – Permanent mold cast parts.

UNIT II FORMING
Design considerations for: Metal extruded parts – Impact/Cold extruded parts – Stamped parts – Forged parts.

UNIT III WELDING

UNIT IV MACHINING
Design considerations for: Turned parts – Drilled parts – Milled, planed, shaped and slotted parts– Ground parts.

UNIT V ASSEMBLY

OUTCOME:
Upon completion of this course, the students will be able to:
- Gain technical competency in design modification of components / products with respect to manufacturability.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To learn thermal and stress analysis on various parts of the heat exchangers
- To analyze the sizing and rating of the heat exchangers for various applications.

UNIT I INTRODUCTION
Types of heat exchangers, shell and tube heat exchangers – regenerators and recuperators - Temperature distribution and its implications - Parts description, Classification as per Tubular Exchanger Manufacturers Association (TEMA).

UNIT II PROCESS DESIGN OF HEAT EXCHANGERS

UNIT III STRESS ANALYSIS
Stress in tubes – header sheets and pressure vessels – thermal stresses, shear stresses - types of failures, buckling of tubes, flow induced vibration.

UNIT IV COMPACT AND PLATE HEAT EXCHANGER
Types- Merits and Demerits- Design of compact heat exchangers, plate heat exchangers, performance influencing parameters, limitations.

UNIT V CONDENSERS AND COOLING TOWERS
Design of surface and evaporative condensers – cooling tower – performance characteristics.

OUTCOME:
Upon completion of this course, the students will be able to:
- Apply the mathematical knowledge for thermal and stress analysis of various parts of the heat exchangers components.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand the importance, functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of standard views of the final design.

UNIT I PRINCIPLES OF JIGS, FIXTURES AND PRESS WORKING 9
Objectives and importance of tool design—work holding devices- Basic elements of jigs and fixtures- location – clamping-indexing-operational chart-Fits and Tolerances

UNIT II JIGS 9
Design and development of jigs for given component - Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs.

UNIT III FIXTURES 9
Design and development of fixtures for given component- General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT IV DESIGN OF CUTTING DIES 9
Complete design and preparation of standard views of simple blanking, piercing, compound and progressive dies -fine Blanking dies.

UNIT V DESIGN OF BENDING, FORMING, DRAWING AND MISCELLANEOUS DIES 9

TOTAL:45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
Upon completion of this course, the students will be able to:
- Design jigs, fixtures and press tools and give the assembly drawing with dimensions and Parts list.
- Use the above knowledge to design various types of dies and give the standard dimensioned views

TEXT BOOKS:
REFERENCES:

PTME7009 DESIGN OF PRESSURE VESSELS AND PIPING  L  T  P  C
3  0  0  3

OBJECTIVES:
- To apply the Mathematical knowledge gained in the design of pressure vessels and piping
- To carry out the stress analysis in pressure vessels and piping.

UNIT I INTRODUCTION

UNIT II STRESSES IN PRESSURE VESSELS
Introduction – Stresses in a circular ring, cylinder –Dilation of pressure vessels, Membrane stress
Analysis of Vessel – Cylindrical, spherical and, conical heads – Thermal Stresses – Discontinuity
stresses in pressure vessels.

UNIT III DESIGN OF VESSELS
Design of Tall cylindrical self supporting process columns – Supports for short vertical vessels –
Stress concentration at a variable Thickness transition section in a cylindrical vessel, about a
circular hole, elliptical openings. Theory of Reinforcement – Pressure Vessel Design.

UNIT IV BUCKLING AND FRACTURE ANALYSIS IN VESSELS
Buckling phenomenon – Elastic Buckling of circular ring and cylinders under external pressure –
collapse of thick walled cylinders or tubes under external pressure – Effect of supports on Elastic
Buckling of Cylinders – Buckling under combined External pressure and axial loading.

UNIT V PIPING

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Apply the mathematical fundamentals for the design of pressure vessels and pipes.
- Analyse and design pressure vessels and piping.

TEXT BOOK:
1. John F. Harvey, “Theory and Design of Pressure Vessels”, CBS Publishers and Distributors,
1987.
REFERENCES:

PTGE7071 DISASTER MANAGEMENT L T 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 stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

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

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

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

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, Scenarios in the Indian context,
- Disaster damage assessment and management.

TEXT BOOKS:

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

PTME7010 ENERGY CONSERVATION IN INDUSTRIES

OBJECTIVES:
- To understand and analyse the energy data of industries.
- To carry out energy accounting and balancing.
- To conduct energy audit and suggest methodologies for energy savings.
- To utilise the available resources in optimal ways.

UNIT I: INTRODUCTION

UNIT II: ECONOMICS
UNIT III  ELECTRICAL SYSTEMS  9

UNIT IV  THERMAL SYSTEMS  9

UNIT V  ENERGY CONSERVATION IN MAJOR UTILITIES  9
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems - Cooling Towers – D.G. sets

TOTAL:45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
• Analyse the energy data of industries.
• Carry out energy accounting and balancing.
• Suggest methodologies for energy savings.

TEXT BOOK:

REFERENCES:

PTGE7072  ENGINEERING ETHICS AND HUMAN VALUES  L T P C
3 0 0 3

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

UNIT I  HUMAN VALUES  3

UNIT II  ENGINEERING ETHICS  9
UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime - the challenger case study.

UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY

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

TOTAL : 45 PERIODS

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

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- The students will be provided with an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

UNIT I ENTREPRENEURSHIP

UNIT II MOTIVATION

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING

UNIT V SUPPORT TO ENTREPRENEURS

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of the course, the students will be able to:
- Gain knowledge and skills needed to run a business successfully.

TEXT BOOKS:

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

UNIT I  INTRODUCTION  8
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  9
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  12
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, Quantum wires, Quantum dotspreparation,
properties and applications

UNIT IV  CHARACTERIZATION TECHNIQUES  9
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  7
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
Cambridge, Wiley-VCH, 2000

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

- To understand the fundamentals of compressible flow in constant and variable area ducts.
- To understand the behaviour of shock waves and its effect on flow.
- To gain basic knowledge about Jet and Rocket propulsion.

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS


UNIT II FLOW THROUGH DUCTS

Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties. Choking concept, Isothermal flow with friction. Use of Gas tables.

UNIT III NORMAL AND OBLIQUE SHOCKS


UNIT IV JET PROPULSION

Theory of jet propulsion – thrust equation – Performance parameters - thrust, power and efficiency. Operation, cycle analysis and performance of ram jet, turbojet, turbofan, turbo prop and pulse jet engines.

UNIT V SPACE PROPULSION


TOTAL: 45 PERIODS

OUTCOME:

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

- Apply the principles of gas dynamics in Jet and Space Propulsion.

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

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

REFERENCES:
OBJECTIVE:
- To introduce the concepts in optimization of resources for manufacturing and service based industries.

UNIT I  LINEAR PROGRAMMING PROBLEMS  9
OR-Definition - Phases - models, LP problems formulation – Graphical solution, GLPP, Standard and Canonical forms of LPP- simplex methods- Big M, Two phase methods, Alternate optimal solutions, Duality in LP.

UNIT II  TRANSPORTATION  9
Transportation problems- Basic feasible solution, Optimal solution By MODI method, Balanced and Unbalanced TP, Degeneracy, Production problems. Assignment problems – Hungarian method Traveling salesman problems - Sequencing models- Johnson algorithm, n job 2 machines, n job 3 machines and n job m machines.

UNIT III  INVENTORY CONTROL  9
Types of inventory- Inventory cost - EOQ - Deterministic inventory problems – Purchase and Production models with and without shortages-EOQ with price breaks - Stochastic inventory problems - Multi product problems - Systems of inventory control (P and Q Systems)- Determination of buffer stock and re-order levels -Selective inventory control techniques (ABC, VED, SDE, etc.)

UNIT IV  QUEUING THEORY  9
Queuing system - Characteristics - symbols - Poisson process and exponential distribution -Single server queuing models - Multiserver queuing models, Simulation Monte Carlo technique- Inventory & Queuing problems.

UNIT V  PROJECT MANAGEMENT AND REPLACEMENT MODELS  9
Project management: Network logic – Ford-Fulkerson’s rule - AON diagram - CPM and PERT techniques, Critical path and float calculations Replacement models -types of failures – Gradual failures-replacement of items: Efficiency deteriorates with time, sudden failures- individual and group replacement policies.

OUTCOME:
Upon completion of this course, the students will be able to:
- Understand and apply the operations research techniques in industrial operations.

TEXT BOOKS:
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
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
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

UNIT IV DIGITAL PRODUCTS AND LAW

UNIT V ENFORCEMENT OF IPRs
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL :45 PERIODS

OUTCOME:
• Ability to manage Intellectual Property portfolio to enhance the value of the firm.
TEXT BOOKS:

REFERENCES:

PTME7014 MARKETING MANAGEMENT

OBJECTIVE:
- To expose the students to newer concepts of marketing principles like strategic marketing concepts, segmentation, pricing, advertisement and strategic formulation.

UNIT I CONCEPTS IN MARKETING

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION
Cultural, Demographic factors, Motives, Types, Buying Decisions, Segmentation factors, Demographic, Psychographic and Geographic Segmentation, Process, Patterns. Services marketing and Industrial marketing.

UNIT III PRODUCT, PRICE AND MARKETING RESEARCH

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION

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

- Understand the philosophies of marketing and should be able to formulate market planning, strategies and could promote sales in effective manner.

TEXT BOOKS:

REFERENCES:

PTPH7152 MATERIALS SCIENCE L T P C
(Common to Manufacturing, Industrial, Mining, Aeronautical, Automobile and Production Engineering) 3 0 0 3

OBJECTIVE:
- To introduce the essential principles of materials science for mechanical and related Engineering applications.

UNIT I PHASE DIAGRAMS
Solid solutions - Hume Rothery's rules - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT II FERROUS ALLOYS AND HEAT TREATMENT
UNIT III MECHANICAL PROPERTIES

UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS

UNIT V NEW MATERIALS

OUTCOME:
• Upon completion of this course, the students can able to apply the different materials, their processing, and heat treatments in suitable application in mechanical engineering fields.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To understand the sources of vibration and noise in various systems.
- To apply the various control techniques to reduce the vibration and noise and improve the life of the components.

UNIT I  BASICS OF VIBRATION
Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II  BASICS OF NOISE
Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III  AUTOMOTIVE NOISE SOURCES

UNIT IV  TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS
Vibration isolation, tuned absorbers, un-tuned viscous dampers, damping treatments, dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V  SOURCES OF NOISE AND ITS CONTROL
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Appreciate the need and its relevance for vibration and noise studies
- Gain knowledge on measurement of vibration and noise levels in machineries and its components.
- Expose themselves to various control measures of both vibration and noise in different industrial applications.

TEXT BOOKS:

REFERENCES:

PTME7016 MEMS AND MICROSYSTEMS L T P C
3 0 0 3

OBJECTIVES:
- To understand the basic engineering concepts of MEMS.
- To gain knowledge about the various Micromanufacturing Techniques.
- To comprehend the working principle of Microsensors and Actuators.
- To realize the concepts of Microfluidics and the applications of MEMS.

UNIT I BASIC ENGINEERING FOR MEMS

UNIT II MICROMANUFACTURING TECHNIQUES
Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition, Physical Vapour Deposition-Sputtering, Deposition by Epitaxy, Etching, Bulk Micromanufacturing, Micromachining Processes, LIGA Process, Microsystem Assembly and Testing.

UNIT III ELECTROSTATIC AND THERMAL BASED MEMS

UNIT IV PIEZO / RESISTIVE / ELECTRIC AND MAGNETIC BASED MEMS

UNIT V MICROFLUIDICS AND APPLICATIONS OF MEMS
Microfluidics - Fluid Mechanics Concepts, Design and Fabrication of Channels, Valves, Pumps, Case Studies - Accelerometer, Gyros, RF MEMS and MOEMS.

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

- Understand the working principle of MEMS and methods of manufacturing Microsystems.
- Select suitable Microsystems for Industrial applications.

TEXT BOOKS:

REFERENCES:

PTME7017 NEW AND RENEWABLE SOURCES OF ENERGY

OBJECTIVES:
- To instruct the importance of renewable energy sources and its utilization.
- To educate the various renewable energy technologies.

UNIT I SOLAR ENERGY

UNIT II WIND ENERGY

UNIT III BIO-ENERGY

UNIT IV OCEAN AND GEOTHERMAL ENERGY

UNIT V NEW ENERGY SOURCES

TOTAL:45 PERIODS
OUTCOME:
Upon completion of this course, the students will be able to:
- Know the importance of renewable energy sources utilization and various renewable energy technologies.

TEXT BOOKS:

REFERENCES:

PTME7018 NONDESTRUCTIVE MATERIALS EVALUATION L T P C

OBJECTIVE:
- To impart knowledge on various Non-Destructive Evaluation and Testing methods, Interpretation of results, theory and their industrial applications.

UNIT I INTRODUCTION AND VISUAL INSPECTION METHODS
NDT versus Mechanical testing, Need for NDT, Relative merits and limitations, various physical characteristics of materials and their applications in NDT.
Visual Inspection- Unaided, Aided- Borescopes - Videoscopes, Special features in Borescopes, Selection of borescopes, Optical sensors, Microscopes & replication Microscopy Technique and applications.

UNIT II LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING
LPT - Principle, types, Procedures, Penetrants and their characteristics, Emulsifiers, Solvent Cleaners / Removers, Developers- properties and their forms, Equipments, Advantages and limitations, Inspection and Interpretation, Applications.

UNIT III THERMOGRAPHY AND EDDY CURRENT TESTING
Thermography – Introduction, Principle, Contact & Non-Contact inspection methods, Active & Passive methods, Liquid Crystal – Concept, example, advantages & limitations. Electromagnetic spectrum, infrared thermography- approaches, IR detectors, Instrumentation and methods and applications.
Eddy current Testing – Principle, properties of eddy currents, Eddy current sensing elements, probes, Instrumentation, Types of arrangement, Advantages & Limitations, Interpretation of Results & applications.
UNIT IV  ULTRASONIC TESTING AND ACOUSTIC EMISSION TESTING  9
Ultrasonic Testing-Principle, Basic Equipment, Transducers, couplants, Ultrasonic wave, Variables in UT, Transmission and Pulse-echo method, Straight beam and angle beam, A-Scan, B-Scan & C-Scan, Phased Array Ultrasound & Time of Flight Diffraction, Advantages & Limitations, Interpretation of Results & Applications.

UNIT V  RADIOGRAPHY  9

OUTCOME:
Upon completion of this course, the students will be able to:
- Evaluate and interpret components / products through NDT either as Quality Assurance Team Member or Production Team Member.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
At the end of this course the students are expected to
• Understand the working principles of various non-traditional machining processes, their applications, advantages and limitations.
• The students can also learn advanced nano finishing processes, recent developments in the non-traditional machining processes and to compare them.

UNIT I INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES 9
Introduction to non-traditional machining processes, need for non-traditional machining, classification of non-traditional machining processes, their applications, advantages, limitations. Abrasive jet machining, abrasive water jet machining, ultrasonic machining their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT II CHEMICAL AND ELECTROCHEMICAL ENERGY BASED PROCESSES 9
Chemical machining, electro-chemical machining, electro-chemical honing, electro-chemical grinding, electro-chemical deburring their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT III THERMO-ELECTRIC ENERGY BASED PROCESSES 9
Electric discharge machining, wire electric discharge machining, laser beam machining, plasma arc machining, electron beam machining, Ion beam machining their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT IV ADVANCED NANO FINISHING PROCESSES 9
Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magneto rheological abrasive flow finishing their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT V RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES 9
Recent developments in non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Comparison of non-traditional machining processes.

OUTCOMES:
At the end of this course the students are expected to understand
• The working principles of various non-traditional machining processes, their applications, advantages and limitations.
• Advanced nano finishing processes.
• Recent developments in the non-traditional machining processes.
• Comparison of non-traditional machining processes.

TEXT BOOKS:
REFERENCES:

PTMA7071 PROBABILITY AND STATISTICS

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 ( $\bar{X}$ 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 to characterize probability models using probability mass (density) functions and 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:

PTME7019 PROCESS PLANNING AND COST ESTIMATION L T P C 3 0 0 3

OBJECTIVE:
- To give an understanding of the fundamentals of Process Planning and estimation of appropriate costs of processes and products and applying these to manage competitive manufacturing systems and organisations.

UNIT I INTRODUCTION TO PROCESS PLANNING 9
Aims and Objectives, Place of process planning in Manufacturing cycle, Drawing interpretation, Dimensional tolerance vs Production processes.

UNIT II PROCESS PLANNING STEPS 9
Design of a process plan – Selection of production processes, tools and process parameters-Positioning and work holding devices, Selection of inspection devices and tools, Documenting the process plan, Simple Case studies.

UNIT III INTRODUCTION TO COST ESTIMATION 9
Importance, Types, Purpose, Components, Procedure, Classification of costs, Cost elements, Overhead expenses, Break-even analysis.

UNIT IV PRODUCTION COST ESTIMATION 9
Estimation of production cost for - Casting processes, Welding processes, and Forging processes.
UNIT V  ESTIMATION OF MACHINING TIME AND COST

Estimation of Machining time – Lathe operations, Drilling, Milling, Shaping and Planing, and Grinding, Cost estimation for machining processes.

TOTAL: 45 PERIODS

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

- Make logical, rational and economical process plans and realistic cost estimates of Components and Products.

TEXT BOOKS:

REFERENCES:

PTME7020  PRODUCT DESIGN AND DEVELOPMENT  L  T  P  C
3  0  0  3

OBJECTIVES:
- To understand the basic concepts of Product Design and Process Development.
- To appreciate the importance, various stages, concepts, management and prototyping of products.

UNIT I  INTRODUCTION

UNIT II  PRODUCT PLANNING, IDENTIFYING CUSTOMER NEEDS, PRODUCT SPECIFICATION
Product Planning Process: Identification of opportunities; evaluation and prioritization of projects; allocation of resources & plan timing; completion of pre-project planning. Identification of Customer Needs: Collection of raw data from customers; interpretation of raw data of customer needs; organization of the needs into a hierarchy; establishment of relative importance of needs. Product Specifications: Establishment of Target Specifications, Setting-up of Final Specifications.
UNIT III CONCEPT GENERATION, SELECTION, TESTING 9
Concept Generation: clarification of the problem; searching externally; searching internally, systematic exploration. Concept Selection: concept screening steps; concept scoring steps. Concept Testing: Defining the purpose of concept test; choosing a survey population; format; communicating the concept; measuring the customer response; interpretation of results.

UNIT IV PRODUCT ARCHITECTURE, INDUSTRIAL DESIGN, DESIGN FOR MANUFACTURE 9

UNIT V PROTOTYPING AND MANAGING PRODUCTS 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Launch own ideas and the ideas of others, which would enable them to manage to work with innovation and development in large companies
- Apply new theories on innovation and change, including emerging paradigms such as user-driven innovation, open innovation and market forecasting in practice.

TEXT BOOK:

REFERENCES:

PTME7021 REFRIGERATION AND AIR - CONDITIONING L T P C
3 0 0 3

OBJECTIVE:
- To understand the principle of operation and design aspects of Refrigeration & Air conditioning systems and components.

UNIT I VAPOUR COMPRESSION REFRIGERATION SYSTEM 9
UNIT II   REFRIGERANTS AND COMPONENTS OF REFRIGERATION SYSTEMS  9
Refrigerants desirable properties – Classification - Nomenclature - ODP & GWP; Equipments: Type of Compressors, Condensers, Expansion devices, Evaporators.

UNIT III  OTHER REFRIGERATION SYSTEMS  9
Working principles of Vapour absorption systems and adsorption cooling systems - Steam jet refrigeration- Thermoelectric refrigeration- Air refrigeration - Magnetic - Vortex and Pulse tube refrigeration systems.

UNIT IV   PSYCHROMETRIC PROPERTIES AND PROCESSES  9

UNIT V   AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION  9
Air conditioning loads: Outside and inside design conditions; Heat transfer through structure, Solar radiation, Electrical appliances, Infiltration and ventilation, internal heat load; Apparatus selection; fresh air load, human comfort & IAQ principles, effective temperature & chart, calculation of summer & winter air conditioning load; Classifications, Layout of plants; Air distribution system. Air Conditioning Systems with Controls: Temperature, Pressure and Humidity sensors, Actuators & Safety controls, Filters.

TOTAL:45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Appreciate the principles of operation of different Refrigeration and Air conditioning systems in total as well as the significance of the various component system.

TEXT BOOKS:

REFERENCES:

PTML7001   RELIABILITY CONCEPTS IN ENGINEERING  L T P C
3 0 0 3

OBJECTIVE
- To impart knowledge in reliability concepts, reliability estimation methods and reliability improvement methods

UNIT I   RELIABILITY CONCEPT  9
Reliability definition –Reliability parameters- f(t), F(t) and R(t) functions- Measures of central tendency – Bath tub curve – A priori and posteriori probabilities of failure – Component mortality - Useful life.
UNIT II  LIFE DATA ANALYSIS
Data classification – Non parametric methods: Ungrouped, Grouped, Complete, Censored
data – Time to failure distributions – Probability plotting: Exponential, Weibull - Goodness
of fit tests – Survival graphs.

UNIT III  RELIABILITY ESTIMATION
Series parallel configurations – Parallel redundancy – m/n system – Complex systems:
RBD approach – Baye’s method – Minimal path and cut sets - Fault Tree analysis – Standby
system.

UNIT IV  RELIABILITY MANAGEMENT
Reliability testing: Failure terminated test – Time terminated test – Upper and lower

UNIT V  RELIABILITY IMPROVEMENT
Analysis of downtime – Repair time distribution – Maintainability prediction – Measures of
maintainability – Availability definitions – System Availability – Replacement decisions –
Economic life.

TOTAL: 45 PERIODS

OUTCOME
- The course enable student the application of reliability in various field of
engineering.

REFERENCES:
1. An Introduction to Reliability and Maintainability Engineering, Charles E.Ebeling,
2. Roy Billington and Ronald N. Allan, Reliability Evaluation of Engineering
3. Reliability Engineering, Srinath L S, East West Publisher, 4th
edition.

PTME7022  THEORY OF METAL FORMING

OBJECTIVES:
- To impart knowledge on plasticity, surface treatment for forming of various types of metal
forming process.
- To study the basic concepts of metal forming techniques and force calculation in metal
forming process.
- To study the thermo-mechanical regimes and its requirements in metal forming.

UNIT I  THEORY OF PLASTICITY
Theory of plastic deformation–Yield criteria–Tresca and von-Mises–Distortion energy–Stress-strain
relation–Mohr’s circle representation of a state of stress–cylindrical and spherical co-ordinate
systems–upper and lower bound solution methods–Overview of FEM applications in Metal
Forming.
UNIT II  THEORY AND PRACTICE OF BULK FORMING PROCESSES  9
Analysis of plastic deformation in Forging, Rolling, Extrusion, rod/wire drawing and tube drawing –
Effect of friction – calculation of forces, work done – Process parameters, equipment used –
Defects – applications – Recent advances in Forging, Rolling, Extrusion and Drawing processes – Design
consideration in forming.

UNIT III  SHEET METAL FORMING  9
Formability studies – Conventional processes – HERF techniques – Superplastic forming techniques –
Hydro forming – Stretch forming – Water hammer forming – Principles and process parameters –
Advantage, Limitations and application.

UNIT IV  POWDER METALLURGY AND SPECIAL FORMING PROCESSES  9
Overview of P/M technique – Advantages – applications – Powder preform forging – powder rolling
– Tooling, process parameters and applications - Orbital forging – Isothermal forging – Hot and
cold isostatic pressing – High speed extrusion – Rubber pad forming – Fine blanking – LASER
beam forming.

UNIT V  SURFACE TREATMENT AND METAL FORMING APPLICATIONS  9
Experiment techniques of evaluation of friction in metal forming selection – influence of
temperature and gliding velocity – Friction heat generation – Friction between metallic layers –
Lubrication carrier layer – Surface treatment for drawing, sheet metal forming, Extrusion, hot and
cold forging. Processing of thin Al tapes – Cladding of Al alloys – Duplex and triplex steel rolling
Thermo mechanical regimes of Ti and Al alloys during deformation – Formability of welded blank

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of the course the students will be able to:
• Use of mechanical and thermodynamics principle of plastic deformation to form the
components using different metal forming techniques.

TEXT BOOKS:

REFERENCES:
5. Altan T., “Metal forming – Fundamentals and applications” – American Society of Materials
7. Shiro Kobayashi, Soo-Ik Oh, Taylan Altan-“Metal forming and Finite Element Method”, Oxford
AIM

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

OBJECTIVES

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

UNIT I  INTRODUCTION

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

UNIT II  TQM PRINCIPLES

Leadership - The Deming Philosophy, Quality council, Quality statements and Strategic planning - Customer Satisfaction - Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal - Continuous process improvement - Juran Trilogy, PDSA cycle, 5s and Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III  TQM TOOLS & TECHNIQUES I


UNIT IV  TQM TOOLS & TECHNIQUES II

Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures - Cost of Quality - BPR.

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:

PTME7023 TURBO MACHINERY

OBJECTIVE:
- To understand the process of energy transfer and operating principles of various turbomachines and their use for various engineering applications.

UNIT I WORKING PRINCIPLES

UNIT II CENTRIFUGAL FANS AND BLOWERS

UNIT III CENTRIFUGAL COMPRESSOR

UNIT IV AXIAL FLOW COMPRESSOR

UNIT V AXIAL AND RADIAL FLOW TURBINES

TOTAL: 45 PERIODS

OUTCOME:
Upon completion of this course, the students will be able to:
- Explain the various systems, principles and applications and different types of turbo machinery components.
TEXT BOOKS:

REFERENCES:
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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 9
Characteristic equation – Eigen values and Eigenvectors of a real matrix – Properties of eigen values and eigenvectors – Cayley Hamilton theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 9

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

UNIT IV COMPLEX INTEGRATION 9

UNIT V LAPLACE TRANSFORMS 9

OUTCOMES:
- 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:

PTGE7151 COMPUTING TECHNIQUES
(Common to all branches of Engineering and Technology) 3 0 0 3

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

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

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

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

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL: 45 PERIODS
OUTCOMES
At the end of the course, the student should be able to:
• Write C program for simple applications
• Formulate algorithm for simple problems
• Analyze different data types and arrays
• Perform simple search and sort.
• Use programming language to solve problems.

TEXT BOOKS:

REFERENCES:

PTGE7152 ENGINEERING MECHANICS L T P C
3 0 0 3

OBJECTIVE :
The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I STATICS OF PARTICLES 9

UNIT II EQUILIBRIUM OF RIGID BODIES 9

UNIT III DISTRIBUTED FORCES 9
Centroids of lines and areas –symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration.
Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV   FRICTION
9

UNIT V   DYNAMICS OF PARTICLES
9

L–45 TOTAL: 45 PERIODS

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

TEXT BOOK

REFERENCES

PTPH7152   MATERIALS SCIENCE
(Common to Manufacturing, Industrial, Mining, Aeronautical, Automobile and Production Engineering)
L T P C
3 0 0 3

OBJECTIVE:
- To introduce the essential principles of materials science for mechanical and related engineering applications.

UNIT I   PHASE DIAGRAMS
9
Solid solutions - Hume Rothery’s rules - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.
UNIT II FERROUS ALLOYS AND HEAT TREATMENT


UNIT III MECHANICAL PROPERTIES


UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS


UNIT V NEW MATERIALS


OUTCOME:

• Upon completion of this course, the students can able to apply the different materials, their processing, and heat treatments in suitable application in mechanical engineering fields.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To impart the knowledge about the various production processes available
- To expose the student on the principle and applications of the processes
- To make a decision on a relevant process based on the merits and demerits.

UNIT I CASTING PROCESSES

UNIT II METAL FORMING PROCESSES

UNIT III MACHINING PROCESSES
Machine and machine tool – construction, types operations in the following machines with block diagrams – Lathe, Milling, Drilling and Grinding – Concept of NC/CNC machines – Comparison of CNC with conventional machines – sample manual part programming for CNC Lathe and milling.

UNIT IV WELDING PROCESSES

UNIT V UNCONVENTIONAL MACHINING PROCESSES
Need for unconventional – Construction, working principle merits, demerits and applications with block diagram only for AJM, AWJM, USM, CHM, ECM, EDM, EBM, LBM, PAM and IBM.

OUTCOMES:
- Has enough knowledge on the various process available to make a part.
- Confident to select the process to based on cost of time and quantities.
- Can determine processes for new materials.

TEXT BOOKS
1. Serope Kalpakjian, Steven R. Schmid, Manufacturing Engineering and Technology - Anna University, 4/e, Pearson Education, 2014
REFERENCES:

PTAU7201 AUTOMOTIVE PETROL ENGINES

OBJECTIVE
- To impart basic knowledge on IC engines and its types and to develop the knowledge on various additional systems which are helps to improve the engine characteristics. Also to give through knowledge on complete construction and working details of petrol engine and its different accessories.

UNIT I ENGINE CONSTRUCTION AND WORKING

UNIT II FUEL AND IGNITION SYSTEM
Carburetor – requirements, working principle, types, different circuits – Compensation & Maximum power devices – Petrol injection in SI engines, Magneto coil and battery coil spark ignition system. Advance mechanism. Electronic ignition System – CDI.

UNIT III COOLING AND LUBRICATION SYSTEM

UNIT IV COMBUSTION AND COMBUSTION CHAMBERS

UNIT V TWO STROKE ENGINES
Two stroke engine – types, terminologies, definitions, construction and operation. Comparison of four stroke and two stroke engine operation. Theoretical scavenging processes. Merits and demerits, scavenging efficiency, Scavenging pumps, Rotary valve engine.

TOTAL : 45 PERIODS

OUTCOMES
Student can able to,
- identify various components of petrol engines and its sub systems.
- understand the actual engine working principle and its related components
- enhance their knowledge on other sub systems like ignition, lubrication etc.
- understand basic knowledge on petrol combustion and its related parameters

**TEXT BOOKS**

**REFERENCES**

**PTEI7205 ELECTRICAL AND ELECTRONICS ENGINEERING**

**OBJECTIVES**
- Gain knowledge on network theorems.
- Understand the basics of AC circuits and the terms related to AC circuits.
- Gain knowledge on construction and working principle of AC and DC machines.
- Get exposed to basic electronic devices and their applications.
- Gain knowledge on logic gates and their applications in digital electronics.

**UNIT I BASIC CONCEPTS AND D.C. CIRCUIT ANALYSIS**
9
Ohm’s law - Ideal voltage and current sources-Independent sources -dependent sources-circuit elements - Kirchhoff’s law - voltage and current division in series and parallel circuits-Node and Mesh analysis - Star/Delta transformations- Thevenin’s , Norton’s and Super position theorem.

**UNIT II A.C. CIRCUITS**
9
Sinusoidal voltage and current-RMS and average value of periodic waves - Form factor - Phase and Phase difference – Simple RC.RL and RLC circuits - series and parallel resonance - power and power factor – introduction to three phase systems – power measurement in 3 phase system.

**UNIT III ELECTRICAL MACHINES**
9

**UNIT IV ANALOG ELECTRONICS**
9

**UNIT V DIGITAL ELECTRONICS**
9
Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression-Combinational circuits- Design of adder, subtractor, encoders, decoders, multiplexers and demultiplexers-Flip flops.

**TOTAL : 45 PERIODS**
OUTCOMES

- Able to analyze and solve problems for all types of electrical networks by applying various theorems.
- Able to understand and solve problems for basic AC circuits.
- Will be in a position to suggest suitable AC/DC machines for a given application.
- Able to analyze the characteristics of electronic devices such as PN junction and other diodes.

REFERENCES


PTAE7201 MECHANICS OF SOLIDS

OBJECTIVES

- The objective of this course is to make the students to understand the concepts of stress and strain and their relationships by analysis of solids and structures, to analyze determinate and indeterminate axial members, torsional members, and beams, in order to determine axial forces, torque, shear forces, bending moments, stresses and deflections.

UNIT I STRESS-STRAIN – AXIAL LOADING

Definition of stress and strain- Stress-Strain relation- Relation between material constants.-Bar under axial loading- Statically determinate and indeterminate cases – Thermal stress-Impact Loading

UNIT II STRESSES IN BEAMS

Types of beams and loadings – Relation between shear force and bending moment - Shear force and bending moment diagrams – Euler beam theory - Bending stress in beams – Shear stress in beam – Composite beam.

UNIT III DEFLECTION OF BEAM


UNIT IV TORSION AND SPRINGS

Shear stress and twist relation for circular section – Comparison of hollow shaft and solid shaft – Compound shaft – Power transmission by circular shafts – Springs – Deflection expression for close coiled helical spring – Stress in springs.
UNIT V  BIAXIAL STRESS
Thin walled cylinder under internal pressure – Principal stresses for general biaxial stress field – Mohr’s circle - Stresses in combined loading

OUTCOMES
At the end of the course, the students are expected to
- Know about how a solid (materials, structures) behaves when it is exposed to forces and deformations.
- Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force-deformation, and stress-strain relationships to the solid and structural mechanics problems
- Analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments
- Have physical insight into distribution of stresses and strains in structural members

TEXT BOOKS:

REFERENCES:

PTMA7251  NUMERICAL METHODS  L T P C
3 0 0 3

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

UNIT I  SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS
UNIT II  INTERPOLATION AND APPROXIMATION  
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  
Finite difference methods for solving two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat - flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL : 45 PERIODS

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

TEXT BOOKS :

REFERENCES :
OBJECTIVE:

- The objective of this course is to introduce the basic principles of thermodynamics and thermal engineering via real world engineering examples, to show students how thermodynamics is applied in engineering practice.

UNIT I BASIC THERMODYNAMICS


UNIT II AIR STANDARD CYCLES AND COMPRESSORS

Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Compressors, Classifications of compressors, Single stage and multi stage, Effect of intercooler in multi stage compressor, Perfect and imperfect intercooler, work done by the compressor, Reciprocating, Rotary, Axial, Vane compressors.

UNIT III STEAM AND JET PROPULSION

Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart – Rankine cycle, Work done, Steam rate – Steam Nozzles, Types of nozzles, Friction in nozzles - Simple jet propulsion system – Thrust rocket motor – Specific impulse.

UNIT IV REFRIGERATION AND AIR-CONDITIONING

Principles of refrigeration, Vapor compression – Vapor absorption types, comparison - Co-efficient of performance (COP), Properties of refrigerants – Basic Principle, Summer, winter and Year round Air conditioning.

UNIT V HEAT AND MASS TRANSFER

Modes of heat transfer, Heat conduction in parallel, radial and composite wall – Basics of Convective heat transfer. Fundamentals of Radiative heat transfer – Flow through heat exchangers, Logarithmic Mean Temperature Difference (LMTD) for parallel flow and Arithmetic Mean Temperature Difference (AMTD) counter flow heat exchangers. TOTAL:45 PERIODS

(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)

OUTCOMES:

- Students will demonstrate a basic understanding of the nature of the thermodynamic processes for pure substances of ideal gases
- Student will demonstrate a basic understanding of the First law Thermodynamics and its application to systems and control volumes
- To analyze any problem in an engineering approach based on basic concepts and logic sequences.
- To understand the basics and modes of heat transfer, Refrigeration and Air-conditioners.

TEXT BOOKS:
REFERENCES:

PTAU7301 AUTOMOTIVE CHASSIS

OBJECTIVES:
- The student shall gain appreciation and understanding function of front axle, types of stub axle, types of steering gear box. Shall be able to understand need of suspension and its types, types of tyre, tyre specification, tyre rotation. Student shall gain knowledge of design consideration braking system, suspension system and for chassis

UNIT I LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM

UNIT II DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL

UNIT III REAR AXLES, WHEELS, RIMS AND TYRES
Construction of rear axles, Types of Loads acting on rear axles, Full –Floating, Three–Quarter Floating and Semi–Floating Axles, Twist beam rear axle, Types, Multi axles vehicles. Wheels and Rims, Types of Tyres and their constructional details. tubeless, cross ply radial type, tyre sizes and designation.

UNIT IV SUSPENSION SYSTEM

UNIT V BRAKE SYSTEMS
OUTCOMES
- Ability to know the steering geometry, what should be the tyre pressure for different vehicle, which type of brakes are best for vehicle.
- Ability to recognize which safety systems are best for vehicle and also for safety consideration.

TEXT BOOKS

REFERENCES

PTAU7302 AUTOMOTIVE DIESEL ENGINES

OBJECTIVES
- To impart knowledge on basic concepts of automotive diesel engines, combustion process involved in diesel engines and the various subsystems used along with their functions in detail.

UNIT I BASIC S OF DIESEL ENGINES

UNIT II FUEL INJECTION IN DIESEL ENGINES

UNIT III AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS

UNIT IV SUPERCHARGING AND TURBOCHARGING

UNIT V ENGINE TESTING AND RECENT DEVELOPMENTS


TOTAL : 45 PERIODS

OUTCOMES

- On completion of the course the students will understand the basic principle of operation of diesel engine, its subsystems
- The students can be able to apply their knowledge in operating the diesel engine and analyzing the engine performance characteristics.

TEXT BOOKS


REFERENCES


PTAE7301 ENGINEERING FLUID MECHANICS AND MACHINERY

OBJECTIVE:

- The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy. The applications of the conservation laws to flow through pipes and hydraulics machines are studied.

UNIT I INTRODUCTION

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS

UNIT III  DIMENSIONAL ANALYSIS  8
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV  TURBINES  10

UNIT V  PUMPS  10

TOTAL: 45 PERIODS

OUTCOME:
- On completion of the course, students will be familiar with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to simple problems.

TEXT BOOKS:

REFERENCES:

PTPR7301  KINEMATICS AND DYNAMICS OF MACHINES  L T P C 3 0 0 3

OBJECTIVE:
- To understand the basic concepts of mechanisms and machinery.

UNIT I  MECHANISMS  10

UNIT II  FRICTION  9
Types of friction – friction in screw and nut – screw – plate and cone clutch – belt (Flat and V) and rope drives – creep in belts – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – condition for maximum power transmission.
UNIT III  GEARS AND CAMS

UNIT IV  VIBRATION

UNIT V  BALANCING
Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – Balancing of single and multi cylinder engines

OUTCOME:
The student shall be able to apply the kinematics and dynamics of machinery in design and analysis of engineering problems.

TEXT BOOKS:

REFERENCES:
LIST OF EXPERIMENT FOR AUTOMOTIVE ENGINE
1. Study the layout of chassis system
2. Study the layout of steering systems with different Steering gearboxes
3. Dismantling, study and Assembling of Transfer case
4. Dismantling, study and Assembling of Constant Velocity Joint(Front Axles )
5. Dismantling, study and Assembling of Clutch.
6. Dismantling, study and Assembling of sliding mesh gear box
7. Dismantling, study and Assembling of Constant mesh gear box
8. Dismantling, study and Assembling of Syncro mesh gear box
10. Study the Layout of Rear Axle.
11. Study the Layout of Braking system.
12. Study of different types of suspension system.
13. Study the Automatic transmission system.

STUDY OF THE FOLLOWING ENGINES AND ITS COMPONENTS:
1. Single Cylinder Four Stroke Diesel Engine
2. Two wheeler Two stroke Petrol engines
3. Two wheeler Four Stroke Petrol Engine
4. Three wheeler Engine
5. Multi cylinder inline diesel engine
6. Multi cylinder inline Petrol engine
7. Multi cylinder V type diesel Engine
8. MPFI engine
9. CRDI engine

TOTAL: 30 PERIODS

OUTCOMES
- Dismantle and Assemble the automobile chassis and Engine components
- Identify & differentiate components of SI & CI engines
- Understand working of braking, steering, clutch, transmission, Suspension systems.
- Differentiate various subsystems of two, three & Four wheeler vehicles
- Train on various types of frames.
- Develop skills in Dismantling and assembling of chassis components.
- Correct minor repairs and trouble shoots the breakdowns.

PTAU7401 AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS

OBJECTIVES
- Knowledge in vehicle electrical and electronics components for engine operation.
- Enhancing the knowledge of revoir and microprocessor applications in vehicle control systems.
- Gaining information's on modern safety system in vehicle braking.

UNIT I BATTERIES AND STARTING SYSTEM 10
Different types of Batteries – principle, rating, testing and charging. Starter motors characteristics, capacity requirements. Drive mechanisms. Starter switches.
UNIT I  CHARGING SYSTEM LIGHTING AND ACCESSORIES  9

UNIT III  ELECTRONIC IGNITION AND INJECTION SYSTEM  9
Spark plugs. Advance mechanisms. Different types of ignition systems. Electronic fuel injection systems.

UNIT IV  SENSORS AND MICROPROCESSORS IN AUTOMOBILES  9
Basic sensor arrangements. Types of sensors – oxygen sensor, hot wire anemometer sensor, vehicle speed sensor, detonation sensor, accelerometer sensor, crank position sensor. Microprocessor and microcomputer controlled devices in automobiles such voice warning system, travel information system, keyless entry system, automatic transmission system, electronic steering system.

UNIT V  SAFETY SYSTEMS  8
Antilock braking system, air bag restraint system, voice warning system, seat belt system, road navigation system, anti theft system.

OUTCOMES:
- The student will have to know about all automotive electrical and electronic components used in a vehicle.

REFERENCES:

PTAU7402  AUTOMOTIVE TRANSMISSION  L T P C
3 0 0 3

OBJECTIVES:
- The main objective of this course is to impart knowledge in detailed concept, construction and principle of operation of various types of mechanical transmission components, hydrodynamic devices, hydrostatic devices, automatic transmission system and electric drive used in road vehicles. At the end of course the students will have command over both mechanical transmission system, automatic transmission systems and their applications.

UNIT I  CLUTCH  9
Requirement of transmission system, Types of transmission system, Clutches – Functions-Types of clutches, construction and operation of Single plate, multi plate and Diaphragm spring clutches.
UNIT II GEAR BOX
Purpose of gear box. Construction and working principle of sliding, constant and synchromesh gear boxes. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & power and acceleration. Determination of gear box ratios for different vehicle applications.

UNIT III HYDRODYNAMIC TRANSMISSION

UNIT IV AUTOMATIC TRANSMISSION

UNIT V HYDROSTATIC DRIVE AND ELECTRIC DRIVE

OUTCOMES:
Upon completion of the course, students will
- acquire knowledge in the construction and working principle of different types of mechanical transmission system, hydrodynamic, hydrostatic devices and electric drives.
- design the mechanical transmission system namely clutches and Gearboxes.
- have command over automotive transmission concepts and its applications in modern vehicles.

TEXT BOOKS:

REFERENCES:
1. SAE Transactions 900550 & 930910.
OBJECTIVE

- To understand the basic of manufacturing of fuels and lubricants along with properties of fuels and lubricants for the design and operation of the I.C engines.

UNIT I  MANUFACTURE OF FUELS AND LUBRICANTS  9
Introduction to Structure of petroleum, refining process-Distillation, cracking processes, Catalytic reforming, alkylation, isomerisation and polymerization, finishing process- blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II  THEORY OF LUBRICATION  9
Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT III  LUBRICANTS  9
Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.

UNIT IV  PROPERTIES AND TESTING OF FUELS  9
Properties and testing of fuels- density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion.

UNIT V  FUEL RATING  9

TOTAL : 45 PERIODS

OUTCOMES

Student would have basic understanding of

- Various refinery processes
- Theory of lubricants
- Properties and testing of fuels
- Fuel ratings

TEXT BOOKS:


REFERENCES


PTAU7411          AUTOMOTIVE ELECTRICAL AND ELECTRONICS                        L T P C
                        LABORATORY                                              0 0 3 2

OBJECTIVE:
The main objective of this course is to impart practical knowledge in various automobile
electrical and electronic components by testing, checking and programming.

LIST OF EXPERIMENTS:
1. Testing and checking of battery
2. Testing and checking of starting systems
3. Testing and checking of charging systems
4. Testing and checking of ignition systems
5. Study of automotive lighting system
6. Adjustment of head lights beam
7. Testing and checking of body controller systems
8. Logic gates, Adders, Flip flops
9. SCR and IC Timers
10. Interface circuit like amplifier, filter, Multiplexer and De Multiplexer
11. Interfacing seven segment displays
12. Basic microprocessor and microcontroller programming like arithmetic and Logic operation,
    code conversion, waveform generation, look up table etc
13. Interfacing ADC and DAC for Data Acquisition and Control Application
14. Interfacing Sensors for Measurements of position, displacement, velocity, force,
    temperature, proximity/range etc
15. Display, Keyboard, Stepper Motor and DC Motor interface using microcontroller.
16. EPROM Programming
17. Study of Virtual Instrumentation

TOTAL : 45 PERIODS

OUTCOMES:
• Students will gain an understanding of the automobile electrical and electronic components.
• Student will read and analyze electrical and electronic circuits.
• Students will study the sensor and actuators interface through programming

PTAU7501          AUTOMOTIVE COMPONENTS DESIGN                                      L T P C
                        3 0 0 3

OBJECTIVE:
To familiarize the various steps involved in the design process and understand the principles
involved in design.

UNIT I          INTRODUCTION
Classification of design -Principle of Design optimization – Engineering materials and their
physical properties as applied to design – Selection of materials – Factors of safety in design –
Endurance limit of materials –Determination of endurance limit for ductile materials – Notch
sensitivity –Future trends – CAD Euler’s formula – Rankine’s formula – Tetmajer’s formula –
Johnson formula – Reduction of stress Concentration
UNIT II DESIGN OF SHAFTS AND SPRINGS
9

UNIT III DESIGN OF FLYWHEELS
9

UNIT IV DESIGN OF BEARINGS
9
Types of bearings – Sliding contact bearings –Rolling contact bearings .Bearing life –Static load capacity – Dynamic load capacity – Bearing material – Boundary lubrication – Oil flow and temperature rise. Design of journal bearings - Ball and Roller bearings

UNIT V GEAR DESIGN
9

OUTCOMES:
The students will be able
- To identify the design requirements for any specific components.
- To design transmission parts.
- To explain the requirements of flywheel.

TEXT BOOK

REFERENCES
UNIT I  INTRODUCTION

UNIT II  EMISSION FROM SPARK IGNITION ENGINE AND ITS CONTROL
Emission formation in SI Engines- Carbon monoxide- Unburned hydrocarbon, NOx, Smoke - Effects of design and operating variables on emission formation – controlling of pollutants - Catalytic converters — Charcoal Canister — Positive Crank case ventilation system, Secondary air injection, thermal reactor, Laser Assisted Combustion.

UNIT III  EMISSION FROM COMPRESSION IGNITION ENGINE AND ITS CONTROL
Formation of White, Blue, and Black Smokes, NOx, soot, sulphur particulate and Intermediate Compounds – Physical and Chemical delay — Significance Effect of Operating variables on Emission formation — Fumigation, EGR, HCCI, Particulate Traps, SCR — Cetane number Effect.

UNIT IV  NOISE POLLUTION FROM AUTOMOBILES

UNIT V  TEST PROCEDURES AND EMISSION MEASUREMENTS
Constant Volume Sampling I and 3 (CVSI &CVS3) Systems- Sampling Procedures — Chassis dyno - Seven mode and thirteen mode cycles for Emission Sampling — Sampling problems - Emission analyzers —NDIR, FID, Chemiluminescent, Smoke meters, Dilution Tunnel, SHED Test, Sound level meters.

TOTAL : 45 PERIODS

OUTCOMES:
By the end of this course, students will be able to
- Understand the various emissions formed in IC engines
- Understand the effects of pollution on human health and environment
- Understand the control techniques
- Understand the emission norms

TEXT BOOKS:

REFERENCES:
3. SAE Transactions, Vehicle emission, 1982 (3 volumes).
OBJECTIVES:

- The main objective of this course is to impart knowledge in the construction of vehicle aerodynamics, paneling of passenger car and commercial vehicle body design. At the end of the course the student will be well versed in the design and construction of external body of all types of vehicles such as car, light commercial vehicles and heavy commercial vehicles.

UNIT I CAR BODY DETAILS

Types of Car body - Saloon, convertibles, Limousine, Estate Van, Racing and Sports car – Visibility regulations, driver’s visibility, improvement in visibility and tests for visibility. Driver seat design - Car body construction - Various panels in car bodies. Safety: Safety design, safety equipment for cars.

UNIT II BUS BODY DETAILS

Types of bus body: based on capacity, distance travelled and based on construction. – Bus body lay out, floor height, engine location, entrance and exit location. Types of metal sections used – Regulations – Constructional details: Conventional and integral.

UNIT III COMMERCIAL VEHICLE DETAILS

Types of commercial vehicle bodies - Light commercial vehicle body. Construction details of Flat platform body, Tipper body and Tanker body – Dimensions of driver’s seat in relation to controls – Drivers cab design.

UNIT IV VEHICLE AERODYNAMICS

Objectives, Vehicle drag and types. Various types of forces and moments. Effects of forces and moments. Side wind effects on forces and moments. Various body optimization techniques for minimum drag. Wind tunnels – Principle of operation, Types. Wind tunnel testing such as: Flow visualization techniques, Airflow management test – measurement of various forces and moments by using wind tunnel.

UNIT V BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR

Types and properties of materials used in body construction - Such as steel sheet, timber, plastics and GRP. Body trim items - body mechanisms. Hand tools - power tools for body repair. Vehicle corrosion - Anticorrosion methods - Modern painting process procedure.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will

- Know about different aspects of car body, bus body and commercial vehicle bodies.
- Role of various aerodynamic forces and moments, measuring instruments in vehicle body design.
- Knowledge about the material used in body building, tools used in body repairs and command over vehicle body engineering applications.

TEXT BOOKS:


REFERENCES:

OBJECTIVE:
- The main objective of this course is to impart knowledge in automotive Emission measurement and methods of testing engines. The detailed measuring techniques of pollutants like UBHC, CO, NOx, CO₂ and smoke for both SI and CI engines will be taught and compared with the emission standards. The knowledge about the instruments used for measurement of pollutants, engine performance and combustion parameters are to be explained with live example. At the end of the course the students will have knowledge about methods to test the engine and emission.

LIST OF EXPERIMENTS:
1. Study and use of IC engine testing Dynamometers.
2. Study and use of Pressure pickups, charge amplifier, storage oscilloscope and signal analyzers used for IC engine testing.
3. Performance study on petrol engine.
4. Performance study on diesel engine.
5. Determine the Frictional power on petrol engines.
7. Study of NDIR Gas Analyzer and FID.
8. Study of Chemiluminescent NOₓ analyser.
10. Diesel smoke measurement.

OUTCOMES:
By the end of this course, students will be able to
- Understand the various emission measuring instruments
- Understand the various engine testing instruments
- Understand the procedure to measure the emission
- Understand the procedure for measuring the engine performance and combustion parameters
- Understand the emission norms

TEXT BOOK:

REFERENCES:
UNIT I  MODERN POWER PLANT AND POWER TRAIN  9
Modern Engine Technology like DTS- i, DTS – Fi, DTS – Si, VVT, Camless Engine, GDi, CRDi , Hybrid / Electric and Future Cars, Fuel Cell.

UNIT II  PASSIVE SAFETY EQUIPMENTS AND CONVENIENCE SYSTEM  9
Seat belt, Seat belt tightener system and importance , collapsible steering column. Air bags and its activation .Designing aspcets of automotive bumpers and materials for bumpers. Steering And mirror adjustment, central locking system, Tire pressure control system, rain sensor system, automated wiper system.

UNIT III  ACTIVE SAFETY  9
Antilock braking system, Stability Control. Adaptive cruise control, Lane Keep Assist System, Collision warning, avoidance system, Blind Spot Detection system, Driver alertness detection system.

UNIT IV  VEHICLE INTEGRATION  9
Vision enhancement, road recognition system, Looking out sensors and Looking in sensors, intelligent vision system, Vehicle Integration system. Anti theft technologies, smart card system, number plate coding. Locking system- Central locking system- acoustic signaling devices.

UNIT V  VEHICLE NAVIGATION SYSTEM  9

TOTAL : 45 PERIODS

OUTCOMES:
The students should be able to:
- Know about the design of the bumper for safety.
- Know about the concept of crumble zone, and also the effect of acceleration and deceleration of the vehicle in the compartment of the vehicle.
- Know the various types of safety aspects such as active and passive safety, the active safety components and the working passive safety components such as air bags, seat belts
- Know the working of the compartment while moving of the vehicle, about the collapsible steering and tiltable steering column, about the collision avoidance system, front and rear object detection.
- Know about the rear vehicle detection system, and the braking system, the comfort and convenience system for the vehicle such as central

TEXT BOOKS:
REFERENCES:
4. ARAI Safety standards

PTAU7602 ELECTRONIC ENGINE MANAGEMENT SYSTEMS L T P C
3 0 0 3

OBJECTIVE
- The objective of the course is to make the student to understand the need, role, components, control strategies used in an engine management system. The student will be familiarized in the fundamentals, operation, function of various sensors and actuators in an engine. The student will gain knowledge on various systems related to ignition and injection system, and various engine control algorithm used during engine operation.

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS
Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Switches, active resistors, Transistors, Current mirrors/amplifiers, Voltage and current references, Comparator, Multiplier. Amplifier, filters, A/D and D/A converters.

UNIT II SENSORS AND ACTUATORS
Working principles, construction and location of sensors to measure speed, load, air flow, temperature, pressure, lambda, throttle position, knock, etc. Working principles, construction and location of actuators viz. Solenoid, relay, stepper motor etc. Design constraints.

UNIT III SI ENGINE MANAGEMENT
Layout, types and working of SI engine management systems (K, KE, Mono Jetronic, L, LH, Motronic). GDI. Development of ignition system – Transistor assisted, Contactless, Distributor less, CDI, Ignition Map, Knock control. Flowcharts for combined fuel injection and ignition control. Introduction to LASER Ignition system.

UNIT IV CI ENGINE MANAGEMENT

UNIT V DIGITAL ENGINE CONTROL SYSTEM

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course, the student should able to
- Describe basic electronic engine management theory
- Define the function, construction and operation of various sensors and actuators
- Demonstrate the principles and application of computerized engine control devices and electronic fuel and ignition management systems in the modern automobile.
TEXT BOOKS:

REFERENCES:

PTAU7611 VEHICLE TESTING LABORATORY
L T P C
0 0 3 2

OBJECTIVES:
• To impart the knowledge on testing of vehicle and subsystems.

LIST OF EXPERIMENTS:
1. Minor and major tune up of gasoline and diesel engines
2. Calibration of Fuel pump
3. Engine fault diagnosis using scan tool
4. Fault diagnosis and service of transmission system
5. Fault diagnosis and service of braking system
6. Fault diagnosis and service of suspension system
7. Fault diagnosis and service of steering system
8. Fault diagnosis and service of Electrical system like battery, starting system, charging system, lighting system etc
9. Vehicle testing on chassis dynamometer
10. Practice the following:
   i. Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play.
   ii. Air bleeding from hydraulic brakes, air bleeding of diesel fuel system.
   iii. Wheel bearings tightening and adjustment.
   iv. Adjustment of head lights beam.
   v. Removal and fitting of tire and tube.

TOTAL : 30 PERIODS

OUTCOMES
• End of the course student would have deep practical knowledge on
OBJECTIVE:

- The objective of this course is to provide fundamental knowledge of the dynamics of ground vehicles, knowledge of suspension design and function, basic concepts on concerning stability and control and to study about basic analysis of vehicle dynamics in performance, handling and ride modes.

UNIT I  CONCEPT OF VIBRATION  9

UNIT II  TYRES  9

UNIT III  VERTICAL DYNAMICS  9

UNIT IV  LONGITUDINAL DYNAMICS AND CONTROL  9

UNIT V  LATERAL DYNAMICS  9

OUTCOMES:
At the end of the courses, the students can able to
- Develop physical and mathematical models to predict the dynamic response of vehicles;
- Apply vehicle design performance criteria and how to use the criteria to evaluate vehicle dynamic response;
- Use dynamic analyses in the design of vehicles.

TEXT BOOKS:
REFERENCES:

PTAU7001 ADVANCED THEORY OF IC ENGINES

OBJECTIVES
- To impart knowledge in modern trends and developments in internal combustion engines.
- To develop knowledge in non-conventional engines and their operation in detail, and to acquire complete knowledge in engine modeling and combustion analysis of internal combustion engines.

UNIT I COMBUSTION OF FUELS

UNIT II ENGINE CYCLE ANALYSIS
Ideal air, fuel air cycle and actual cycle analysis. Progressive combustion analysis in SI engines. Parametric studies on work output, efficiency and other engine performance.

UNIT III COMBUSTION MODELLING

UNIT IV NON CONVENTIONAL IC ENGINES

UNIT V COMBUSTION ANALYSIS IN IC ENGINES
Photographic studies of combustion processes – Analysis of Pressure crank angle diagrams in SI and CI engines. Knock study for Pressure crank angle histories. Apparent heat release rate and Wiebe’s law analysis for combustion. Calculation of Ignition delay and combustion duration. – Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS
OUTCOMES:
- Students will understand the recent developments and trends in internal combustion engines. They will be able to apply their knowledge in making changes in engine design for better engine performance.
- Students will become familiar with the non conventional engines and their importance, difficulties involved in using them for power generation
- They will also get familiarized with the equipment used for flow and combustion analysis.

TEXT BOOKS

REFERENCES

PTAU7002 ALTERNATIVE FUELS AND ENERGY SYSTEMS L T P C
3 0 0 3

OBJECTIVES
- To acquire complete knowledge on availability of possible alternate fuels and their properties to use as fuel in CI and SI engines. To develop knowledge in changing the engine system, modifying the fuel for efficient use in the internal combustion engines and to understand the challenges and difficulties in using alternative fuels in internal combustion engines.

UNIT I INTRODUCTION TO ALTERNATIVE FUELS 9
Need for alternative fuels. World and Indian energy scenario on alternative fuels. Availability of different alternative fuels for SI and CI engines. Production technologies for biofuels for internal combustion engines- Pyrolysis, gasification, digestion.

UNIT II ALCOHOLS AS FUELS 9

UNIT III VEGETABLE OILS AS FUELS 9
Various vegetable oils and their important properties. Different methods of using vegetable oils engines – Blending, preheating Transesterification and emulsification of Vegetable oils - Performance in engines – Performance, Emission and Combustion Characteristics in diesel engines. Role of Nano fluids, additives and cetane improvers for performance improvement of vegetable oils as fuel.
UNIT IV  HYDROGEN AS ENGINE FUEL  

UNIT V  BIOGAS, LPG AND NATURAL GAS AS FUELS  
Production methods of Biogas, Natural gas and LPG. Properties studies. CO₂ and H₂S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines.

TOTAL : 45 PERIODS

OUTCOMES
- Upon completion the course the students will have the complete knowledge on bio fuel production methods and their properties in detail.
- They will be able to apply their knowledge in making changes in engine design and fuel modification for the utilizing the alternative fuels effectively in the engines.

TEXT BOOKS

REFERENCES
3. Technical papers of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.).

PTAU7003  AUTOMOTIVE AERODYNAMICS  
L T P C
3 0 0 3

OBJECTIVE
- To learn the basics of fluid mechanics on vehicle motion and expose to the optimization techniques followed in automotive industry in reducing aerodynamics drag, fuel consumption and improving vehicle stability. This course will also expose the students to testing techniques practiced in industry.

UNIT I  BASICS OF FLUID DYNAMICS ON VEHICLE MOTION  
Importance of study - timeline developments -basics of fluid mechanics -flow phenomenon related to vehicles - external flow problem -various resistances to vehicle motion - performance, fuel consumption and traction force diagram of a passenger car.
UNIT II  DRAG FRACTIONS AND LOCAL ORIGINS IN A PASSENGER CAR  
Car as a bluff body - generation & transportation of vortices around car - types of aerodynamic drag forces & its contribution to total drag - analysis of aerodynamic drag at local origins - shape and detail optimization techniques with case studies.

UNIT III  VEHICLE HANDLING  
The origin of forces and moments on a vehicle - lateral stability problems - methods to calculate forces and moments – vehicle dynamics under side winds - the effects of forces and moments, dirt accumulation on the vehicle, wind noise. Add-ons to improve stability of road vehicles.

UNIT IV  COMMERCIAL VEHICLE AERODYNAMICS  
Tractive resistance & fuel consumption – Drag coefficients of various commercial Vehicles – Scope for reducing drag on commercial vehicles (Trucks with trailers and buses), Advantages of commercial vehicles aerodynamics & its effects – Vehicle soiling & its effects on driving.

UNIT V  WIND TUNNELS FOR ROAD VEHICLES AERODYNAMICS  
Need of a wind tunnel, principle of wind tunnel technology, problems with reduced scale models, full scale wind tunnels examples and case studies, instrumentation & measurement techniques, Introduction to numerical analysis (CFD).

TOTAL : 45 PERIODS

OUTCOMES:
- Know the forces & moments influencing drag
- Solve simple numericals related to fuel economy & drag
- Learn the techniques of optimization practiced in industry
- Learn the relation between drag, stability & fuel economy
- Expose to fundamentals of numerical & experimental testing

TEXT BOOKS:
1. R.H.Barnard - “Road vehicle aerodynamic design, An Introduction”, Mechaero publications, Third edition

REFERENCES:

PTAU7004  AUTOMOTIVE AUTOMATION  
L  T  P  C  3  0  0  3

OBJECTIVE:
- To understand the various automated Automobile manufacturing activities and study the application of computer technology in the Automobile manufacturing activities.

UNIT I  AUTOMATION IN AUTOMOBILE MANUFACTURING  
UNIT II AUTOMATED MATERIAL HANDLING SYSTEMS 9
Automated assembly systems- Design principles and types – part feeding devices, automated material handling devices – conveyor systems- types and applications, AGVs – types and control applications ,rail guided vehicles-automated storage/retrieval systems-industrial robots-basics components-special features-applications.

UNIT III GROUP TECHNOLOGY AND FMS 9
Part families-visual-part classification and coding-production flow analysis, benefits of GT-FMS-workstations-FMS layouts configurations-computer control systems- planning the FMS- machine cell design-FMS application and benefits – automated work flow-automated flexible assembly systems.

UNIT IV AUTOMATED ASSEMBLY AND INSPECTION 9
Automated chassis assembly-car body assembly-engine assembly-transfer lines-visual inspection-machine visions application-CMM-types-principle and applications, industrial robots for assembly of automobile components-applications.

UNIT V SHOP FLOOR AND COMPUTER AIDED QUALITY CONTROL 9
Automated chassis assembly-car body assembly-engine assembly-transfer lines-visual inspection-machine visions application-CMM-types-principle and applications, industrial robots for assembly of automobile components-applications.

TOTAL: 45 PERIODS

OUTCOMES:
- Students will have a sound knowledge in the various automated manufacturing process.
- Students will be familiar in modern engineering manufacturing process and will have an update in recent scenario

TEXT BOOKS:

REFERENCES:

PTAU7005 AUTOMOTIVE MATERIALS

OBJECTIVES
- Knowledge on properties of engineering materials
- To select suitable materials for design
- Materials selection criteria for engine and transmission systems
- Different materials used for automotive structures.
- Different electronic materials for automotive applications
UNIT I  ENGINEERING MATERIALS AND THEIR PROPERTIES

Classes of engineering materials - the evolution of engineering materials, Definition of materials properties, Displaying material properties using materials selection charts, Forces for change in materials selection and design, Materials and the environment—selection of materials for automotive, aerospace, marine and defence applications.

UNIT II  BASIS OF MATERIAL SELECTION


UNIT III  MATERIALS FOR ENGINES AND TRANSMISSION SYSTEMS

Materials selection for IC engines: Piston, piston rings, cylinder, Engine block, Connecting rod, Crank shaft, Fly wheels, Gear box, Gears, Splines, Clutches.

UNIT IV  MATERIALS FOR AUTOMOTIVE STRUCTURES

Materials selection for bearings, leaf springs, chasis & frames, Bumper, shock absorbers, wind screens, panels, brake shoes, Disc, wheels, differentials, damping and antifriction fluids, Tyres and tubes.

UNIT V  ELECTRONIC MATERIALS FOR AUTOMOTIVE APPLICATIONS

Materials for electronic devices meant for engine control, ABS, Steering, Suspension, Sensors, anti-collision, Anti-fog, Head lamps.

TOTAL: 45 PERIODS

OUTCOMES

- Discuss different materials used for automotive component manufacturing.
- Select proper material for Automobile applications

TEXT BOOKS


REFERENCES

OBJECTIVES

- To develop complete knowledge in using sensors, actuators and instruments in automobiles. To understand their necessities, working principles and performance characteristics in detail and to impart knowledge in modern laboratory experimental techniques for testing automobiles

UNIT I  MEASUREMENT SYSTEMS  9
Introduction to Measurement systems-static and dynamic measurement –closed and open loop system - Requirements and characteristics – Analysis of experimental detail. Error analysis

UNIT II  TRANSDUCERS, MODIFIERS AND TERMINATING DEVICES  9
Transducers for Automotive Applications – Amplifiers- filters –data Acquisition- Indicators, Printers and displays –Signal Analyzing.

UNIT III  MECHANICAL MEASUREMENT  9
Instrumentation for measuring Weight, Force, torque, pressure power, temperature, fluid flow, vibration, rotational speed, velocity, acceleration and angular motion.

UNIT IV  ENGINE EXPERIMENTAL TECHNIQUES  9

UNIT V  VEHICLE EXPERIMENTAL TECHNIQUES  9
Laboratory tests- Study of chassis dynamometer- test tracks - Endurance Tests- crash tests- Vehicle performance test – Brake tests.

TOTAL: 45 PERIODS

OUTCOMES

- Upon completion of the course the students will be able to apply their knowledge in using all kind of sensors, actuators and instruments used in automobile testing
- They will be able to apply their knowledge in conducting different types of experiments in automobiles

TEXT BOOKS


REFERENCES

1. A.W. Judge, Engineering Precision Measurement, Chapman and Hall Ltd, Essex Street W.C.,1951,
2. T.G. Beckwith and Buck, Mechanical Measurements, Oxford and IBH Publishing House, New Delhi, 1995
OBJECTIVES

- To make the students understand the principle of general and engine combustion.
- To understand engine heat release rate and various heat transfer models and to study the experimental methods for combustion and heat transfer in engines.

UNIT I  THERMODYNAMICS OF COMBUSTION  9
Premixed and diffusion combustion process in IC engines. First and Second Law of Thermodynamics applied to combustion- combustion Stoichiometry- chemical equilibrium, spray formation and droplet combustion.

UNIT II  CHEMICAL KINETICS OF COMBUSTION  9

UNIT III  FLAMES  9
Laminar premixed – flame speed correlations- quenching, flammability, and ignition, flame stabilization, laminar diffusion flames, turbulent premixed flames-Reynolds and Damkohler numbers and their significance.

UNIT IV  HEAT TRANSFER IN IC ENGINES  9

UNIT V  EXPERIMENTS IN IC ENGINES  9
Cylinder pressure measurement. Rate of heat release calculation – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL : 45 PERIODS

OUTCOMES

- Upon completion the students will understand the principle of engine combustion and the various heat transfer models and measuring methods of engine heat transfer in derail
- They will understand thermodynamics of combustion, grasp the basics of normal, abnormal combustion and heat transfer in engines
- They also understand experimental techniques in investigating the combustion and heat transfer processes in IC engines

TEXT BOOK

REFERENCES
OBJECTIVE:
- To develop finite difference and finite volume discretized forms of the CFD equations and formulate explicit & implicit algorithms for solving the Euler Equations & Navier Stokes Equations.

UNIT I GOVERNING DIFFERENTIAL EQUATIONS AND FINITE DIFFERENCE METHOD
Classification, Initial and Boundary conditions – Initial and Boundary Value problems – Finite difference method, Central, Forward, Backward difference, Uniform and non-uniform Grids, Numerical Errors, Grid Independence Test.

UNIT II CONDUCTION HEAT TRANSFER BY FINITE DIFFERENCE METHOD AND FINITE VOLUME METHOD
Steady one-dimensional conduction, Two and three dimensional steady state problems, Transient one-dimensional problem, Two-dimensional Transient Problems.

UNIT III CONVECTION HEAT TRANSFER BY FINITE DIFFERENCE METHOD AND FINITE VOLUME METHOD

UNIT IV INCOMPRESSIBLE FLUID FLOW BY FINITE DIFFERENCE METHOD AND FINITE VOLUME METHOD
Governing Equations, Stream Function – Vorticity method, Determination of pressure for viscous flow, SIMPLE, Computation of Boundary layer flow - Finite difference approach.

UNIT V FINITE ELEMENT METHOD AND TURBULENCE MODELS

TOTAL: 45 PERIODS

OUTCOMES:
- The student will demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system and to use the appropriate model equations to investigate the flow.
- The student will gain the confidence to simplify a real fluid-flow system into a simplified model problem, and select the proper governing equations involved in the system.
- The student will analyze and interpret data obtained from the numerical solution of fluid flow problems.

TEXT BOOKS:
REFERENCES:

PTAU7009 FINITE ELEMENT TECHNIQUES

OBJECTIVE:
- The objective of the course is to make the students to understand the general steps of finite element methods, FEM formulation, be able to derive equations in finite element methods for 1D, 2D and 3D problems and its application solid mechanics and heat transfer.

UNIT I INTRODUCTION
Review of various approximate methods – Raleigh Ritz’s, Galerkin and finite difference methods – Steps in FEM Analysis – Governing equation and convergence criteria of finite element method.

UNIT II DISCRETE ELEMENTS

UNIT III CONTINUUM ELEMENTS
Plane stress, Plane strain and axisymmetric problems, constant and linear strain, triangular elements, stiffness matrix, axisymmetric load vector. Computer codes for CST and LST elements.

UNIT IV ISOPARAMETRIC ELEMENTS
Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, Stiffness matrix and consistent load vector, Gaussian integration

UNIT V FIELD PROBLEM

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students can able to
- Understand and perform engineering analysis of structural members using FEM.
- Demonstrate the ability to evaluate and interpret FEA analysis results for design and evaluation purposes
- Develop computer codes for FEM Elements.
TEXT BOOKS:

REFERENCES:

PTAU7010 HYBRID AND ELECTRIC VEHICLES
L T P C 3 0 0 3

OBJECTIVE:
• To understand the basic concept of Hybrid, Electric Vehicles, energy Storage devices and controls.

UNIT I INTRODUCTION TO NEED FOR ALTERNATIVE SYSTEM

UNIT II ENERGY STORAGE DEVICES AND FUELL CELLS
Electromechanical batteries- types of batteries –lead acid batteries, nickel based batteries, lithium based batteries, electrochemical reactions, thermodynamic voltage, specific energy, specific power, energy efficiency and ultra-capacitors.
Fuel Cell- Fuel cell characteristics- Fuel cell types-Hydrogen fuel cell- Connecting cell in series-water management in the PEM fuel cell- Thermal Management of the PEM fuel cell

UNIT III ELECTRIC VEHICLES
Electric vehicle layout, performance of electric vehicles – traction motor characteristics, tractive effort, transmission requirements, vehicle performance, energy consumption, advantage and limitations, specifications, system components, electronic control system, safety and challenges in electric vehicles.
UNIT IV  HYBRID VEHICLES
Concepts of hybrid electric drive train, types, architecture of series and parallel hybrid electric drive train, merits and demerits, hybrid electric drive train design, mild and full hybrids, plug-in hybrid electric vehicles and range extended hybrid electric vehicles.

UNIT V  PROPULSION MOTORS AND CONTROLLERS
Types of electric motors – working principle of AC and DC motors. Characteristic of shunt, series and compound type of DC motors- permanent magnet and separately exited DC motors. AC single phase and 3-phase motor – inverters – DC and AC motor speed controllers.

TOTAL : 45 PERIODS

OUTCOMES
End of the course student would have deep knowledge on
- Basic of hybrid and electric vehicles
- Different energy storage devices
- Concepts of hybrid electric drive train
- Electric motors and controllers

TEXT BOOKS:

REFERENCES:

PTAU7011  HYDRAULIC AND PNEUMATICS SYSTEMS

OBJECTIVE:
- To understand the hydraulic and pneumatic principles, involved and their components as well as its selection.

UNIT I  INTRODUCTION TO FLUID POWER
Introduction to fluid power control- Hydraulic and pneumatics- Selection criteria, application of fluid power, application of pascal’s law, equation, Transmission and multiplication of force pressure losses- fluids, selection and properties- ISO symbols

UNIT II  FLUID POWER DRIVES
Fluid power drives- Pumps- working principle and construction details of gear, vane and piston pumps, hydraulic motor, Hydrostatic transmission drives and characteristics - Hydraulic supply Components- Pneumatic power supply- Compressor, air distribution, air motors. Case study related to automotive application.

UNIT III  FLUID POWER ELEMENTS
UNIT IV HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN

UNIT V ELECTRO PNEUMATICS AND PLC CIRCUITS
Use of electrical timers, switches, solenoid, relay, proximity sensors etc. Electro pneumatic sequencing Ladder diagram- PLC: – elements, function and selection- PLC programming- Ladder and different programming methods- Sequencing circuits. Case study related to automotive application.

OUTCOMES:
• Students will be able to design a hydraulic system circuit that can be incorporated in an automotive application.
• Students will gain ability to design Pneumatic circuit for an automotive component that meets desired specifications and requirements.

TEXT BOOKS:

REFERENCES:

PTAU7012 MANUFACTURING OF AUTOMOTIVE COMPONENTS

OBJECTIVE:
• To study in detail about the modern casting, forging, molding and machining processes followed in automotive components. To enhance the knowledge of the students in the field of non –ferrous materials, emerging metallic and non-metallic materials like polymers, fiber reinforced plastics (FRP), engineering ceramics, metal matrix composites (MMCs) and its manufacturing methods, selection criteria, properties and applications for automotive components.

UNIT I ENGINE COMPONENTS
UNIT II
TRANSMISSION COMPONENTS

UNIT III
BODY COMPONENTS

UNIT IV
CHASSIS COMPONENTS

UNIT V
TYRES AND ADVANCED MATERIALS MANUFACTURING
Tire and tube manufacturing, spray painting, powder coating, Prototype Manufacturing - RPT, 3-D Printing, chemical vapour deposition, physical vapour deposition, cryogenic grinding of powders, sealants, sound proof materials, structural adhesives, MMC liners –Selection of materials for Auto components.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course the student should
• Will be able to select an appropriate manufacturing process for particular Automotive Components.
• Have in-depth knowledge of various engineering materials used in automobile engineering and the corresponding manufacturing processes for the same.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To understand the different degree of accuracy obtained from different types of instruments and the process of reducing uncertainties in measurements

UNIT I  SCIENCE OF MEASUREMENT  8

UNIT II  LINEAR AND ANGULAR MEASUREMENT  8
Linear measuring instruments: Vernier, micrometer, interval measurement, Slip gauges and classification, interferometer, optical flats, limit gauges – Comparators: Mechanical, pneumatic and electrical types, applications.
Angular measurements:-Sine bar, optical bevel protractor, angle Decker–Taper measurements, coordinate measuring machine (CMM)

UNIT III  FORM MEASUREMENT  8

UNIT IV  PRESSURE, FORCE AND TORQUE MEASUREMENT  11
Bourdon tube, diaphragm, bellows and pressure capsules: Transducers used in pressure measurement – potentiometer, strain gauges, LVDT, capacitive and variable reluctance type transducers. Dynamic pressure measurement piezo electric and piezo resistive transducers. Farnboro engine indicator. Low pressure measurement – Mc leod gage, Pirani gauge, thermal conductivity type pressure measurement.
Force measuring devices – Balances, platform scales, weigh bridges, load cells, proving ring. Torque measurement – prony brake, rope brake and fan type brakes. Dynamometers – hydraulic, electric cradle and eddy current dynamometers.

UNIT V  MEASUREMENT OF TEMPERATURE AND FLOW  10

TOTAL: 45 PERIODS

OUTCOMES:
The Students will
- Be able to demonstrate their knowledge about different measurement method and devices used in industries.
- Have the ability to handle and interpret measurement data, to estimate measurement uncertainties
- Design measuring equipments for the measurement of Pressure Force, temperature and flow.
TEXT BOOKS:

REFERENCES:

PTAU7014 NOISE, VIBRATION AND HARSHNESS L T P C 3 0 0 3

OBJECTIVE:
- To provide introduction to students the fundamentals of noise and vibration related to
generation, transmission, control techniques and the effect of human sensitivity. To enable
the students acquaint with principles and fundamentals in NVH instrumentation and signal
analysis techniques

UNIT I FUNDAMENTALS OF NOISE, VIBRATION AND HARSHNESS 9
Theory of Sound—Predictions and Measurement, Sound Sources, Sound Propagation in the
Atmosphere, Sound Radiation from Structures and Their Response to Sound, General
Introduction to Vibration, Vibration of Simple Discrete and Continuous Systems, Random
Vibration, Response of Systems to Shock, Passive Damping.

UNIT II EFFECTS OF NOISE, BLAST, VIBRATION AND SHOCK ON HUMANS 9
General Introduction to Noise and Vibration Effects on People and Hearing Conservation, Sleep
Disturbance due to Transportation Noise Exposure, Noise-Induced Annoyance, Effects of
Infrasound, Low-Frequency Noise, and Ultrasound on People, Auditory Hazards of Impulse and
Impact Noise, Effects of Intense Noise on People and Hearing Loss, Effects of Vibration on
People, Effects of Mechanical Shock on People, Rating Measures, Descriptors, Criteria, and

UNIT III TRANSPORTATION NOISE AND VIBRATION – SOURCES, PREDICTION
AND CONTROL 9
Introduction to Transportation Noise and Vibration Sources, Internal Combustion Engine
Noise—Diesel and Gasoline Engines, Tire/Road Noise, Aerodynamic Sound Sources in
Vehicles, Transmission and Gearbox Noise and Vibration, Brake Noise. Introduction to Interior
Transportation Noise and Vibration Sources, Automobile, Bus, and Truck Interior Noise and
Vibration, Noise and Vibration in Off-Road Vehicle Interiors.

UNIT IV ACOUSTICAL DESIGN OF MUFFLERS AND SILENCERS 9
Exhaust and Intake Noise in Diesel and Gasoline Engines - Electro-Acoustic Modeling, Transfer
Matrix Modeling, Simple Expansion Chamber, Extended Tube Expansion Chamber, Extended
Concentric Tube Resonator, Plug Muffler, Multiply Connected Muffler, Absorptive Ducts and
Mufflers, Combination Mufflers, Acoustic Source Characteristics of I.C. Engines, Designing for
Adequate Insertion Loss, Mufflers for High Pressure Vents and Safety Valves, Design of Muffler
Shell and End Plates, Helmholtz Resonators, Active Noise Control in a Duct and Pressure Drop
Considerations.
UNIT V NOISE AND VIBRATION TRANSDUCERS ANALYSIS EQUIPMENT, SIGNAL PROCESSING, AND MEASURING TECHNIQUES.


TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course the student should
- Identify sources of noise and vibration from an automobile.
- Solve complicated problems in Noise and Vibration.
- Able to design and select the appropriate Muffler/Silencer for the control of tail pipe noise from an IC engine.
- Demonstrate the knowledge of noise, vibration and physiological effects on Humans.
- Exposed to acoustic instrumentation and noise control techniques

TEXT BOOKS:

REFERENCES:

PTAU7015 OFF HIGHWAY VEHICLES

OBJECTIVE:
- The main objective of this course is to introduce the concept and principle of operation of special vehicles such as Bulldozers, Ditchers, Bucket excavators, farm equipments, military vehicles etc. At the end of the course, the students can have a better understanding of the application of the Off Highway Vehicle in the excavation of earth.
UNIT I  EARTH MOVING EQUIPMENTS  
Construction layout, capacity and applications of earthmovers like dumpers, front-end loaders, bulldozers, backhoe loaders, scrapers, hydraulic shovels, Bucket conveyors etc. Selection criteria of prime mover for dumpers and front end loaders based on vehicle performance characteristics. Surface Miners – Highwall Miners, Off-Highway Mining Trucks.

UNIT II  CONSTRUCTIONAL EQUIPMENTS  

UNIT III  FARM EQUIPMENTS  

UNIT IV  INDUSTRIAL APPLICATIONS  

UNIT V  MILITARY AND COMBAT VEHICLES  
Ride and stability characteristics, power take off, special implementations. Special features and constructional details of Main Battle tankers, gun carriers and transport vehicles, bridge builders, communication vehicles.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course the student should
• Know the concept and principle of operation of special vehicles such as bull dozers, ditchers bucket excavators far equipments military vehicles etc
• Have better understanding of the application of the Off Highway Vehicle in the excavation.
• Understand earth moving and constructional equipments
• Learn the basics of power train concepts for special vehicles
• Grasp the maintenance of farm equipments, military and combat vehicles

TEXT BOOKS:
2. SAE Handbook Volume III
PTAU7016 PRINCIPLES OF CONTROL SYSTEMS

OBJECTIVES:
The student should be able to state, explain and illustrate a set of key concepts related to Control Systems qualitatively in the context of an engineering application.

UNIT I SYSTEM AND THEIR REPRESENTATION
Basic elements in control systems-Open loop and Closed loop system-Feedback characteristics- Effects of feedback-mathematical modeling of physical systems:- mechanical, Thermal, hydraulic and Pneumatic systems-Transfer function- AC and DC servomotor- Block diagram reduction techniques-signal flow graph- control system components – computer simulation.

UNIT II TIME RESPONSE ANALYSIS
Time response- Types of test inputs- First and Second order responses- Error coefficient-Generalized error series- Steady state error- Time domain specifications- Problems related to automotive domain- Computer simulation.

UNIT III FREQUENCY RESPONSE ANALYSIS
Frequency response- Frequency domain specifications-Bode plot-Polar plot- Determination of phase margin and gain margin- Constant M and N circles-Nichols chart- Determination of closed loop responses from open loop response- Problems related to automotive domain Computer simulation.

UNIT IV STABILITY OF CONTROL SYSTEM

UNIT V CONTROL SYSTEM DESIGN

TOTAL: 45 PERIODS

OUTCOMES:
- To understand the methods of representation of system and their transfer function models
- To provide adequate knowledge in the time response of systems and steady state error analysis
- To give basic knowledge in obtaining the open loop and closed loop frequency responses of systems
- To understand the concept of stability of control system and methods of stability analysis
- To study the three ways of designing compensators for a control system
TEXT BOOKS:

REFERENCES:
2. Dorf Bishop, “Modern Control System”, Prentice Hall, 2004

PTAU7017 QUALITY CONTROL AND RELIABILITY

OBJECTIVE:
- Teach the essentiality of Quality Control, sampling and reliability engineering. Study on various types of control charts, six sigma and process capability to help the students understand various quality control techniques. Reliability engineering focuses on the dependability, failure mode analysis, reliability prediction and management of a system.

UNIT I STATISTICAL PROCESS CONTROL

UNIT II ACCEPTANCE SAMPLING

UNIT III EXPERIMENTAL DESIGN AND TAGUCHI METHOD

UNIT IV RELIABILITY AND ITS PREDICTION

UNIT V FAILURE DATA ANALYSIS
Real time distribution, exponential, normal, log normal, gamma and weibull – reliability data requirements – Graphical evaluation.

OUTCOMES:
At the end of this course the student should
- Will be able to select an appropriate SPC and Sampling process for the Quality Control in particularly for manufacturing Automotive Components.

TOTAL: 45 PERIODS
• Have in-depth knowledge of the Reliability and Failure Data Analysis.
• Will be able to design the experiment based on Taguchi methods

TEXT BOOKS:

REFERENCES:

PTAU7018 SIMULATION OF IC ENGINES L T P C
3 0 0 3
OBJECTIVES
• To impart knowledge in simulating IC engine processes. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. At the end of the course the students will have command over simulation of IC engine process.

UNIT I INTRODUCTION TO SIMULATION 9

UNIT II STOICHIOMETRY AND ADIABATIC FLAME TEMPERATURE 9
Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction - combustion equation for hydrocarbon fuels. Calculation of minimum air, excess air and stoichiometric air required for combustion. Introduction, complete combustion in C-H-N-O systems, constant volume adiabatic combustion, constant pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state.

UNIT III SI ENGINE SIMULATION 9
SI Engine simulation with air as working medium, deviation between actual and ideal cycle. Fuel air cycle analysis - Temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation. SI Engines simulation with progressive combustion. Models for mass burnt fraction.

UNIT IV SI ENGINE SIMULATION WITH GAS EXCHANGE PROCESS 9
Introduction, gas exchange process, Heat transfer process, friction calculations, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram, brake power, brake thermal efficiency, effect of speed on performance.
UNIT V CI ENGINE SIMULATION


TOTAL : 45 PERIODS

OUTCOMES

- Students will understand the classifications and applications of engine cycle simulation model and grasp the major modeling and simulation methods and the influence of model parameters on engine performance.
- Students will become familiar with the modeling of progressive combustion and gas exchange processes and ability to build up control-oriented simulation model of internal combustion engines.
- They will get familiarized with the essential models of engine cycle simulation and theoretical knowledge to control the calculation accuracy and calculation efficiency of engine performance, combustion and emission.

TEXT BOOK


REFERENCES


PTAU7019 TWO AND THREE WHEELER TECHNOLOGY

OBJECTIVE:

- To develop the basic knowledge of the students in constructional details of two and Three Wheelers. Dissect the skills of the students in the operating principles.

UNIT I POWER UNIT


UNIT II FUEL AND IGNITION SYSTEM

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, and starting system - Kick starter system – Self starter system. Recent technologies.

UNIT III CHASSIS AND SUB – SYSTEMS

Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar, Freewheeling devices
UNIT IV  BRAKES AND WHEELS  9

UNIT V  TWO & THREE WHEELER CASE STUDY  9
Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Importance of maintenance – general maintenance schedule – Servicing of two and three wheeler – periodic checkups. Recent developments.

TOTAL: 45 PERIODS

OUTCOMES
On successful completion of this course students will be able to:
- Explain the working of two and four stroke engines.
- Illustrate the functioning of clutch and gear box.
- Demonstrate the wheels, tyres, suspensions and braking systems.
- Identify the latest models of two wheelers.
- Define the operations of three wheelers and latest models of three wheelers

TEXT BOOK:

REFERENCES:
2. K. K. Ramalingam, Two Wheelers, Scitech publications, Chennai,

PTAU7020  VEHICLE AIR-CONDITIONING  L  T  P  C
3  0  0  3

OBJECTIVES :
- The objective of the course is to impart knowledge in the area of pychrometry, refrigerant and to understand the various components of vehicle air conditioning. Also the Servicing and repairing aspects of vehicle air conditioning will be covered.

UNIT I  AUTOMOTIVE AIR CONDITIONING FUNDAMENTALS  9
Purposes of Heating, Ventilation and Air Conditioning- Environmental Concerns- Ozone layer depletion- Location of air conditioning components in a car – Schematic layout of a vehicle refrigeration system. Psychrometry – Basic terminology and Psychrometric mixtures- Psychrometric Chart- Related problems

UNIT II  AUTOMOTIVE COOLING AND HEATING SYSTEM  9
Vehicle Refrigeration System and related problems- Fixed thermostatic and Orifice tube system-Variable displacement thermostatic and Orifice tube system- Vehicle air conditioning operation Types of compressor- Compressor Clutches- Compressor Clutch electrical circuit- Compressor lubrication- Condensers- Evaporators- Expansion devices- Evaporator temperature and
pressure controls- receiver-drier- Accumulators- refrigerant hoses, Connections and other assemblies- Heating system

UNIT III AIR-CONDITIONING CONTROLS, DELIVERY SYSTEM AND REFRIGERANTS 9
Types of Control devices- Preventing Compressor damage- Preventing damage to other systems- Maintaining drive ability- Preventing Overheating Ram air ventilation- Air delivery Components- Control devices- Vacuum Controls Containers – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT IV AUTOMATIC TEMPERATURE CONTROL 9
Different types of sensors and actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system

UNIT V SYSTEM SERVICING AND TESTING 9
Special tools for servicing vehicle air conditioning – Diagnosing components and air conditioning systems- Diagnosing cooling system- Air delivery system- Automatic temperature Control system diagnosis and service

TOTAL : 45 PERIODS

OUTCOMES:
- Student will understand the fundamental principles and operation of the heating, cooling, ventilation and air-conditioning system.
- Student will able to solve the simple problems related to psychrometry and refrigerant
- Enable the student to understand the operation of the individual components of the A/C
- System, sensors, actuators and electronic control
- Enable the reader to understand the range of techniques that can be used in diagnosing faults which affect system performance
- To provide adequate knowledge in safe working practice, understanding the correct procedures for A/C service and repair

TEXT BOOKS:

REFERENCES:

PTAU7021 VEHICLE MAINTENANCE L T P C
3 0 0 3

OBJECTIVE :
- To impart the knowledge on basics of vehicle maintenance and maintenance of engine subsystems and drive line components.
UNIT I MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS


UNIT II ENGINE AND ENGINE SUBSYSTEM MAINTENANCE

General Engine service- Dismantling of Engine components- Engine repair- Service of basic engine sub systems- cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis - servicing emission controls

UNIT III TRANSMISSION AND DRIVELINE MAINTENANCE

Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

UNIT IV STEERING, BRAKE, SUSPENSION, WHEEL MAINTENANCE

Maintenance and Service of steering system-Inspection, Maintenance and Service of brake system- Drum brake, Disc brake, Parking brake. Bleeding of brakes. Inspection, Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers-Dismantling and assembly procedures. Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation. Inspection,

UNIT V AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE

Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

TOTAL : 45 PERIODS

OUTCOMES

End of the course student would have deep knowledge on

- Importance of Vehicle maintenance
- Service procedure of engine and subsystems
- Service procedure of drive line
- Maintenance of electrical and air conditioning system

TEXT BOOKS


REFERENCES

2. Vehicle Service Manuals of manufacturers
OBJECTIVE:
- The objective of the course is to impart knowledge in the areas of vehicle networking, various vehicle networking standards and multiplexing buses.

UNIT I
INTRODUCTION TO VEHICLE NETWORKING CONCEPTS
- Historical Perspective
- Multiplexing Paradox
- Vehicle multiplexing comparison to industry
- Why multiplexing
- Popularity of multiplexing
- SAE Classification
- Intra Module Versus Intermodule communication
- Examples of Vehicle Nodes
- Terminology like: open architecture, Broadcast, Peer to peer, Baud rate versus Bit rate, protocol Synchronous and asynchronous protocol
- On board Diagnostics
- Encoding
- Error Handling
- Media Characteristics etc.

UNIT II
VARIOUS MULTIPLEXING LEVEL
- The vehicle Level
- Topologies
- Network Design issues
- Development Tools
- Service tools
- Vehicle Level Testing
- The Electronic Control Level
- Integrated Control
- Unexpected message delays
- Message synchronization
- Local loss of power and ground
- Integrated circuit level
- Partitioning
- General digital tradeoffs
- Digital CAN implementation
- Electromagnetic compatibility

UNIT III
MULTIPLEXING STANDARDS
- ISO standards
- SAE international standards
- Class A protocols
- Class B protocols
- Class C protocols
- Diagnostic Protocols
- Air Bag Protocols
- Wireless Protocols
- Data Link Usage
- Future Trends

UNIT IV
CAN: FROM CONCEPT TO REALITY
- The CAN bus: general
- CAN: its protocol, its properties, its novel features
- The CAN physical layer: Medium, implementation and physical layers in CAN-Components, applications and tools
- for CAN-Event-triggered and time-triggered aspects
- TTCAN – Time-triggered communication on CAN
- Towards high-speed, X-by-Wire and redundant systems

UNIT V
NEW MULTIPLEXED BUS CONCEPTS
- LIN – Local Interconnect Network
- Think ‘Bus’, think ‘Fail-safe SBC’, ‘Gateways’
- Safe-by-Wire
- Audio-video buses

TOTAL: 45 PERIODS

OUTCOMES:
- Students will acquire knowledge in multiplexing terminology and Standards relevant to vehicle
- Student can able to understand the current state of the CAN protocol, all the possible subdivisions of the physical layers and everything relating to conformity problems.
- Student can able to know the importance of various new multiplexed bus concepts

TEXT BOOKS:
OBJECTIVE:
- To learn and understand the programming, data acquisition hardware and implementing small automotive related projects in virtual instrumentation.

UNIT I INTRODUCTION
Virtual Instrumentation-Definition and flexibility-Block diagram and Architecture of Virtual Instrumentation- Virtual instruments versus Traditional Instruments- Review of software in virtual Instrumentation- VI programming techniques- VI, sub VI, Loops and charts, Arrays, Clusters and Graphs, Case and Sequence Structures, Formula nodes, string and File Input / Output.

UNIT II DATA ACQUISITION IN VI
A/D and D/A Converters, plug-in Analog input / Output cards- Digital Input and Output cards, Organization of the DAQ VI system- Opto Isolation- Performing analog input and analog output- Scanning multiple analog channels- issues involved in selection of data acquisition cards- Data acquisition modules with serial communication- Design of digital voltmeter with transducer input-Timers and Counters.

UNIT III COMMUNICATION NETWORKED MODULES

UNIT IV REAL TIME CONTROL IN VI
Design of ON/OFF controller and proportional controller for a mathematically described processes using VI software- Modeling and basic control of level and Reactor Processes- Case Studies on development of HMI, SCADA in VI.

UNIT V AUTOMOTIVE APPLICATIONS
PC based digital storage oscilloscope- Sensor technology and signal processing- virtual laboratory- spectrum analyzer- wave form generator- Data visualization and multiple locations:- Distributed monitoring and control-Vision and motion control. Case study related to automotive applications

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the various quantitative techniques and optimization techniques and to make the students apply these techniques for modeling and solving many engineering situations in general and manufacturing situations in particular.

UNIT I  LINEAR PROGRAMMING  12

UNIT II  REPLACEMENT MODELS AND GAME THEORY  12

UNIT III  QUEUING MODELS AND SIMULATION  12

UNIT IV  FORECASTING, SEQUENCING AND LINE BALANCING  12

UNIT V  PROJECT NETWORK ANALYSIS AND DECISION TREE ANALYSIS  12
Network – CPM/PERT – Project time estimation – critical path – crashing of network, Decision tree analysis – applications

OUTCOME:
- The students shall able to select and apply techniques for typical engineering and industrial situations.

TEXT BOOKS:

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

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

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

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

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

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

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

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

PTGE7072 ENGINEERING ETHICS AND HUMAN VALUES L T P C
3 0 0 3

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

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

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

UNIT IV ENGINEER'S RIGHTS AND RESPONSIBILITIES ON SAFETY

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

TOTAL : 45 PERIODS
OUTCOMES
- Students will have the ability to perform with professionalism, understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.

TEXT BOOKS

REFERENCES

PTGE7073
HUMAN RIGHTS

OBJECTIVES :
- To sensitise 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
OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

PTGE7074 TOTAL QUALITY MANAGEMENT

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

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

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

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II
UNIT V  QUALITY MANAGEMENT SYSTEM  9

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
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.
TOTAL : 45 PERIODS

OUTCOME:
• Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS

REFERENCES
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property,

PTGE7076  FUNDAMENTALS OF NANO SCIENCE  L T P C
                            3 0 0 3

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, TiO$_2$, MgO, ZrO$_2$, NiO, nanoalumina, CaO,
AgTiO$_2$, 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

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

REFERENCES
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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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 3 0 0 3

OBJECTIVES:

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

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

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


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:

COURSE OBJECTIVES

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

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

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

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

UNIT IV  RESONANCE AND APPLICATIONS  9

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

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OBJECTIVES:
The student should be made to:

- Be familiar with the structure of basic electronic devices.
- Be exposed to the operation and applications of electronic devices.

UNIT I PN JUNCTION DEVICES

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

UNIT II TRANSISTORS

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

UNIT III AMPLIFIERS

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

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis –
FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers – Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS

TOTAL: 45 PERIODS

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

<table>
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<th>PTEE7201</th>
<th>DIGITAL SYSTEMS AND MICROCONTROLLERS</th>
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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 Electromagnetic 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 9

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

UNIT IV TRANSFER FUNCTION SYNTHESIS 9

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 9

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


PTME7751 POWER PLANT ENGINEERING LT P C

3 0 0 3

OBJECTIVES:

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

UNIT I HYDRO POWER PLANTS 9


UNIT II COAL, OIL AND GAS TURBINE POWER PLANTS 9


UNIT III NUCLEAR POWER PLANTS 9

UNIT IV RENEWABLE ENERGY POWER PLANTS 9

UNIT V ECONOMICS OF POWER GENERATION 9

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 L T P C
LABORATORY 0 0 4 2

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 9
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 9

UNIT III FREQUENCY DOMAIN ANALYSIS 9

UNIT IV STATE VARIABLE MODEL AND ANALYSIS 9

UNIT V DESIGN OF CONTROL SYSTEMS 9
Design Specification – Controller configurations – PID controller - Design using reaction curve and Ziegler-Nichols technique – Compensation schemes - Effect of providing Lag, Lead and Lag- Lead compensation on system performance and design. State variable design

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

TEXTBOOKS

REFERENCES

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

UNIT IV  INDUCTION MACHINES: THEORY 9

UNIT V  INDUCTION MACHINES: PERFORMANCE 9

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:

REFERENCES:
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, clampsers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types, Sigma-Delta ADC.

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

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

TOTAL: 45 PERIODS

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, 66kV and 33kV lines, 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 – 1 No.
   CRO Probe – 2 Nos
2. Personal computers
3. DC motor – 1 No.
   Generator – 1 No.
   Rheostats – 2 Nos
   Ammeters
   Voltmeters
   Connecting wires (3/20))
4. CRO 30MHz – 1 No.
   2 MHz Function Generators – 1 No.
5. Position Control Systems Kit (with manual) – 1 No.,
   Tacho Generator Coupling set
6. AC Synchro transmitter & receiver – 1 No.
   Digital multimeters

INSTRUMENTATION:

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

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

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

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

   d) Optical sensor – 1 No.
   Light source

   e) Strain Gauge Kit with Handy lever beam – 1 No.
   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) – 1 No. 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

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  UNCONTROLLED RECTIFIERS
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  CONTROLLED RECTIFIERS
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:
analysis—Generator-transformer transmission line and load representation for different powersystem studies—Primitivenetwork-constructionofY-bus using inspection and singular transformation methods—Z-bus.

UNIT II POWER FLOW ANALYSIS

UNIT III FAULT ANALYSIS—BALANCED FAULTS

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

UNIT V STABILITY ANALYSIS
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-today 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 emphasis 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.

UNITI   INTRODUCTION

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

UNITII  REALPOWER-FREQUENCYCONTROL


UNITIII REACTIVEPOWER–VOLTAGECONTROL

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

UNITIV UNIT COMMITMENT AND ECONOMIC DISPATCH


UNITV COMPUTERCONTROLOFPOWERSYSTEMS

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


REFERENCES

PTEE7503 PROTECTION AND SWITCH GEARS

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 9
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 9
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 9
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 9
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 9

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&3Φsemiconductor, 1Φ&3Φfullconverter, 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) -2each
2. Single phase SCR based half controlled converter and fully controlled converter along with built-in/separate/firing circuit/module and meter –2each

37
3. MOSFET based step up and step down choppers – 1 each
4. IGBT based single phase PWM inverter module – 2
5. IGBT based three phase PWM inverter module – 2
6. Switched mode power converter module – 2
7. SCR & TRIAC based single phase AC controller alongwith lamp or rheostat load – 2
8. Cyclo-converter kit with firing module – 2
9. Dual regulated DC power supply with common ground
10. Cathode Ray Oscilloscope – 10
11. Isolation Transformer – 5
12. Single phase Autotransformer – 3
13. Components (Inductance, Capacitance) 3 sets for each
14. Multimeters – 5
15. LCR meter – 3
16. Rheostats of various ranges – 2 sets of 10 values, 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 3 0 0 3

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

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

OUTCOMES:

- Ability to develop algorithms to study load flow, short circuit and stability analysis.
PTEE7711  PROJECT WORK  

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

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

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

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

TOTAL : 135 PERIODS

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.

PTMA7001  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 ($\bar{X}$ 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

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

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

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

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

UNIT IV DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.
UNIT V  DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

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

PTGE7072  ENGINEERING ETHICS AND HUMAN VALUES  L T P C
(Common to all branches)  3 0 0 3

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

UNIT I  HUMAN VALUES

UNIT II  ENGINEERING ETHICS

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.
UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY


UNIT V GLOBAL ISSUES

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

OUTCOMES

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

TEXT BOOKS


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

UNIT II TQM PRINCIPLES
Leadership - The Deming Philosophy, Quality council, Quality statements and Strategic planning - Customer Satisfaction - Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal - Continuous process improvement - Juran Trilogy, PDSA cycle, 5s and Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II
Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures - Cost of Quality - BPR.

UNIT V QUALITY MANAGEMENT SYSTEM

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


PTGE7076 FUNDAMENTALS OF NANO SCIENCE

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

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

REFERENCES

PTMG7001 MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING LT P C 3 0 0 3

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

UNIT I DEMAND & SUPPLY ANALYSIS 9
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 9
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 9
Pricing Objectives - Determinants of price - Pricing under different market structures – price discrimination - pricing methods in practice

UNIT IV FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT) 9
financial statements - Comparative financial statements

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

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

UNIT V CONTROLLING

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 LT P C 3 0 0 3

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

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

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

UNIT III  RECURSIVE IDENTIFICATION METHODS  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

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

2. R G Dromey,”How to solve it by computers”, Pearson Education Asia, 2005.
OBJECTIVES:
- To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.
- To classify signals and systems & their mathematical representation.
- To analyse the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

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

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

UNIT III  DISCRETE FOURIER TRANSFORM & COMPUTATION

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

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

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


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**

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

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

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

**UNIT II  EMBEDDED NETWORKING**

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

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

UNIT IV  VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9


UNIT V  CO-ORDINATION OF FACTS CONTROLLERS 9


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

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 9

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  9
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  9
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  9
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  9
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

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.

UNIT I 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

UNIT II 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 of 12 pulse converters—Analysis of VSC topologies and firing schemes

UNIT III 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.

UNIT IV 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

UNIT V 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
TEXTBOOKS

REFERENCES

PTEE7016 INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN LT P C
3 0 0 3

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

UNIT I MOTOR STARTING STUDIES 9

UNIT II POWER FACTOR CORRECTION STUDIES 9

UNIT III HARMONIC ANALYSIS 9
Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study

UNIT IV FLICKER ANALYSIS 9
Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects.

UNIT V GROUND GRID ANALYSIS 9

TOTAL : 45 PERIODS

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

TEXT BOOKS
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

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

UNIT IV IMAGING MODALITIES AND ANALYSIS

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES
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

UNIT V APPLICATIONS

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 NANO SCALE 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, WileyIndia.
OBJECTIVES

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

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

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

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

UNIT IV    INTERIOR POINT METHODS

UNIT V    DYNAMIC PROGRAMMING

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

TOTAL: 45 PERIODS

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

TEXT BOOKS
REFERENCES

PTEE7023  RESTRUCTURED POWER SYSTEMS  LT P C
3 0 0 3

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

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

UNIT II  TRANSMISSION CONGESTION MANAGEMENT

UNIT III  LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHT

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

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

TEXT BOOKS

REFERENCES
1. Sally Hunt, "Making competition work inelectricity", John Willey and Sons Inc., 2002

PTEE7024 SMART GRID L T P C 3 0 0 3

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 LT P C

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

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox

UNIT III FUZZY SET THEORY

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions
UNIT IV  Fuzzy Logic for Modeling and Control  9
Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller –
Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy
systems – Familiarization with fuzzy logic toolbox

UNIT V  Hybrid Control Schemes  9
Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron–
Introduction to GA – Optimization of membership function and rule base using Genetic Algorithm
– Introduction to support vector machine – Particle swarm optimization – Case study –
Familiarization with ANFIS toolbox

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

TEXTBOOKS
1.  Laurence Fausett, “Fundamentals of Neural Networks”, Prentice Hall, Englewood Cliffs,
    N.J., 1992

REFERENCES
    Wesley Publishing Company Inc. 1989
    Engineering”, 2006

PTEE7026  SPECIAL ELECTRICAL MACHINES  LT P C
3 0 0 3

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

UNIT I  Permanent Magnet Brushless DC Motors  9
Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis-
EMF and Torque equations- Characteristics and control

UNIT II  Permanent Magnet Synchronous Motors  9
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

UNIT IV  STEPPER MOTORS

UNIT V  OTHER SPECIAL MACHINES

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

TEXT BOOKS:

REFERENCES:

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

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

PTCS7071  OPERATING SYSTEMS  L T P C
3 0 0 3

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

UNIT I  OPERATING SYSTEMS OVERVIEW  9

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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ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
REGULATIONS – 2017
B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING (PART-TIME)

Educational Objectives
Bachelor of Electronics and Instrumentation Engineering curriculum for part-time is designed to prepare the graduates having attitude and knowledge to

1. Have successful technical and professional careers in their chosen fields such as Process Control, Electronics & Information Technology.
2. Engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics & Instrumentation

Programme Outcomes
The graduates will have the ability to

a. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
b. Identify and formulate Instrumentation Engineering problems from research literature and be able to analyze the problem using first principles of Mathematics and Engineering Sciences.
c. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
d. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
e. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems/processes and also being conscious of the limitations.
f. Understand the role and responsibility of the Professional Instrumentation Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
g. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for sustainable Development.
h. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
i. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
j. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
k. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinary environments.
l. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

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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 :


PTPH7151 ENGINEERING PHYSICS L T P C
(Common to all branches of B.E / B.Tech programmes) 3 0 0 3

OBJECTIVE:
• To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER

UNIT II ACOUSTICS AND ULTRASONICS
UNIT III THERMAL AND MODERN PHYSICS
Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity - heat conductions in solids - flow of heat through compound media - Forbes’s and Lee’s disc method: theory and experiment - Black body radiation - Planck’s theory (derivation) - Compton effect - wave model of radiation and matter - Schrödinger’s wave equation - time dependent and independent equations - Physical significance of wave function - particle in a one dimensional box.

UNIT IV APPLIED OPTICS

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

TOTAL: 45 PERIODS

OUTCOME:
- The students will acquire knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXTBOOKS:

REFERENCES:
COURSE OBJECTIVES

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

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

UNIT II  SURFACE CHEMISTRY AND CATALYSIS  9

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY  9

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

TOTAL : 45 PERIODS

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

TEXT BOOKS

REFERENCES
OBJECTIVES:

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

UNIT I INTRODUCTION

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

UNIT II C PROGRAMMING BASICS


UNIT III ARRAYS AND STRINGS


UNIT IV POINTERS

Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations.

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES


TOTAL : 45 PERIODS

At the end of the course, the student should be able to:

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort.
- Use programming language to solve problems.
TEXT BOOKS

REFERENCES

PTEI7101 ELECTRONICS FOR ANALOG SIGNAL PROCESSING I

COURSE OBJECTIVES
- To introduce the students to the construction, operation, characteristics and applications of various semiconductor diodes and transistors.
- To impart knowledge on different types of configurations and biasing circuits for BJT and FET.
- To impart knowledge on single & multi-stage amplifiers, power amplifiers and oscillators.
- To enable the students to analyze a given BJT / FET amplifier circuit for voltage gain, current gain, input impedance, output impedance and bandwidth.
- To enable the students to design transistor amplifiers and oscillators for a given set of specifications.

UNIT I SEMICONDUCTOR DIODES
PN junction diode: Forward and reverse characteristics, Applications in Rectifier, Switching, Clipper, Clamper and Protection circuits - Zener diode: Forward and reverse characteristics, Application as voltage regulator, Introduction to special diodes: Schottky diode, Varactor diode, Laser diode, Photodiode – UJT characteristics and application as relaxation oscillator, Thyristors: Characteristics and applications of SCR, DIAC and TRIAC.

UNIT II BJT AMPLIFIERS
UNIT III  FET AMPLIFIERS

UNIT IV  MULTISTAGE AND FEEDBACK AMPLIFIERS

UNIT V  OSCILLATORS AND POWER AMPLIFIERS

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Apply the knowledge of semiconductor device fundamentals to understand the operation of any diode or transistor based circuit.
2. Analyze a given transistor amplifier and evaluate its performance with respect to gain, impedance and bandwidth.
3. Design single stage / multistage BJT/FET amplifiers for a given set of specifications. Select an appropriate diode / transistor circuit for a specific application.

TEXT BOOKS:

REFERENCES:
6. NPTEL video lectures on “Electronics for Analog Signal Processing I” by Prof. K.R.K. Rao, IITM.

**MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES**

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**PTEI7201 ELECTRICAL AND ELECTRONIC MEASUREMENTS**

**LT PC 3 0 0 3**

**COURSE OBJECTIVES**

- To provide knowledge in the specific area of electrical measuring instruments. Emphasis is laid on the meters used to measure current, voltage, resistance, inductance and capacitance.
- To have an adequate knowledge in the measurement techniques for power and energy.
- Elaborate discussion about potentiometer and to impart knowledge on various instrument transformers and to understand the calibration of various meters.
- In-depth understanding and idea of analog and digital instruments.
- Detailed study of display and recording devices.

**UNIT I MEASUREMENT OF ELECTRICAL PARAMETERS**


**UNIT II POWER AND ENERGY MEASUREMENTS**


**UNIT III POTentiometers and Instrument Transformers**


**UNIT IV ANALOG AND DIGITAL INSTRUMENTS**

UNIT V DISPLAY AND RECORDING DEVICES


TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. An ability to compare the working principles, merits, demerits and errors of different types of electrical instruments and can understand about different instruments that are used for measurement purpose.
2. Understanding of how different bridge networks are constructed and balanced for finding out values of resistance, capacitance and inductance.
3. An ability to apply knowledge of electronic instrumentation for measurement of electrical quantities.
4. Able to apply the principles and practices for instrument design and development to real world problems.

TEXT BOOKS:

REFERENCES:

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COURSE OBJECTIVES

- To introduce the basics of operational amplifiers, their characteristics and their configurations.
- To impart knowledge about the concepts and applications of timer, PLL, ADC and DAC.
- To enable the students to analyze the given integrated circuit and evaluate the output.
- To enable the students to design signal conditioning circuits using operational amplifiers.
- To enable the students to design multi-vibrator circuits using OPAMP / Timer for switching applications.

UNIT I OPERATIONAL AMPLIFIERS


UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIER

Differentiator and Integrator: ideal and practical circuits, V to I and I to V converters - Instrumentation amplifier circuit analysis, Instrumentation amplifier IC – Active Filters: Low pass, High pass, Band pass and Band reject filters – Comparator, Schmitt trigger, Multi-vibrators, Triangular wave generator, Sine wave generator, Function generator - Clipper and Clamper – Log and Antilog amplifiers.

UNIT III TIMER AND PHASE LOCKED LOOP


UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS


UNIT V SPECIAL FUNCTION IC’S


TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to interpret data sheet of a given analog IC.
2. Ability to apply the knowledge of analog IC’s to understand the operation of a given
electronic circuit involving IC’s.
3. Ability to analyze an electronic circuit involving IC’s and evaluate its output.
4. Ability to design an analog IC based electronic circuit for a given application.
5. Compare the performance of IC based circuits with discrete component circuits for the same application.

TEXT BOOKS:

REFERENCES:
4. NPTEL video lectures on “Electronics for Analog Signal Processing II” by Prof. K.R.K. Rao, IITM.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- Get to know the methods of measurement, classification of transducers and to analyze error.
- To understand the behavior of transducers under static and dynamic conditions and hence to model the transducer.
- Get exposed to different types of resistive transducers and their application areas.
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on variety of transducers and get introduced to MEMS and Smart transducers.

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS

- Units and standards – Static calibration – Classification of errors, Limiting error and probable error

UNIT II CHARACTERISTICS OF TRANSDUCERS

- Static characteristics: Accuracy, precision, resolution, sensitivity, linearity, span and range.
- Dynamic characteristics: Mathematical model of transducer, Zero, I and II order transducers, Response to impulse, step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS

- Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezo-resistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS


UNIT V OTHER TRANSDUCERS


TOTAL: 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to apply the mathematical knowledge and science & engineering fundamentals
gained to solve problems pertaining to measurement applications.
2. Be able to analyze the problems related to sensors & transducers.
3. Be able to select the right sensor/transducer for a given application.
4. Be able to determine the static and dynamic characteristics of transducers using software packages.

TEXT BOOKS:

REFERENCES:

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COURSE OBJECTIVES

- To introduce the representation and classification of continuous-time and discrete-time signals.
- To impart knowledge on the methods and impact of analog to digital conversion and digital to analog conversion.
- To teach the analysis of CT and DT systems through various transform techniques such as Laplace transform, Fourier transform and Z-transform.
- To familiarize the concept of random signals and their statistical properties.

UNIT I  INTRODUCTION TO CT SIGNALS AND SYSTEMS  9
Introduction to signals and systems and their classifications. Definition of CT signal, Representation of elementary CT signals: – Impulse, Pulse, Step, Ramp, Exponential, Sinusoidal. Classification of CT signals: – periodic and a-periodic, power and energy, deterministic and random signals. Definition of CT system, Classification and characterization with examples: – Static & dynamic, causal & non causal, linear & non linear, time variant & time invariant, stable & unstable, FIR & IIR.

UNIT II  ANALYSIS OF CT SIGNALS AND SYSTEMS  9
Time domain analysis:-solutions of differential equation. Fourier series and Fourier transform analysis of signals, spectrum of CT signals, Laplace Transform analysis of signals and systems, Analysis of random signals.

UNIT III  DISCRETIZATION AND SIGNAL RECONSTRUCTION  9
Discretization of signals: sample and hold circuit, Sampling:- Sampling theorem, selection of sampling rate, Types of sampling, Aliasing:- Aliasing effects, Anti-aliasing filter, Quantization:- Quantization errors due to truncation and rounding in fixed and floating point representations, signal reconstruction:-Interpolation using zero-order hold & first order hold.

UNIT IV  CLASSIFICATION AND ANALYSIS OF DISCRETE TIME SIGNALS  9

UNIT V  TRANSFORM TECHNIQUES FOR DT SIGNALS AND SYSTEMS  9

TOTAL :  45  PERIODS
COURSE OUTCOMES
At the end of the course, the students
• Will gain ability to generate different types of CT and DT signals.
• Will be capable to analyze and characterize any given CT or DT system and obtain the time response and frequency response.
• Will gain knowledge on the application of transform techniques.
• Will be familiarized with random signals and their statistical properties.

TEXT BOOKS
2. Tarun Kumar Rawat, Signals and Systems, Oxford University Press, 2010

REFERENCES

PTEI7211 SENSORS AND SIGNAL CONDITIONING LABORATORY LT P C 0042

COURSE OBJECTIVES
• To make the students aware of basic concepts of measurement and operation of different types of transducers.
• To make the students conscious about static and dynamic characteristics of different types of transducer.

LIST OF EXPERIMENTS
1. Static and Dynamic characteristics of Thermocouple (J,K,E) with and without thermo-well.
2. Static and Dynamic characteristics of RTD and Thermistor.
4. Characteristics of angular displacement transducers (Synchros and Capacitive
   transducer).
5. Sensitivity analysis of strain gauge bridges (quarter, half and full).
6. a. Static characteristic of flapper-nozzle system.
   b. Loading effect on resistive potentiometer.
7. Characteristic of seismic type accelerometer.
8. Measurement of inductance (Anderson), capacitance (Schering) and resistance (Kelvin
double) using bridges.
   b. Design and testing of Instrumentation amplifier.
10. Design of cold junction compensation for Thermocouples and lead wire compensations
    for RTD.
11. Design of signal conditioning circuits for high output impedance sensor (pH).
12. PC Based Data Acquisition system.

TOTAL : 60 PERIODS

COURSE OUTCOMES(COs)

1. Understand the concepts of measurement, error and uncertainty.
2. Understand the static and dynamic characteristics of measuring instruments.
3. Gain knowledge about the principle of operation and characteristics of different types of
   resistance, capacitance and inductance transducers.
4. Acquire knowledge of operation and applications of special transducers.
5. Acquire knowledge of interfacing and analyzing different stages of signal conditioning units.
6. Ability to present the results in oral form as well as in written form as a report.
7. Ability to interpret the results and draw meaningful conclusions.
8. Ability to work as a member of a team while carrying out experiments.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To make the students familiarize about various representations of systems.
- To develop linear models mainly state variable model and Transfer function model from Non Linear systems.
- To make the students analyze linear systems in time domain and frequency domain.
- To train the students to design compensator for system(s) using time and frequency domain techniques.

UNIT I MODELING OF LINEAR TIME INVARIANT SYSTEM (LTIV) 9
Control system: Open loop and Closed loop – Feedback control system characteristics – First principle modeling: Mechanical, Electrical and Hydraulic systems – Transfer function representations: Block diagram and Signal flow graph.

UNIT II STATE SPACE MODEL OF LTIV AND LTV SYSTEMS 9

UNIT III TIME DOMAIN AND STABILITY ANALYSIS 9

UNIT IV FREQUENCY DOMAIN ANALYSIS 9

UNIT V DESIGN OF FEED BACK CONTROL SYSTEM 9
Design specifications – Lead, Lag and Lag-lead compensators using Root locus and Bode plot techniques – Introduction to Non-linear system.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.
2. Ability to do time domain and frequency domain analysis of various models of linear system.
3. Ability to come out with solution for complex control problem.
4. Ability to interpret characteristics of the system to develop mathematical model.
5. Ability to design appropriate controller for the given specifications.

TEXT BOOKS:

REFERENCES:


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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PTEI7302 DIGITAL PRINCIPLES AND APPLICATIONS LT P C 3 0 0 3

COURSE OBJECTIVES

- To study various number systems, Boolean expressions and simplifications.
- To study, analyze and design of the combinational logic circuits for arithmetic operations.
- To study, analyze and design of sequential circuits, registers and counters.
- To study, analyze and design asynchronous sequential circuits and to know the functions of ASM charts.
- To learn memory components, PLA, PAL and the basic of HDL.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9
UNIT II  COMBINATIONAL LOGIC


UNIT III  SYNCHRONOUS SEQUENTIAL LOGIC


UNIT IV  ASYNCHRONOUS SEQUENTIAL LOGIC

Analysis and design of asynchronous sequential circuits – Reduction of state and flow tables – Race-free state assignment – Arithmetic State Machines: Introduction, components, features, examples.

UNIT V  MEMORY AND PROGRAMMABLE LOGIC DEVICES


TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)

At the end of the course, the student should have the ability:

1. To apply mathematics knowledge of number systems, Boolean expressions / functions.
2. To analyze the combinational and sequential circuits.
3. To design combinational logic circuits for different problems.
4. To design sequential logic circuits for various problems.
5. To investigate various programmable logic devices.

TEXT BOOKS:


REFERENCES:


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**PTEI7303**

**INDUSTRIAL INSTRUMENTATION I**

**COURSE OBJECTIVES**

- To make students understand the various measuring techniques for displacement, velocity, force, torque, acceleration, vibration, density, viscosity, humidity and moisture

**UNIT I MEASUREMENT OF DISPLACEMENT AND VELOCITY**


**UNIT II MEASUREMENT OF FORCE AND TORQUE**

Force: Analytical balance, Steel yard, Electronic microbalance- Hydraulic, Pneumatic, Strain gauge, Magneto-elastic and Piezoelectric load cells Torque: Measurement using load cell, Strain gauge and relative angular twist

**UNIT III MEASUREMENT OF ACCELERATION, VIBRATION AND SHAFT POWER**


**UNIT IV MEASUREMENT OF VISCOSITY AND DENSITY**

Viscosity: Units and definitions of viscosity terms - Friction tube Viscometer, Saybolt viscometer, Rotameter type and Torque type viscometers - Industrial Consistency Meters
Density: Baume scale and API scale, Pressure head type densitometers, displacer type densitometer, 
Float type densitometers, buoyancy effect densitometer, radioactive and resonance type 
densitometer, Ultrasonic densitometer and hot wire gas bridge densitometer.

UNIT V MEASUREMENT OF HUMIDITY AND MOISTURE

Humidity: Definitions of humidity terms - Dry and wet bulb psychrometers – hair hygrometer - 
Resistive and capacitive type hygrometers – Dew cell –Commercial type dew meter.

Moisture: Different terms to express moisture content in a material - Different methods of moisture 
measurements: Thermal, Conductivity and Capacitive sensors, Microwave, IR and NMR sensors, 
Application of moisture measurement - Moisture measurement in granular materials, solid penetrable 
materials like wood.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

• Ability to understand the construction and working of instruments used for measurement of 
Displacement, velocity, force, torque, acceleration, vibration, shaft power, density, viscosity, 
humidity and moisture.
• Ability to select instruments according to the application.
• Understand the concept of calibration of measuring instruments

TEXT BOOKS:


REFERENCES:


Company Ltd., New Delhi, 2010.


Delhi, 2009.

Kharagpur.

Madras.
COURSE OBJECTIVES

- To get familiarized with architecture, addressing modes and instructions of 8085 & 8086 microprocessor.
- To get exposed to high Performance and advanced architectures.
- To gain knowledge on essential peripherals and the associated interfacing ICs.
- To get acquainted with 8-bit microcontroller and be able to program in assembly and C-language.
- To design microcontroller based system/application.

UNIT I ARCHITECTURE OF 8085/8086 PROCESSOR

UNIT II ADVANCED ARCHITECTURES

UNIT III PERIPHERALS AND THEIR INTERFACING
Programmable Peripheral Interface (8255) - Keyboard display controller (8279) – ADC – DAC Interface – Programmable Timer Controller (8254) – Programmable interrupt controller (8259) – Serial Communication Interface (8251) – DMA Controller (8257).

UNIT IV MICROCONTROLLER ARCHITECTURE & PROGRAMMING

UNIT V 8051: INTERFACING AND SYSTEM DESIGN

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to understand the architecture of any advanced Processor to keep in pace with technological challenges.
2. Apply the acquired Programming skills and relate to any Processor/microcontroller in a multidisciplinary project.
3. Able to utilize the IT tools like TASM, MASM and Proteus to develop electronic prototyping and thereby establishing real time control.
4. Ability to develop/design microcontroller based system paving way for automation and continuous development.

TEXT BOOKS:

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COURSE OBJECTIVES

- To develop skill in program writing for 8085, 8086 processors and 8051 microcontroller.
- To gain Practical knowledge on interfacing hardware and associated software.
- To get trained to Programming and interfacing using simulators.
- To get exposed to programming and interfacing using ARM7, ARM11, MSP430, and PIC microcontroller.

LIST OF EXPERIMENTS

ASSEMBLY LANGUAGE PROGRAMMING

1. a) Understanding the instruction set of 8085 µp.
   b) PROGRAMMING using Arithmetic, Logical instructions of 8085 microprocessor.

2. a) Understanding the instruction set of 8086 µp.
   b) Programming using String manipulation instructions (Compare &Scan) of 8086 microprocessor.

3. a) Understanding the instruction set of 8051 µc.
   b) Programming using Arithmetic, Logical and Bit manipulation instructions of 8051 microcontroller

SIMULATION EXPERIMENTS

4. Turbo assembler Programming (using arithmetic, logical, string instructions) of 8086.

5. Interfacing Keyboard / LCD with µc.

6. Interfacing ADC/DAC/stepper motor with µc.

Hardware based Experiments using 8085 / 8086 / 8051 / ARM7 / ARM11 / MSP430 and PIC MICROCONTROLLER

7. Interfacing ADC and DAC with µp / µc.

8. Data transfer between computer and µp / µc.

9. a) Interfacing Keypad (4 x 4) with µp / µc.
    b) Interfacing LCD with µp / µc.

10. I²C based RTC/ EEPROM/ 7-Segment display Interface with µp / µc.

11. Interfacing limit Switches/ Push buttons/ Solenoid valves/ Pumps with µp / µc.

12. a) Realization of PID algorithm in µp / µc.
b) µp / µc based control of temperature / Level process.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to exploit the features/instruction of the microprocessor and microcontroller to develop microprocessor/microcontroller based system.
2. Provide automation solutions to the real-time processes and thereby improving the efficiency.
3. Facilitate interdisciplinary projects based on the acquired programming skills.
4. Ability to present the results in oral form as well as in written form as a report
5. Ability to interpret the results and draw meaningful conclusions.
6. Ability to work as a member of a team while carrying out experiments.

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COURSE OBJECTIVES

- To understand the theory and operational principles of instrumental methods for identification and quantitative analysis of chemical substances by different types of spectroscopy.
- To impart fundamental knowledge on gas chromatography and liquid chromatography.
- To integrate a fundamental understanding of the underlying principles of physics as they relate to specific instrumentation used for gas analyzers and pollution monitoring instruments.
- To impart knowledge on the important measurement in many chemical processes and laboratories handling liquids or solutions.
- To understand the working principle, types and applications of NMR and Mass spectroscopy.

UNIT I  SPECTROPHOTOMETRY  9

UNIT II  CHROMATOGRAPHY  9

UNIT III  INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS  9
Gas analyzers – Oxygen, NO₂ and H₂S types, IR analyzers, thermal conductivity detectors, analysis based on ionization of gases.
Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV  pH METERS AND DISSOLVED COMPONENT ANALYZERS  9

UNIT V  NUCLEAR MAGNETIC RESONANCE AND MASS SPECTROMETRY  9

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Understand the fundamental principles of selective analytical instruments used in medical diagnosis, quality assurance & control and research studies.
2. Assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors, and also suggest alternative
analytical methods for quality assurance.
3. Critically evaluate the strengths and limitations of the various instrumental methods.
4. Develop critical thinking for interpreting analytical data.

TEXT BOOKS:


REFERENCES:

4. NPTEL lecture notes on, “Modern Instrumental methods of Analysis” by Dr.J.R. Mudakavi, IISC, Bangalore.

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PTEI7402 INDUSTRIAL INSTRUMENTATION II LT P C 3 0 0 3

COURSE OBJECTIVES

- To make students understand the various measuring techniques for temperature and pressure.
- To make students analyze the characteristics of each measurement device and design signal conditioning circuits for the same.

UNIT I PRESSURE MEASUREMENT I 9

Units of pressure – Different types of Manometers- Elastic type pressure gauges: Bourdon tube, Bellows, Diaphragms and Capsules - Electrical methods: Elastic elements with LVDT and strain
gauges - Capacitive type pressure gauge - Piezo resistive pressure sensor - Resonator pressure sensor

UNIT II PRESSURE MEASUREMENT II
Measurement of vacuum: McLeod gauge, Thermal conductivity gauge, ionization gauges, Cold cathode type and hot cathode type – Installation and maintenance of pressure gauges - Calibration: Dead Weight Tester.

UNIT III TEMPERATURE MEASUREMENT I

UNIT IV TEMPERATURE MEASUREMENT II
RTDs: Material, Construction, Working, characteristics, lead wire compensation and signal conditioning circuit. IC sensor.
Thermocouples: Laws of thermocouple, Fabrication of industrial thermocouples, Reference junctions compensation, Commercial circuits for cold junction compensation, Response of thermocouple, Signal conditioning for thermocouple, Special techniques for measuring high temperature using thermocouple - installation and maintenance of thermocouples.

UNIT V TEMPERATURE MEASUREMENT III
Radiation fundamentals - Radiation methods of temperature measurement – Optical pyrometers - Total radiation pyrometers — Two color radiation pyrometers – Fiber optic sensor for temperature measurement – Thermograph, Temperature switches and thermostats.

TOTAL : 45 PERIODS

COURSE OUTCOMES
1. Ability to understand the construction and working of instruments used for measurement of temperature and pressure.
2. Ability to select instruments according to the application.
3. Understand the concept of calibration of instruments and gain knowledge about temperature measurement devices.
4. Ability to design signal conditioning circuits and compensation schemes for temperature measuring instruments.

TEXT BOOKS:

REFERENCES:

COURSE OBJECTIVES

- To introduce technical terms and nomenclature associated with Process control domain.
- To familiarize the students with characteristics, selection, sizing of control valves.
- To introduce students to the fundamentals of system identification.
- To provide an overview of the features associated with Industrial type PID controller.
- To make the students understand the various PID tuning methods.
- To elaborate different types of control schemes such as cascade control, feed-forward control and Model Based control schemes.

UNIT I          PROCESS DYNAMICS


UNIT II       CONTROL VALVE

Actuators: Pneumatic and electric actuators – I/P converter – Control Valve Terminology. Characteristic of Control Valves: Inherent and Installed characteristics - Valve Positioner – Modeling of a Pneumatically Actuated Control Valve – Valve body: Commercial valve bodies – Control Valve Sizing: ISA S 75.01 standard flow equations for sizing Control Valves – Cavitation and flashing – Materials for Control Valves – Control Valve selection

UNIT III      CONTROL ACTIONS


UNIT IV   PID CONTROLLER TUNING – SINGLE LOOP REGULATORY CONTROL & ENHANCEMENT TO SINGLE LOOP REGULATORY CONTROL

UNIT V MODEL BASED CONTROL SCHEMES & INTRODUCTION TO MULTI-LOOP REGULATORY CONTROL & CASE STUDIES


TOTAL : 45 PERIODS

COURSE OUTCOMES (COS)
1. Ability to understand technical terms and nomenclature associated with Process control domain.
2. Ability to build models using first principles approach as well as analyze models.
3. Ability to Design, tune and implement PID Controllers to achieve desired performance for various processes.
4. Ability to Analyze Systems and design & implement control Schemes for various processes.
5. Ability to use appropriate software tools (Example: MATLAB/SCILAB) for analysis and design of Process Control System.
6. Ability to Identify, formulate and solve problems in the Process Control Domain.

TEXT BOOKS:

REFERENCES:
PTEI7411  PROCESS CONTROL AND INSTRUMENTATION  
LABORATORY I  
LT P C 0 0 4 2

COURSE OBJECTIVES

To impart theoretical skills in

- Process Identification
- Tuning of PID controller including Auto-tuning
- PID Enhancements (Cascade and Feed-forward Control Schemes) and
- Design and Implementation of basic and advanced Control schemes using simulation software.
- To make the students aware about calibration of meter, sensors and transmitters.
- To make the students conscious about the working and operation of different types of analytical sensors.
- To identify, formulate, and analyze complex problems regarding sensors and transmitter
- To use research-based knowledge and research methods for interpretation of data from sensors

LIST OF EXPERIMENTS

Process Control

Simulation Based Experiments

1. Interpretation of P & ID (ISA S5.1)
2. Simulation of Lumped/ Distributed Parameter System.

3. Identification of Transfer function model of a Typical Industrial Process using non-parametric identification methods.


5. Design and Implementation of Feed forward and Cascade control schemes on the simulated model of a Typical Industrial Process.

6. (i) Analysis of MIMO system.
   (ii) Design and implementation of Multi-loop PID schemes on the simulated model of a Typical Industrial Process.

**Industrial Instrumentation**

1. Testing of pressure gauge using dead weight tester.

2. a) Calibration of thermocouple and RTD using temperature calibrator.
    b) Calibration of temperature transmitter using multifunction calibrator.

3. Calibration of ammeter, voltmeter and wattmeter using multifunction calibrator.


5. Measurement of Conductivity, pH and Viscosity of Test solutions

6. a) Temperature Measurement using IR Thermometer.
    b) Measurement of Pressure using fiber optics system.

**COURSE OUTCOMES (COs)**

1. Get exposed to simulation tools such as MATLAB/LABVIEW/ASPEN.

2. Be able to build dynamic models using the input-output data of a process.

3. Get acquainted with PID implementation issues and be able to tune the PID controller.

4. Ability to obtain servo and regulatory responses and be able to analyze and draw meaningful conclusions.

5. Be able to design and implement simple adaptive control scheme and model based control scheme.

6. Be able to present the results in written and oral forms.

7. Ability to work as a Member in a group.

8. Ability to experimentally measure industrial process parameters such as temperature, pressure and viscosity.

9. Ability to measure and analyze pH, conductivity, UV absorbance and transmittance.

10. Ability to calibrate sensors and transmitters.

11. Ability to present the results in oral form as well as in written form as a report and graph.

**TOTAL : 60 PERIODS**
PTEI7501  INDUSTRIAL INSTRUMENTATION III  LT P C
3 0 0 3

COURSE OBJECTIVES

• To make students understand the various measuring techniques for flow and level
• To make students understand different type of transmitters.

UNIT I  VARIABLE HEAD TYPE FLOWMETERS


UNIT II  QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS


UNIT III  ELECTRICAL TYPE FLOW METERS

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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UNIT IV LEVEL MEASUREMENT


UNIT V TRANSMITTERS


COURSE OUTCOMES

1. Ability to understand the construction, installation and working of different variable head type flow meters.
2. Able to understand the construction, working and calibration of different quantity flow meters, variable area flow meters, mass flow meters, electrical type, open channel and solid flow meters.
3. Gain knowledge about the construction, working and calibration of different type of transmitters.
4. Able to choose appropriate flow meters or level sensor for an application.

TEXT BOOKS:


REFERENCES:

COURSE OBJECTIVES

- To give an overview of the automation technologies such as PLCs, SCADA and DCS used in industries.
- To provide a fundamental understanding of the different languages used for PLC programming.
- To provide insight into some of the advanced principles those are evolving for present and future automation.

UNIT I PLC & SCADA

PLC: Evolutions of PLCs – Programmable Controllers – Architecture, I/O modules – Comparative study of Industrial PLCs.
SCADA: Remote terminal units - Master station - Communication architectures.

UNIT II BASICS OF PLC PROGRAMMING(LADDER)


UNIT III PLC PROGRAMMING (OTHER LANGUAGES)

Functional block programming - Sequential function chart – Instruction list – Structured text programming – PLC controlled sequential Process Examples.

UNIT IV DISTRIBUTED CONTROL SYSTEM

DCS: Evolution & types – Hardware architecture – Field control station – Interfacing of conventional and smart field devices (HART and FF enabled) with DCS Controller – Communication modules – Operator and Engineering Human interface stations – Study of any one DCS available in market.

UNIT V ADVANCED TOPICS IN AUTOMATION

Introduction to Networked Control systems – Plant wide control – Internet of things – Cloud based Automation – OLE for Process Control – Safety PLC – Case studies: PLC - SCADA - DCS.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to understand all the important components such as PLC, SCADA, DCS, I/O modules and field devices of an industrial automation system.
2. Ability to develop PLC program in different languages for industrial sequential applications.
3. Able to select and use most appropriate automation technologies for a given application.
4. Ability to gain knowledge on the recent developments in industrial automation.

TEXT BOOKS:

REFERENCES:


4. NPTEL Notes on, “Programmable Logic Control System” by Department of Electrical Engg., IIT Kharagpur.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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PTEI7511 PROCESS CONTROL AND INSTRUMENTATION LABORATORY II

LT P C 0 0 4 2

COURSE OBJECTIVES

To impart theoretical skills in

- Process Identification
- Tuning of PID controller including Auto-tuning
- PID Enhancements (Cascade and Feed-forward Control Schemes) and
- Design and Implementation of basic and advanced Control schemes using the facilities available in the Process Control lab.
- To make the students aware about calibration of meter, sensors and transmitters.
- To make the students conscious about the working and operation of different types of analytical sensors.
- To identify, formulate, and analyze complex problems regarding sensors and transmitter
- To use research-based knowledge and research methods for interpretation of data from sensors.
LIST OF EXPERIMENTS

Process Control

Hardware Based Experiments

1. (i) Study of a Process Control Training plant.
   (ii) Determination of characteristics of a Pneumatically Actuated Control valve (with and without Positioner).

2. Design and implementation of ON-OFF controller for the Temperature Process.

3. Control of flow process using industrial type PID controller.

4. PC based control of level process.

5. On-line monitoring and control of a pilot plant using an industrial type distributed control system.

6. Design and implementation of advanced control scheme (adaptive controller or model predictive Control scheme) on the skid mounted pilot plant.

Industrial Instrumentation

1. Level measurement using d/p transmitter including elevation consideration
2. a) Calibration and configuration of smart transmitter using HART communicator.
   b) Calibration and configuration of transmitters using loop calibrator.
3. Monitor of Physiological Parameters using Vital signs monitor
4. Interfacing Different types of flow meter with PC using DAC
5. Determination of stoichiometry ratio in a combustion process.
6. a) Testing of Rotameter. b) Instillation of d/p based level Transmitter.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Gain hands on experience in working with SKID mounted pilot plants (Flow/Level/Temperature/Pressure Control Loop(s))
2. Ability to experimentally measure industrial process parameters such as flow and level
3. Ability to measure and analyze physiological parameters such as BP, ECG and pulse rate.
4. Ability to calibrate sensors and transmitters.
5. Ability to present the results in oral form as well as in written form as a report and graph.
6. Ability to interpret the results of analysis and draw meaningful conclusions.
7. Ability to work as a member of a team while carrying out experiments.
COURSE OBJECTIVES

- Gain knowledge on different types of power plants.
- Study about the important process variables and their measurements.
- To understand the important control loops involved in thermal power plants.
- To analyze the various parameters related to steam turbines.

UNIT I OVERVIEW OF POWER GENERATION 9

UNIT II MEASUREMENTS IN POWER PLANTS 9

UNIT III BOILER CONTROL I 9

UNIT IV BOILER CONTROL II 9

UNIT V TURBINE MONITORING AND CONTROL 9
Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.

TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)

1. Able to understand and analyze the process diagram of hydel, thermal, nuclear, wind and solar power plants.
2. Will be in a position to select instruments for monitoring various parameters related to thermal power plant.
3. Able to develop, analyze and select appropriate control strategy for various systems involved in thermal power plant.
4. Gain knowledge on the important terms related to turbine monitoring system and able to analyze the problems related to turbine governing.
TEXT BOOKS:

REFERENCES:

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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PTEI7651 INDUSTRIAL DATA COMMUNICATION LT P C
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COURSE OBJECTIVES

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

UNIT I DATA NETWORK FUNDAMENTALS 9

UNIT II MODBUS AND HART 9

UNIT III PROFIBUS AND FF 9
Fieldbus: Introduction – General Fieldbus architecture – Basic requirements of Fieldbus standard –

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:

PTEI7611 INDUSTRIAL AUTOMATION LABORATORY

COURSE OBJECTIVES
To teach the importance of measurement for monitoring, control and to impart theoretical and practical skills in

- Sensor Data acquisition, Data analysis, Data processing and Data visualization.
- Interfacing Conventional and Smart Field Devices (Transmitters & Control Valves) with Industrial Type Programmable Logic Controller and Distributed Control System
- Understanding the Instruction set of Programmable Logic Controller.
- Programming of Industrial Type Programmable Logic Controller (Ladder Logic, Function Block Programming, Sequential Function Chart and Instruction List)

LIST OF EXPERIMENTS
1. Interfacing Level Transmitter and Control Valve with Personal Computer.

2. (i) Study of PLC Field Device Interface Modules (AI, AO, DI, DO Modules)
   (ii) Interfacing Analog/Digital Input/output Devices with Industrial Type PLC

3. Simple exercises using the Instruction Set of an Industrial Type PLC.

4. PLC Exercises-I (Hardware Implementation)
   i. Filling/drainage control operation.
   ii. Reversal of DC motor direction.

5. PLC Exercises-II (Hardware Implementation)
   i. Traffic light control.
   ii. Alarm Annunciator Sequence.

6. Control of Level Process using an Industrial Type PLC

7. Implementation of Discrete Control Sequence in PLC using Sequential Function Chart
Programming method.


9. (i) Study of DCS Field Device Interface Modules (AI, AO, DI, DO, H1 Modules)
   (ii) Interfacing Analog/Digital Input/Output Devices with an Industrial Type DCS

10. Implementation of Feedback Control Scheme in DCS using IEC 61131-3 Function Block Programming method.

11. (i) Interfacing HART and FF enabled Field Devices with Industrial Type DCS.
    (ii) Demonstration of PID Control in Field Devices.

12. Interfacing Wireless HART enabled Field Devices with DCS.  
    **TOTAL : 60 PERIODS**

**COURSE OUTCOMES(COs)**

1. Gain hands on experience in working with Industrial Automation Systems (Industrial Type DCS & PLC)
2. Be able to Configure Function Blocks and develop Feedback Control Schemes.
3. Ability to monitor and Control a pilot plant using Industrial Type DCS/PLC
4. Be able to analyze & interpret results and draw meaningful conclusions.
5. Be able to present the results in written and oral forms.
6. Ability to work as a Member in a group.

**MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES**

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COURSE OBJECTIVES

- To introduce the students the method of oil recovery and the steps involved in oil gas production process.
- To make the students understand the process behavior of some of the important unit operations in petrochemical industry through mathematical model.
- To familiarize the students to apply knowledge to select the appropriate control strategy for the selective process.
- To provide information about the most important derivatives obtained from petroleum products.
- To help the students in understanding selection and maintenance of instruments in petrochemical industry.

UNIT I OIL EXTRACTION AND OIL GAS PRODUCTION
Techniques used for oil discovery – Oil recovery methods – oil rig system - Overview of oil gas production – oil gas separation – Gas treatment and compression – Control and safety systems.

UNIT II IMPORTANT UNIT OPERATIONS IN REFINERY

UNIT III DERIVATIVES FROM PETROLEUM
Derivatives from methane – Methanol Production – Acetylene production - Derivatives from acetylene —Derivatives from ethylene – Derivatives from propylene.

UNIT IV IMPORTANT PETROLEUM PRODUCTS & MEASUREMENTS
BTX from Reformate – Styrene – Ethylene oxide/Ethylene glycol – polyethylene – Polypropylene – PVC production. Parameters to be measured in refinery and petrochemical industry – Selection and maintenance of measuring instruments.

UNIT V SAFETY IN INSTRUMENTATION SYSTEMS

COURSE OUTCOMES (COs)
1. Gain knowledge on oil gas production process and important unit operations in a refinery
2. Having gained the process knowledge, ability to develop and analyze mathematical model of selective processes.
3. Able to develop, analyze and select appropriate control strategy for selective unit operations in a refinery.
4. Gain knowledge on the most important chemical derivatives obtained from petroleum products.
5. Understand safety instrumentation followed in process industries.

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MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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PTEI7711 PROJECT WORK

COURSE 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 topic must be selected either from research literature or the students themselves may propose suitable topics in consultation with their guides. The aim of the project work is to deepen Comprehension of principles by applying them to a new problem which may be the design/fabrication of Sensor/Activator/Controller, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department.
A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

**TOTAL : 135 PERIODS**

**COURSE OUTCOMES (COs)**

At the end of the course, the student should be able to:

1. select a good project and able to work in a team leading to development of hardware/software product.
2. prepare a good technical report and able to present the ideas with clarity

**MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES**

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**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**  
9
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)**  
9
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 stake-holders- 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, Scenarios in the Indian context, Disaster damage assessment and management.

TEXT BOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
OBJECTIVES
- To emphasise into awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

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

UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY

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

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

TEXT BOOKS

REFERENCES
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics –
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

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

UNIT II TQM PRINCIPLES
Leadership - The Deming Philosophy, Quality council, Quality statements and Strategic planning - Customer Satisfaction - Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal - Continuous process improvement - Juran Trilogy, PDSA cycle, 5s and Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II
Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures - Cost of Quality - BPR.

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

OBJECTIVE:
- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION
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
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

UNIT IV DIGITAL PRODUCTS AND LAW

UNIT V ENFORCEMENT OF IPRs
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

PTGE7076 FUNDAMENTALS OF NANO SCIENCE L T P C 3 0 0 3

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

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

REFERENCES

PTEI7001 ADVANCED CONTROL ENGINEERING

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COURSE OBJECTIVES

The student should be made to:
• gain knowledge on the methods of plotting Nyquist chart for multivariable system.
• develop state space models.
• design state feedback control schemes and state observers.
• learn the different types of non-linearities and phase plane analysis.
• understand the different methods of determining the stability of non-linear systems.

UNIT I FREQUENCY DOMAIN DESCRIPTIONS
Properties of transfer functions - poles and zeros of transfer function matrices – singular value analysis – Multivariable Nyquist plots.

UNIT II STATE SPACE APPROACH
UNIT III  STATE FEEDBACK CONTROL AND STATE ESTIMATOR  
State Feedback – Output Feedback – Pole placement technique – Full order and Reduced Order Observers – Deadbeat Observers – Dead beat Control

UNIT IV  NON-LINEAR SYSTEMS  

UNIT V  STABILITY OF NON-LINEAR SYSTEMS  

TOTAL : 45 PERIODS

COURSE OUTCOMES
At the end of the course, the student should be able to:
• analyze MIMO systems methods of plotting Nyquist chart for multivariable system.
• analyze the state space models and capable to design state feedback control schemes and state observers.

TEXT BOOK:

REFERENCE BOOKS:
COURSE OBJECTIVES

- To make the students review the instruments used for measurement of basic process parameters like level, flow, pressure and temperature.
- To explore the various types of analyzers used in industrial applications.
- To make the students aware of basic concepts of safety instrumented system, standards and risk analysis techniques.
- To make students familiarize with Instrumentation standards such as BS1042, ISA 75, ISA 84 and ISA 88.
- To make students familiarize with Instrumentation Symbols, Abbreviations and Identification for Instruments, Process Flow diagrams, Instrument Loop diagrams, Instrument Hookup diagrams and Piping and Instrumentation Diagrams.

UNIT I MEASUREMENT OF PROCESS PARAMETERS

UNIT II INSTRUMENTS FOR ANALYSIS

UNIT III SAFETY INSTRUMENTATION

UNIT IV INSTRUMENTATION STANDARDS
Instrumentation Standards - significance of codes and standards – overview of various types - Introduction of various Instrumentation standards – review, interpretation and significance of specific standards - examples of usage of standards on specific applications.

UNIT V DOCUMENTATION IN PROCESS INDUSTRIES

TOTAL : 45 PERIODS
COURSE OUTCOMES (COs)

students will be able to

- understand the instrumentation behind flow, level, temperature and pressure measurement
- acquire basic knowledge on the various types of analyzers used in typical industries.
- understand the role of Safety instrumented system in the industry.
- explain Standards for applying Instrumentation in Hazards Locations.
- Design, develop, and interpret the documents used to define instruments and control systems for a typical project, including P&IDs, loop diagrams, specification forms, instrument lists, logic diagrams, installation details, and location plans

REFERENCE BOOKS


PTEI7003 ADVANCED TOPIC IN PID CONTROL LT P C 3 0 0 3

COURSE OBJECTIVES

- To provide an overview of the features associated with Industrial type PID controller.
- To make the students understand the various PID Controller Design methods and about PID stabilization for Linear Time-invariant models.
- To develop the skills needed to design adaptive and non-linear PID control schemes.
- To provide basic knowledge about Fractional-order systems and Fractional-order- controller and to lay the foundation for the systematic approach to Design controller for fractional order systems.

UNIT I INTRODUCTION 9
UNIT II    PID CONTROLLER DESIGN

UNIT III    PID STABILIZATION

UNIT IV    ADAPTIVE/NON-LINEAR PID CONTROL SCHEMES
Gain Scheduled PID Controller - Self-tuning PI/PID Controller – PID Types Fuzzy Logic Controller – Predictive PID Control.

UNIT V    INTRODUCTION TO FRACTIONAL ORDER SYSTEM AND FRACTIONAL ORDER PID CONTROLLER

TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)
1. Ability to determine the advanced Features supported by the Industrial Type PID Controller.
2. Ability to Design, tune and implement P/PI/PID Controllers to achieve desired Performance for various processes.
3. Ability to design and implement adaptive PID controllers and Non-linear PID Control schemes.
4. Ability to Analyze Fractional-order systems, Fractional-order- controller and Design controller for fractional order systems.

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61
COURSE OBJECTIVES

- Get familiarized with different architectures and training algorithms of neural networks.
- Get exposed to the various neural modeling and control techniques with case study using simulation tool box.
- Gain knowledge on fuzzy set theory and fuzzy rules.
- Able to design and implement the fuzzy logic controller with case study using simulation tool box.
- Capable of designing hybrid control schemes, selected optimization algorithms with case study using simulation tool box.

UNIT I  ARTIFICIAL NEURAL NETWORK (ANN)  9

UNIT II  NEURAL NETWORKS FOR MODELING AND CONTROL  9

UNIT III  FUZZY SET THEORY  9

UNIT IV  FUZZY LOGIC FOR MODELING AND CONTROL  9

UNIT V  HYBRID CONTROL SCHEMES  9

TOTAL : 45 PERIODS
COURSE OUTCOMES (COs)

1. Be able to analyze problems to formulate models and develop control schemes using soft computing techniques for non-linear systems.
2. Be able to apply engineering fundamentals to use hybrid schemes and optimization algorithms to obtain solution for complex engineering problems.
3. Be capable of using modern IT tool boxes to simulate case studies.

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COURSE OBJECTIVES

- To make students understand various physiological signal measurements, Identification and classification.
- To make students understand various Biomedical Instruments used for Bio-potential measurement and non-electrical parameter measurement.
- To make students familiarized with the medical imaging and understanding the concept of assisting and therapeutic devices.

UNIT I BASIC CONCEPTS OF MEDICAL INSTRUMENTATION

UNIT II ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

UNIT III NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES

UNIT IV MEDICAL IMAGING SYSTEMS

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Able to understand the operation of different medical devices.
2. Able to measure and analyze the Biological signals.
3. Able to apply these instruments in diagnosis, therapeutic treatment and imaging fields.

TEXT BOOKS:


REFERENCES:


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To introduce the basic concepts of Digital Signal processing.
- To make the students familiarize various mathematical tools for analyzing Discrete Time Systems.
- To make the students design Digital Filters based on the Filter specifications.
- To provide the exposure to the architectures of DSP processors.
- To implement various algorithms in DSP for solving Real-time problem.

UNIT I INTRODUCTION

Digital signal processing: Block diagram, advantages and applications, Linear and circular convolution, convolution techniques for long duration sequence, autocorrelation and cross correlation, aliasing effects in time domain – Review of DTFS, DTFT and Z-Transform.

UNIT II DFT AND FFT

DFT properties, magnitude and phase representation – Direct computation of DFT – FFT: Radix 2 DIT & DIF algorithms, computational complexity, DFT and IDFT using FFT algorithms.

UNIT III DIGITAL IIR FILTERS


UNIT IV DIGITAL FIR FILTERS


UNIT V FINITE WORD LENGTH EFFECTS AND DSP PROCESSORS

Finite word length Effect – Fixed and floating point number representation, Quantization errors – Finite word length effects in IIR and FIR filters – Introduction to DSP architectures – addressing modes and Instruction set.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

- Ability to apply various mathematical tools for analyzing discrete time system based on the knowledge of mathematics
- Ability to design digital filters.
- Ability to come out with solutions for solving simple/complex problem.
- Ability to use DSP Processor for real-time implementation.
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PTEI7007 FAULT DETECTION AND DIAGNOSIS LT P C 3 0 0 3

COURSE OBJECTIVES

- To give an overview of different Fault Detection and Diagnosis methods.
- To present an overview of various types of fault detection schemes using Limit Checking, Parameter estimation methods, Principle Component Analysis.
- To impart knowledge and skills needed to design and detect sensor and actuators faults using structured residual approach as well as directional structured residual approach.
- To impart knowledge and skills needed design and detect faults in sensor and actuators using GLR and MLR based Approaches.
- To impart knowledge and skills needed to detect and quantify and compensate stiction in Control valves.

UNIT I INTRODUCTION & ANALYTICAL REDUNDANCY CONCEPTS 9
Introduction – Types of faults and different tasks of Fault Diagnosis and Implementation – Different

UNIT II  FAULT DETECTION AND DIAGNOSIS USING LIMIT CHECKING AND PROCESS IDENTIFICATION METHODS


UNIT III  FAULT DETECTION AND DIAGNOSIS USING PARITY EQUATIONS


UNIT IV  FAULT DIAGNOSIS USING STATE ESTIMATORS


UNIT V  CASE STUDIES


TOTAL : 45 PERIODS

COURSE OUTCOMES (COs):
1. Ability to explain different approaches to Fault Detection and Diagnosis.
3. Ability to design and detect sensor and actuators faults using structured residual approach as well as directional structured residual approach.
4. Ability to design and detect faults in sensor and actuators using GLR and MLR based Approaches.
5. Ability to detect and quantify and compensate stiction in Control valves.

TEXT BOOKS:


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PTEI7008 FIBRE OPTICS AND LASER INSTRUMENTATION

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COURSE OBJECTIVES

- To discuss about theory behind light propagation in optical fibers, types of optical fibers, dispersion characteristics for various types of optical fibers and attenuation measurement system.
- To provide an overview of recent advances in fiber optic sensor technology.
- To provide knowledge on principle of laser generation, laser system and its types.
- To emphasize how lasers have been used for industrial applications.
- To acquaint the students with fundamentals of holography.

UNIT I OPTICAL FIBER AND THEIR PROPERTIES


UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBER

Fiber optic sensors – Fiber optic instrumentation system for measurement of fiber characteristics – Different types of modulators – Interferometric method for measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain – fiber optic gyroscope – Polarization Maintaining fibers.

UNIT III LASER FUNDAMENTALS

9

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

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Understand the principle, transmission, dispersion and attenuation characteristics of optical fibers
2. Apply the gained knowledge on optical fibers for its use as communication medium and as sensor as well which have important applications in production, manufacturing industrial and biomedical applications.
4. Students will gain ability to apply laser theory for the selection of lasers for a specific Industrial and medical application.

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COURSE OBJECTIVES
- To provide wide information dealing with nano material and its necessity.
- To understand the impact of various steps needed to be followed in nano material preparation.
- To analyze methods involving preparation of nano scale devices.
- To provide knowledge about working nature and neighborhood condition regarding the preparation.
- To Explore the properties of various types of nano materials.

UNIT I INTRODUCTION

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

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography.

UNIT IV 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.

UNIT V CHARACTERISATION TECHNIQUES

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Will be familiar with various preparation methods of nano material
2. Will be in a position to learn and keep in pace with recent nano scale materials
3. To draw well-founded conclusions applying the knowledge acquired from research and research methods of nano science and MEMS.

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COURSE OBJECTIVES
- To introduce the fundamentals of hydraulic and pneumatic systems and their applications.
- To provide knowledge about the components involved in hydraulic and pneumatic systems.
- To select the control strategy for hydraulic and pneumatic systems.
- To gain basic safety precaution for hydraulic and pneumatic systems.
- To understand the concept of interfacing these systems with PLC and various microcontrollers.

UNIT I      FLUID POWER PRINCIPLES AND FUNDAMENTALS

UNIT II     HYDRAULIC SYSTEM AND COMPONENTS

UNIT III    CONTROL OF HYDRAULIC SYSTEMS

UNIT IV     PNEUMATIC SYSTEM
Compressors – Filter, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators – Introduction to Fluidics – Pneumatic logic circuits AND, OR, MEMORY, etc.

UNIT V      ELECTRO HYDRAULIC AND ELECTROPNEUMATIC CIRCUITS

TOTAL : 45 PERIODS
COURSE OUTCOMES (COs)
1. Ability to select hydraulic or pneumatic components and to design for automation.
2. Gain knowledge on control of hydraulic and pneumatic systems.
3. Ability to select proper control scheme for the given applications.
4. Capable of proper installation, fault finding and maintenance of hydraulic and pneumatic systems.

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PTEI7011 INSTRUMENTATION STANDARDS L T P C
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COURSE OBJECTIVES
• To impart basic knowledge on Instrumentation standards.

UNIT I STANDARDS ORGANIZATION 9
Standards: Introduction International and National Standards organization: IEC, ISO, NIST, IEEE, ISA, API, BIS, DIN, JISC and ANSI.


UNIT II ISA STANDARDS 9
Documentation of Measurement and Control, Instruments and System (ISA 5): 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7 - General Requirements for Electrical Equipment in Hazardous Location (ISA 12):
UNIT II ISA STANDARDS - CONTROL VALVE AND ACTUATOR
Control Valve Standards (ISA75): 75.01, 75.04, 75.05, 75.7, 75.11, 75.13, 75.14, 75.23, 75.24, 75.26.
Valve Actuator (ISA 96): 96.01, 96.02, 96.03, 96.04.

UNIT IV ISA STANDARDS - FOSSIL AND NUCLEAR POWER PLANTS
Fossil Power Plant Standards (ISA 77): 77.14, 77.22, 77.30, 77.41, 77.42, 77.44, 77.60, 77.70.
Nuclear Power Plant Standards (ISA67): 67.01, 67.02, 67.03, 67.04, 67.06.

UNIT V BS, ISO, IEC, & ANSI

TOTAL: 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to understand the role of standards organization.
2. Ability to interpret and follow different standards while carrying out installation of sensors, transmitters, Industrial automation systems, PLC programming, documentation, equipment selection in hazardous area and instrument specification forms.
3. Ability to understand and follow different standards while performing control valve sizing, actuator sizing and orifice sizing etc.
4. Ability to interpret and follow different standards while carrying out monitoring and control of fossil fuel power plants and nuclear power plants.

TEXT BOOKS:

3. ISA standard 5, “Documentation of Measurement and Control Instruments and Systems”, ISA, North Carolina, USA.
4. ISA standard 12, “Electrical Equipment for Hazardous Locations”, ISA, North Carolina, USA.
5. ISA standard 20, “Instrument Specification Forms”, ISA, North Carolina, USA.
6. ISA standard 37, “Measurement Transducers”, ISA, North Carolina, USA.
7. ISA standard 75, “Control Valve Standards”, ISA, North Carolina, USA.
8. ISA standard 96, “Valve Actuator”, ISA, North Carolina, USA.

10. ISA standard 67, “Nuclear Power Plant Standards”, ISA, North Carolina, USA.


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PTEI7012 INSTRUMENTATION SYSTEM DESIGN

COURSE OBJECTIVES

- To impart knowledge on the design of signal conditioning circuits for the measurement of Level, temperature and pH.
- To develop the skills needed to design, fabricate and test Analog/ Digital PID controller, Data Loggers and Alarm Annunciator
- To make the students familiarize design orifice and control valve sizing.

UNIT I DESIGN OF SIGNAL CONDITIONING CIRCUITS

Design of V/I Converter and I/V Converter- Analog and Digital Filter design – Signal conditioning circuit for pH measurement – Compensation circuit - Signal conditioning circuit for Temperature measurement - Cold Junction Compensation – software and Hardware approaches - Thermocouple Linearization – Software and Hardware approaches

UNIT II DESIGN OF TRANSMITTERS


UNIT III DESIGN OF DATA LOGGER AND PID CONTROLLER

Design of ON / OFF Controller using Linear Integrated Circuits- Electronic PID Controller – Microcontroller Based Digital PID Controller - Micro - controller based Data Logger – Design of PC based Data Acquisition Cards
UNIT IV    ORIFICE AND CONTROL VALVE SIZING

Orifice Sizing: - Liquid, Gas and steam services - Control Valves – Valve body: Commercial valve bodies – Control valve sizing – Liquid, Gas and steam Services – Cavitation and flashing – Selection criteria – Rotameter Design.

UNIT V    DESIGN OF ALARM AND ANNUNCIATION CIRCUIT


TOTAL : 45 PERIODS

COURSE OUTCOMES
Ability to design signal conditioning circuits for temperature sensors, V/I and I/V converters
- Ability to design and fabricate smart transmitters
- Ability to design, fabricate and test PID controllers and alarm circuits
- Ability to carry out orifice and control valve sizing for Liquid/Steam Services

REFERENCE BOOKS
COURSE OBJECTIVES

- To introduce the principles of IoT and the IoT Enabling Technologies
- To impart knowledge about the Internet principles
- To enable the students to understand the design methodologies for IoT
- To impart the fundamentals of servers and clouds
- To familiarize the students with some of the important and advanced topics in IoT

UNIT I  INTRODUCTION TO IOT
Definition and Characteristics – IoT enabling technologies – Levels of deployment – Domain specific IoTs - SDN and NFV for IoT – Overview of IIOT and M2M

UNIT II  INTERNET PRINCIPLES
ISO/OSI model – MAC address and IP address -Overview of TCP/IP and UDP -Basics of DNS - Classes of IP addresses - Static and dynamic addressing –Salient features of IPV4 – Specifications of IPV6 and 6LoPAN.

UNIT III  IOT DESIGN METHODOLOGY

UNIT IV  SERVERS AND CLOUDS FOR IOT
Introduction to cloud storage models and communication APIs – Web application framework – Designing a web API – Web services - IoT device management –Application layer protocols for IoT.

UNIT V  ADVANCED TOPICS
Big Data analytics for IoT – Batch data analysis and Real time data analysis – Security in IoT – Security levels – Ethics in IoT Design - Case studies.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

- Acquire knowledge about the basics of IoT enabling technologies and the levels of IoT deployments
- Understand the characteristics of Internet protocol
- Ability to design and develop simple IoT applications
- Acquire knowledge about Clouds and Servers that are used in IoT design
- Familiarize with advanced topics in IoT design such as Data analytics, Security and Ethics

REFERENCE BOOKS
COURSE OBJECTIVES

- To impart knowledge on PIC microcontroller and ARM processor.
- To introduce the architecture and instruction set of PIC 16F87x.
- To make them familiar with ports, timer, CCP modules, interrupts, peripherals and interfacing of PIC 16F87x.
- To introduce the architecture and assembly language programming of ARM LPC 2148.
- To make them learn the ARM organization and instruction set.

UNIT I PIC INTRODUCTION

UNIT II PORTS, COUNTERS, TIMER, CCP MODULE AND INTERRUPTS
PIC16F87I2C I/O Ports, Counters, Timers CCP Modules – Interrupts.

UNIT III PERIPHERALS AND INTERFACING
16F87xI2C Bus Peripherals Chip Access – Analog to Digital Converter – UART.

UNIT IV ARM LPC2148 INTRODUCTION

UNIT V ARM LPC2148 ORGANIZATION
3-Stage Pipeline ARM Organization – 5-Stage Pipeline ARM Organization – ARM Implementation – ARM Instruction Set.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Able to apply the knowledge of PIC microcontroller and ARM processor to solve simple operations.
2. Able to apply the microcontroller programming skills to design and carry out projects which will be useful for the society.
3. Ability to identify and formulate engineering problems and should be in a position to use the microcontrollers appropriately.
4. Ability to formulate and work in multidisciplinary projects.
5. Capability to learn and keep in pace with latest microcontrollers.

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COURSE OBJECTIVES

- To teach the students the general principles of model predictive control scheme.
- To provide a comprehensive description of model predictive control schemes namely as dynamic matrix control, generalized predictive control scheme and State space based model predictive control scheme.
- To highlight the key features of MPC for its Industrial Success.
- To introduce the skills required to formulate both unconstrained and constrained optimal control schemes.
- To develop the skills needed to design Model Predictive Control schemes to achieve the desired performance.

UNIT I MODEL PREDICTIVE CONTROL SCHEMES
Introduction to Model Predictive Control - Model Predictive Control Elements - Model Predictive Control Schemes: Dynamic Matrix Control and Model Algorithmic Control – Case Studies

UNIT II GENERALIZED PREDICTIVE CONTROL SCHEME
Generalized Predictive Control Scheme – Simple Implementation of Generalized Predictive Control Scheme for Industrial Processes – Multivariable Generalized Predictive Control Scheme – Case Studies

UNIT III STATE SPACE BASED MODEL PREDICTIVE CONTROL SCHEME
State Space Model Based Predictive Control Scheme - Review of Kalman Update based filters – State Observer Based Model Predictive Control Schemes – Case Studies

UNIT IV CONSTRAINED MODEL PREDICTIVE CONTROL SCHEME
Constraints Handling: Amplitude Constraints and Rate Constraints – Constraints and Optimization – Constrained Model Predictive Control Scheme – Case Studies.

UNIT V ADVANCED TOPICS IN MPC
Robust Model Predictive Control Scheme – Adaptive Model Predictive Control Scheme – Multiple-Model based Model Predictive Control Scheme - Fast Methods for Implementing Nonlinear Model Predictive Control Scheme – Case Studies

TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)
1. Ability to explain the advantages and disadvantages of various MPC schemes.
2. Ability to design both unconstrained and constrained model predictive controllers.
3. Ability to explain the advanced Features supported by the MPC Scheme.
4. Ability to Identify, formulate and solve problem in the field of Process Control domain using MPC.
5. Ability to implement MPC algorithms in MATLAB/SCILAB.
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PTEI7016 NON-LINEAR CONTROL SYSTEMS LT P C 3 0 0 3

COURSE OBJECTIVES:

- To understand the nature of non-linear systems and to analyze the stability of such systems
- To develop suitable models of non-linear systems and to develop suitable controllers for such systems
- To understand the chaotic and bifurcation behavior of non-linear systems
- To linearize the non-linear systems.

UNIT I NON-LINEAR SYSTEMS

UNIT II STABILITY OF NON-LINEAR SYSTEMS 9

UNIT III MODELLING AND CONTROL OF NON-LINEAR SYSTEMS 9

UNIT IV CHAOS AND BIFURCATION BEHAVIOR 9

UNIT V LINEARIZATION 9

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs):

1. Ability to apply mathematical knowledge and basics of science and engineering to develop model for non-linear system.
2. Ability to analyze non-linear system based on the first principle model.
3. Ability to come out the solution for complex non-linear system.
4. Ability to develop various control schemes for non-linear systems.
5. Ability to linearize non-linear system for developing linear control,

TEXT BOOKS:


REFERENCES:


7. NPTEL Lecture on “Non-linear system Analysis” by Prof. Laxmidhar Behera, IIT Kanpur.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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PTEI7017 NUCLEAR POWER PLANT INSTRUMENTATION

COURSE OBJECTIVES

- To introduce students to the fundamentals of nuclear power reactor.
- The construction and principle of operation of the different sensing and indicating devices used at nuclear power plants will be explained to students.
- To study about the various types of Nuclear power Reactor.
- To characterize radioactive wastes based on the analysis of radioactive waste generation.
- To elaborate different types of control schemes involved in nuclear power plant.

UNIT I FUNDAMENTAL CONSIDERATIONS IN NUCLEAR POWER REACTOR

UNIT II  MEASURING INSTRUMENTS AND ANALYZER IN NUCLEAR POWER PLANT


UNIT III  TYPES OF NUCLEAR POWER REACTOR


UNIT IV  NUCLEAR WASTE DISPOSAL AND REACTOR SAFETY


UNIT V  MODELING AND CONTROL OF NUCLEAR POWER REACTOR

Multipoint Kinetics modeling of Large reactors: Introduction, Derivation of Multipoint Kinetics model, Selection of suitable nodalization scheme, Application to the AHWR Thermal hydraulics model, Coupled Neutronics –Thermal Hydraulics model – Reactor Stability Analysis – Control of Nuclear Power: General features of Reactor control, Methods of control, control loops , Effectiveness of control rods, Output Feedback control design - Direct block diagonalization and composite control of Three time scale systems – Design of Fast output sampling controller for Three time scale systems.

COURSE OUTCOMES (COs)
1. Ability to recognize and recall the basics of nuclear reactor terminology, definitions, and concepts associated with nuclear reactor physics.
2. Ability to understand the types of radiation measurement equipment and nuclear power plant instrumentation.
3. Ability to identify and analyze the specific features of different types of nuclear reactors.
4. Ability to understand the role and responsibility of effective nuclear waste disposal.
5. Ability to apply their mathematical knowledge and engineering principles to model the nuclear reactor and able to control the reactor.

TEXT BOOKS:

REFERENCES:

4. NPTEL Video Lectures on “Nuclear Reactors and Safety - An Introduction” by Dr. G. Vaidyanathan.

5. NPTEL Video Lectures on “Nuclear Science & Engineering” by Dr. Santanu Ghosh.

6. NPTEL Video Lectures on “Nuclear Reactor Technology” by Dr. K.S. Rajan.

7. NPTEL Video Lectures on “Nuclear Physics: Fundamentals and Applications” by Prof. H.C. Verma

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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PTEI7018 POWER ELECTRONICS DRIVES AND CONTROL

LT P C 3 0 0 3

COURSE OBJECTIVES

- Comprehensive introduction to various power electronic devices, their structure, operating principle and characteristics
- Give exposure to Various topologies, working principle and analysis of controlled rectifiers and ac controllers
- Detailed knowledge on Classification, structure, operating principle of dc choppers
- Introduction to different types of Inverters, their principle of operation and waveform control
- Overview on dc and ac drives and their control using power electronic circuits.

UNIT I POWER SEMICONDUCTOR DEVICES AND CHARACTERISTICS


UNIT II CONTROLLED RECTIFIERS AND AC CONTROLLERS

converters.

**UNIT III  DC TO DC CONVERTERS**
Step up and Step down Chopper – Chopper classification - quadrant of operation – Switching mode Regulators – Buck, Boost, Buck-Boost, and Cuk Regulators.

**UNIT IV  INVERTERS**

**UNIT V  DRIVES AND CONTROL**
Static and Dynamic equations of dc and ac machines – Electrical breaking – Rectifier and chopper control of DC drives – Principles of v/f control of AC drives – Open loop and Closed loop schemes for DC and AC drives(Block diagram approach only) – Introduction to vector control of AC drives.

**TOTAL : 45 PERIODS**

**COURSE OUTCOMES (COs)**

1. Ability to explain various devices and their structure, operating characteristics in the field of electronics.
2. Ability to classify, analyze and design, Control rectifier, chopper and inverter.
3. Will have ability to apply power electronic circuits for the control of popular applications.
4. Exposure to design and analyze PE circuit using simulation software.

**TEXT BOOKS:**


**REFERENCES:**

5. NPTEL Lecture Series on “Power Electronics” by Dr.B.G.Fernandes, IIT Bombay.
### Mapping Course Outcomes with Programme Outcomes

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### Course Objectives

The student should be made to:
- To study and understand the evolution of robot technology and their classification.
- To introduce the methodology for mathematical representation of different types of robots.
- To acquire knowledge on construction of manipulators and their types.
- To learn the procedure for carrying out kinematics and path learning techniques.
- To expose knowledge on the case studies and design of robot machine interface.

### Unit I  Basic Concepts

Brief history - Types of Robot – Technology - Robot classifications and specifications - Design 113 and control issues- Various manipulators – Sensors - work cell - Programming languages

### Unit II  Direct and Inverse Kinematics

Mathematical representation of Robots - Position and orientation - Homogeneous transformation - Various joints - Representation using the Denavit Hattenberg parameters - Degrees of freedom - Direct kinematics - Inverse kinematics - PUMA 560 & SCARA robots Solvability - Solution methods - Closed form solution

### Unit III  Manipulator Differential Motion and Statics

Linear and angular velocities - Manipulator Jacobian - Prismatic and rotary joints – Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance

### Unit IV  Path Planning

Definition - Joint space technique - Use of p-degree polynomial - Cubic polynomial - Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation
UNITY V  DYNAMICS AND CONTROL
Lagrangian mechanics - 2 DOF Manipulator - Lagrange Euler formulation - Dynamic model -
Manipulator control problem - Linear control schemes - PID control scheme - Force control of robotic
manipulator T

COURSE OUTCOMES
At the end of the course, the student should be able to:
• understand the evolution of robot technology and mathematically represent different types of robot.
• Get exposed to the case studies and design of robot machine interface.

TEXTBOOKS
   2005
   2009

114 REFERENCES
REFERENCE BOOKS
1. Ashitava Ghoshal, Robotics - Fundamental Concepts and Analysis’, Oxford University Press,
   Sixth impression, 2010
4. R. D. Klafter, T. A. Chimielewski and M. Negin, Robotic Engineering – An Integrated Approach,
   Prentice Hall of India, New Delhi, 1994
   Singapore, 1996
6. B.K. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers,
   Chennai, 1998
COURSE OBJECTIVES

- To make the students aware of basic concepts of safety instrumented system, standards and risk analysis techniques.
- To make the students understand different layers of protection.
- To make students conscious about safety instrumentation applications.

UNIT I INTRODUCTION

UNIT II PROTECTION LAYERS AND SAFETY REQUIREMENT SPECIFICATIONS

UNIT III SAFETY INTEGRITY LEVEL (SIL)
Evaluating Risk, Safety Integrity Levels, SIL Determination Method : As Low As Reasonably Practical ( ALARP ), Risk matrix, Risk Graph, Layers Of Protection Analysis ( LOPA ) – Issues related to system size and complexity –Issues related to field device safety – Functional Testing.

UNIT IV SYSTEM EVALUATION

UNIT V CASE STUDY

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Able to understand the role of safety instrumented system in the industry.
2. Be able to identify and analyze the hazards.
3. Able to select the safety integrity level for an application.
4. Able to understand the importance of safety environment in industry.
TEXT BOOKS:

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MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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PTEI7021 UNIT OPERATIONS AND CONTROL  L  T  P  C 3  0  0  3

COURSE OBJECTIVES

- Study the unit operations involved for transportation, mixing and separation of solids.
- Study the unit operations involved for transportation, mixing and separation of fluids.
- Understand the basic operations involved with heat exchangers, Distillation and chemical reactions.
- Gain knowledge about the operations of evaporators and crystallizers, drying and cooling towers.
- Gain knowledge on the operation of dryers, distillation column, refrigerators and chemical reactors.

UNIT I MECHANICAL OPERATIONS- I

UNIT II MECHANICAL OPERATIONS-II


UNIT III HEAT TRANSFER- I AND ITS APPLICATIONS

Heat exchangers: Single pass and multi pass heat exchangers, condensers, reboilers Combustion process in thermal power plant, Distillation: Binary distillation, Batch distillation, controls and operations, Chemical reactors.

UNIT IV HEAT TRANSFER- II


UNIT V CASE STUDY

Unit Operations and Control schemes applied to Thermal Power plant, Steel Industry, Paper and Pulp Industry, Leather Industry.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Apply the knowledge on solids & fluids to handle the raw materials.
2. Select and apply relevant handling techniques to convert the solids and fluids for specific applications.
3. Come out with solutions for simple/complex problems in heat transfer and design the heat exchange equipment for different applications such as distillation, boilers.
4. Able to carry out multidisciplinary projects using heat transfer, mass transfer concepts.
5. Gain ability for lifelong learning of new techniques and developments in various types of unit operations in industries.

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I – VII SEMESTERS CURRICULUM AND SYLLABUS  

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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 9

UNIT II FUNCTIONS OF SEVERAL VARIABLES 9

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

UNIT IV COMPLEX INTEGRATION 9

UNIT V LAPLACE TRANSFORMS 9

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:

PTPH7102 PHYSICS FOR ELECTRONICS AND INFORMATION SCIENCE L T P C
(Common to ECE & IT Branches) 3 0 0 3

OBJECTIVE:
• To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic and optical properties of materials and Nano-electronic devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

UNIT II SEMICONDUCTORS AND TRANSPORT PHYSICS 9

UNIT III MAGNETIC PROPERTIES OF MATERIALS 9
UNIT IV  OPTICAL PROPERTIES OF MATERIALS  
Classification of optical materials – Absorption emission and scattering of light in metals, insulators & Semiconductors - LED’s – Organic LED’s – Plasma light emitting devices – LCD’s – Laser diodes – Optical data storage techniques (including DVD, Blue-ray disc, Holographic data storage).

UNIT V  NANO DEVICES  

OUTCOMES:
At the end of the course, the students will able to
• understand the electrical, magnetic and optical properties of semiconductor materials.
• understand the concepts and applications of semiconductor devices.

TEXT BOOKS:

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

UNIT II  SURFACE CHEMISTRY AND CATALYSIS  9

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY  9

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

UNIT V  NANO CHEMISTRY  9

TOTAL: 45 PERIODS

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

TEXT BOOKS:
REFERENCES:

PTec7101 CIRCUIT THEORY L T P C
2 2 0 3

OBJECTIVES:
- To introduce the basic concepts of DC and AC circuits behavior
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To introduce different methods of circuit analysis using Network theorems, duality and topology.

UNIT I DC CIRCUIT ANALYSIS 6+6
Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff’s Current Law, Kirchoff’s voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.

UNIT II NETWORK THEOREM AND DUALITY 4+4

UNIT III SINUSOIDAL STEADY STATE ANALYSIS 8+8

UNIT IV TRANSIENTS AND RESONANCE IN RLC CIRCUITS 6+6

UNIT V COUPLED CIRCUITS AND TOPOLOGY 6+6
Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer, An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

TOTAL: 60 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
- Develop the capacity to analyze electrical circuits, apply the circuit theorems in real time
- Design and understand and evaluate the AC and DC circuits.

TEXT BOOKS:

REFERENCES:

PTEC7102 ELECTRONIC DEVICES L T P C
3 0 0 3

OBJECTIVES:
- To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices.

UNIT I PN DIODE and BIPOLAR JUNCTION TRANSISTOR 9
PN junction diode, current equations, V-I characteristics, the bipolar transistor action, minority carrier, distribution, low frequency common base, current gain, non-ideal effects, equivalent circuits, Ebers Moll Model-Gummel Poon-model, Hybrid-pi model, frequency limitations, large signal switching characteristics, SiGe and hetero-junction- bipolar junction transistor.

UNIT II FUNDAMENTALS OF FIELD EFFECT TRANSISTORS 9
Fundamentals of JFETs and their device characteristics, Two terminal MOS structures, threshold voltage and charge distribution, capacitance-voltage characteristics, MOSFET structures, I-V relationships, transconductance and substrate effects, frequency limitations, non-ideal effects, MOSFET scaling, threshold voltage modification due to short and narrow channel effects, avalanche breakdown, drain induced barrier effects.

UNIT III POWER DEVICES AND DISPLAY DEVICES 9
SCR, Diac, Triac, Power BJT, Power MOSFET, IGBT Heat sinks and junction temperature, LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9
Metal-Semiconductor Junction-MESFET, Schottky barrier diode-Zener diode-Varactor diode –Tunnel diode-Gallium Arsenide device, LASER diode, UJT, LDR.

UNIT V SEMICONDUCTOR PROCESSING 9
Semiconductor materials, Silicon crystal growth and refining, Doping techniques, Ion implantation, Doping impurity diffusion, Gas-phase diffusion, Oxidation, Chemical vapor deposition (CVD), Silicon deposition and epitaxy, Dielectric layer deposition, Photolithography Etching, Metallization, Metal deposition, Metal silicides, CMOS process, bipolar process

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course the students will be able to:
- Explain the V-I characteristic of diode, UJT and SCR
- Describe the equivalence circuits of transistors
- Operate the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices

TEXT BOOKS:

REFERENCES:

PTMA7252 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
(Common to Civil, ECE, Mech, Textile, Chemical) 3 0 0 3

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

UNIT I FOURIER SERIES

UNIT II FOURIER TRANSFORM

UNIT III PARTIAL DIFFERENTIAL EQUATIONS
Formation – Solutions of first order equations – Standard types and equations reducible to standard types – Singular solutions – Lagrange’s linear equation – Solution of homogenous linear equations of higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two dimensional heat equation.

UNIT V Z- TRANSFORM AND DIFFERENCE EQUATIONS

TOTAL : 45 PERIODS
OUT COMES:
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes.
- To develop Z-transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

TEXT BOOK:

REFERENCES:

PTEC7201 DIGITAL ELECTRONICS AND SYSTEM DESIGN L T P C
3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits
- To introduce the electronic circuits involved in the making of logic gates
- To introduce semiconductor memories and related technology

UNIT I BASIC CONCEPTS AND COMBINATIONAL CIRCUITS
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1’s and 2’s complements, Codes – Binary, BCD, 84-2-1, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation methods.

UNIT II MSI CIRCUITS
Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry lookahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital transreceiver / 8 bit Arithmetic and logic unit
UNIT III  SYNCHRONOUS SEQUENTIAL CIRCUITS
Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, circuit implementation - Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling display/real time clock

UNIT III  ASYNCHRONOUS SEQUENTIAL CIRCUITS
Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits.

UNIT V  LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES
Logic families- TTL, MOS, CMOS, BiCMOS - Comparison of Logic families - Implementation of combinational logic/sequential logic design using standard ICs, ROM, PLA and PAL

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Use Boolean algebra and apply it to digital systems.
• Design various combinational digital circuits using logic gates.
• Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits.
• Use electronic circuits involved in the design of logic gates.
• Ability to use the semiconductor memories and related technology.

TEXT BOOKS:

REFERENCES:

PTEC7202  ELECTRONIC CIRCUITS – I

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To learn about biasing of BJT and MOSFET circuits
• To design amplifiers
• To study the effect of source and load
• To design amplifiers with active loads
• To study high frequency response of amplifiers
UNIT I  BIASING OF DISCRETE BJT AND MOSFET  6+6
DC Load line, operating point, Various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, DC bias analysis of MOSFET circuits.

UNIT II  BJT AMPLIFIERS  6+6

UNIT III  MOSFET AMPLIFIERS  6+6
Small signal Analysis of amplifiers, Common source amplifier, Voltage swing limitations, Small signal analysis of Source follower and Common Gate amplifiers, Cascode amplifiers, Differential amplifiers, BiMOS Cascode amplifier.

UNIT IV  FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS  6+6
Low frequency analysis, Miller effect, High frequency analysis of CE and MOSFET CS amplifier, Short circuit current gain, cut off frequency – $f_a$, $f_{\beta}$, Unity Gain Bandwidth, Determination of bandwidth of cascode, differential amplifier and multistage amplifiers.

UNIT V  IC MOSFET AMPLIFIERS  6+6

TOTAL: 30L + 30T: 60 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
  At the end of the course the students will be able to
• Choose appropriate biasing circuit for BJT and MOSFET amplifiers.
• Design and analyze amplifiers.
• Determine the effect of source and load.
• Design amplifiers with active loads meant for ICs.
• Exposed to high frequency response of BJT and MOSFET amplifiers.
• Design biasing circuits for IC amplifiers.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce visualization and mathematical representation of continuous-time and discrete-time signals
• To teach the applications of Laplace and Fourier transforms in the analysis of continuous-time signals
• To teach the applications of Z- and Fourier transforms in the analysis of discrete – time signals

UNIT I            CLASSIFICATION OF SIGNALS AND SYSTEMS  6+6
Continuous time signals (CT signals)- Discrete time signals (DT signals) – Step, Ramp, Pulse, Impulse, Exponential - classification of CT and DT signals – periodic and a periodic signals, random signals, Energy & Power signals - CT systems and DT systems, Classification of systems.

UNIT II          ANALYSIS OF CONTINUOUS TIME SIGNALS  6+6
Fourier series analysis- Spectrum of Continuous Time (CT) signals- Fourier and Laplace transforms in Signal Analysis.

UNIT III         LINEAR TIME INVARIANT –CONTINUOUS TIME SYSTEMS  6+6
Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis.

UNIT IV         ANALYSIS OF DISCRETE TIME SIGNALS  6+6
Baseband Sampling of CT signals- Aliasing, Reconstruction of CT signal from DT signal DTFT and properties, Z-transform & properties.

UNIT V        LINEAR TIME INVARIANT –DISCRETE TIME SYSTEMS  6+6
Difference Equations-Block diagram representation-Impulse response-Convolution sum-DTFT and Z Transform analysis of Recursive & Non-Recursive systems.

TOTAL: 30L + 30T: 60 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• To compute the spectrum of any signal
• To identify the requirements and use transforms for processing real-world signals
• To analyse and design continuous-time and discrete-time systems

TEXT BOOKS:
REFERENCES:

PTEC7211 DIGITAL AND ELECTRONIC CIRCUIT LABORATORY L T P C
0 0 4 2

OBJECTIVES:
- To learn hardware implementation and testing of analog and digital circuits
- To design amplifier circuits to meet desired specifications
- To understand the functionality of combinational and sequential circuits
- To simulate basic combinational and sequential circuits using Hardware Description Language HDL

1. Implementation of Boolean expression using universal gates, BCD adder and 2-bit Magnitude comparator
2. Implementation of Boolean expression using MUX and truth table verification of RS, JK, T, and D Flip Flops
3. BCD counter and counters with seven segment display
4. Data transfer using shift registers
5. Realization of Digital circuits using HDL – Combinational circuits
6. Realization of Digital circuits using HDL – Sequential circuits
7. Frequency Response of CE, CB amplifiers and its Spice simulation
8. Design of CC Amplifier for a specific output impedance and its Spice Simulation
9. Spice simulation of CS, CG, and CD configuration of MOSFET amplifiers with various active load configurations.
10. Design of Differential Amplifiers and its CMRR measurement
11. Frequency response of cascode amplifier
12. Frequency response of cascade amplifier

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to design, build and test any digital logic and analog circuits for handling real life projects.
- Exposed to circuit simulations using present meter technology MOSFETs.
- Exposed to digital IC circuit simulators using HDL.
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the concepts of various modulations and their spectral analysis
- To introduce random processes and their characteristics
- To understand noise impact on modulations and
- To introduce some of the essential baseband signal processing techniques

UNIT I AMPLITUDE MODULATION

UNIT II ANGLE MODULATION

UNIT III RANDOM PROCESS

UNIT IV NOISE PERFORMANCE

UNIT V BASEBAND TECHNIQUES
Quantization – Uniform and non-uniform quantization – Quantization noise – Companding laws of speech signals – PCM, DPCM, ADPCM, DM, ADM, and Subband Coding. Multiplexing– TDM (E and T lines), FDM

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Students will have acquired the knowledge on different modulation techniques
- Students will get information about signals broadcasted with different modulation techniques
- Students will understand the role of random process in communication systems.

TEXT BOOKS:
REFERENCES:
2. H P Hsu, Schaum Outline Series- “Analog and Digital Communications” TMH 2006

PTEC7302 ELECTROMAGNETIC FIELDS AND WAVES

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To impart knowledge on the basics of static electric and magnetic field and the associated laws.
• To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetics.

UNIT I STATIC ELECTRIC FIELD
Introduction to co-ordinate systems, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Principle of superposition, Electric scalar potential, Electric flux density. Gauss’s law and its application, Permittivity, Polarization, Boundary relation, Capacitance, Dielectric strength, Energy and Energy density, Poisson and Laplace equation and their application, Numerical examples

UNIT II STATIC MAGNETIC FIELD

UNIT III TIME VARYING ELECTRIC AND MAGNETIC FIELDS
Faradays law, Transformer and Mutual induction, Maxwell’s equation, Self and Mutual inductance, Displacement current, Amperes law and its inconsistency for time varying fields, Boundary relation, Poynting vector, Numerical examples

UNIT IV PLANE EM WAVES IN ISOTROPIC MEDIA
Wave equation from Maxwell's Equation, Uniform plane waves in perfect dielectric, conductors, free space. Polarization, Reflection and Refraction of plane waves at different boundaries, Surface impedance, Numerical examples

UNIT V APPLICATION OF STATIC FIELDS AND COMPUTATIONAL METHODS

TOTAL: 45 PERIODS
OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- At the end of the course the students will be able to
- Have knowledge on the basics of static electric and magnetic field and the associated laws.
- Understand the propagation of EM waves and also get introduced to the methods in computational electromagnetics.

TEXT BOOKS:


REFERENCES:


PTEC7303 ELECTRONIC CIRCUITS - II L T P C

2 2 0 3

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study about feedback amplifiers and oscillator principles
- To design Op Amps
- To design oscillators
- To study about tuned amplifiers
- To know the principles of DC-DC convertors

UNIT I FEEDBACK AMPLIFIERS AND STABILITY


UNIT II OPERATIONAL AMPLIFIER

UNIT III OSCIILATORS  6+6
Barkhausen criteria for oscillator – Analysis of RC oscillators – Phase shift and Wein bridge oscillators – LC oscillators – Colpitts, Hartley, Clapp, and Ring Oscillators

UNIT IV TUNE(TM) AMPLIFIERS  6+6

UNIT V POWER AMPLIFIERS AND DC CONVERTERS  6+6
Power amplifiers- class A-Class B-ClassAB-Class C-Power MOSFET-Temperature Effect- Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design.

TOTAL: 30L + 30T: 60 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
  At the end of the course the students will
• Acquire knowledge about feedback amplifiers and oscillator principles.
• Design and Construct oscillators, tuned amplifiers, Multivibrators and DC-DC convertors.

TEXT BOOKS:

REFERENCES
2. NPTEL Course: http://www.nptel.ac.in/course.php

PTEC7304 OPERATIONAL AMPLIFIERS AND ANALOG INTEGRATED CIRCUITS L T P C 3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To study the circuit configuration of linear integrated circuits.
• To introduce practical applications of linear integrated circuits.
• To introduce the concept of analog multiplier and Phase Locked Loop with applications.
• To study the application of ADC and DAC in real time systems.
• To introduce special function ICs and its construction.
UNIT I  CIRCUIT CONFIGURATION FOR LINEAR ICS  9
Current sources, Analysis of difference amplifiers with active loads, supply and temperature independent biasing, Band gap references, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate. interpretation of TL082 datasheet.

UNIT II APPLICATION OF OPERATIONAL AMPLIFIERS  9
Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Noninverting Amplifiers, Differentiator, Integrator, Voltage to Currency converter, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, Comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.

UNIT III ANALOG MULTIPLIER AND PLL  9
Analysis of four quadrants and variable Transconductance multipliers, Analog multiplier MPY634 features, Voltage controlled oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators, AVC using op-AMP, Frequency synthesizers, Compander ICs.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS  9
Analogue switches, High speed sample and hold circuit and IC’s, Types of D/A converter, Current driven DAC, Switches for DAC, A/D converter - Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to Frequency converters.

UNIT V SPECIAL FUNCTION ICS  9
Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, SMPS, features of TPS40200, TPS40210 buck and boost controller, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources for Noises, Op Amp noise analysis and Low noise OP-Amps.

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Ability to design new analog linear circuits
• Ability to analyze and develop linear IC based Systems.
• Ability do select appropriate Ics and circuit for analog system design.

TEXT BOOK:

REFERENCES:

TOTAL: 45 PERIODS
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study circuits using feedback concepts and tuned circuits
- To learn circuits using OPAMP, PLL and Timer ICs
- To know the design of power amplifier circuits to meet desired specifications

1. Design and Analysis of Feedback amplifiers
2. Design and analysis of Hartley and Colpitts LC Oscillators
3. Design and analysis of single Tuned amplifier
4. Design and analysis of Wien bridge oscillator using OPAMP
5. Design and analysis of Schmitt trigger using OPAMP
6. Design and analysis of Waveform generators using OPAMP
7. Design and analysis of Active filters using OPAMP
8. Design and analysis of Voltage controlled oscillator using PLL IC
9. Design and analysis of Astable and Monostable Multivibrators using Timer IC

TOTAL : 30 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design oscillators and multistage amplifiers
- Ability to analyse power amplifier circuits.
- Ability to design circuits using OPAMP, PLL and Timer ICs

UNIT I BASEBAND TECHNIQUES
Overall picture and the relevance of digital communication techniques, Pulse Modulation-PAM, PPM and PDM, Line codes – RZ, NRZ, Manchester, Binary N-zero substitution codes – PSDs – ISI – Nyquist criterion for distortionless transmission – Pulse shaping – Correlative coding – M-ary schemes – Eye pattern
UNIT II  ERROR CONTROL CODING TECHNIQUES  9
Channel coding theorem – Linear block codes – Hamming codes – Cyclic codes – Convolutional codes – Viterbi decoding

UNIT III  INTRODUCTION AND INFORMATION THEORY  9

UNIT IV  BANDPASS SIGNALING  9

UNIT V  SYNCHRONISATION AND SPREAD SPECTRUM TECHNIQUES  9

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Capable of configuring Source coding schemes
- To be able to design Channel coding schemes
- To be able to design base band signaling scheme analyze their performance
- To be able to design various Bandpass signaling schemes and compare their performance
- Capable of designing synchronization schemes
- Capable of designing spread spectrum systems

TEXT BOOKS:

REFERENCES:
2. H P Hsu, Schaum Outline Series- “Analog and Digital Communications”, TMH 2006
OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand computation of spectrum and to analyze systems
- To understand filters for spectrum shaping
- To understand implementation issues in a Digital Signal Processor

UNIT I  DISCRETE FOURIER TRANSFORM

UNIT II  DESIGN OF INFINITE IMPULSE RESPONSE FILTERS
Analog filters – Butterworth filters, Chebyshev Type I filters (upto 3 rd order), Analog Transformation of prototype LPF to BPF /BSF/ HPF. Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z transform method - Realization structures for IIR filters – direct, cascade, parallel forms.

UNIT III  DESIGN OF FINITE IMPULSE RESPONSE FILTERS
Design of linear phase FIR filters windowing and Frequency sampling methods - Realization structures for FIR filters – Transversal and Linear phase structures, Comparison of FIR & IIR.

UNIT IV  FINITE WORDLENGTH EFFECTS
Representation of numbers-ADC Quantization noise-Coefficient Quantization error, Product Quantization error-truncation & rounding errors -Limit cycle due to product round-off error- Round-off noise power

UNIT V  INTRODUCTION TO DIGITAL SIGNAL PROCESSORS
DSP functionalities - circular buffering – DSP architecture – Fixed and Floating point architecture principles – Programming – Application examples.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Design systems using spectrum information
- Hardware design and implementation of digital signal processing systems

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the architecture of 8085, 8086 and 8051
- To study the addressing modes and instruction set of 8085, 8086 and 8051
- To introduce the need and use of interrupt structure in 8085 and 8051.
- To develop skill in simple program writing for 8085 and 8051 applications.
- To introduce commonly used peripheral / interfacing ICs.

UNIT I 8- BIT MICROPROCESSOR.
8085 Architecture, Pin configuration, Instruction set, Addressing modes, Interrupts, Timing diagrams Memory and I/O interfacing.

UNIT II 16- BIT MICROPROCESSOR.

UNIT III PERIPHERALS AND INTERFACING
Programmable Peripheral Interface (8255), Keyboard display controller (8279), ADC0808 and DAC0808 Interface, Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251).

UNIT IV MICROCONTROLLER
8051 – Architecture, Special Function Registers (SFRs), Instruction set, Addressing modes, Assembly language programming, I/O Ports, Timers / counters, Interrupts and serial communication.

UNIT V MICROCONTROLLER BASED SYSTEM DESIGN.
Interfacing to: matrix display, (16x2) LCD, high power devices, optical motorshaft encoder, Stepper Motor, DC Motor speed Control using PWM, RTC and EEPROM interface using I2C protocol.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to design and develop microprocessor architecture.
- Ability to develop microprocessor and microcontroller systems for entertainment, communication and medical applications.
- Ability to troubleshoot microprocessor and microcontroller systems.

TEXT BOOKS:
REFERENCES:

PTEC7404  TRANSMISSION LINES AND WAVE GUIDES  L  T  P  C
                                      3  0  0  3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce the various types of transmission lines and to discuss the losses associated.
• To provide thorough understanding about impedance transformation and matching.
• To give insight about the usage of smith chart in problem solving is dealt with.
• To import knowledge on filter theories and waveguide theories are imparted.

UNIT I  TRANSMISSION LINE THEORY & PARAMETERS  8
Introduction to different types of transmission lines, Transmission line Equation – Solution – Characteristic impedance-Infinite line concept - Distortion less line – loading – input impedance, Losses in Transmission lines– Reflection loss, Insertion loss, return loss, Introduction to planar transmission lines. Numerical examples

UNIT II  IMPEDENCE MATCHING AND TRANSFORMATION  9

UNIT III  NETWORK COMPONENTS  8
Filter fundamentals, Filter design- lumped element and distributed element approach to filter design – Design of Attenuators and Equalizers – Lattice type , Concept of inverse networks–Transients in transmission lines, Lattice diagram. Numerical examples

UNIT IV  RECTANGULAR WAVE GUIDES  10
Waves between Parallel Planes – characteristic of TE , TM and TEM waves , Velocities of propagation ,Solution of wave Equation in Rectangular guides ,TE and TM modes , Dominant Mode, Attenuation, Mode Excitation, Dielectric slab wave guides, Numerical examples.

UNIT V  CYLINDRICAL WAVE GUIDES  10
Solution of wave equation in circular guides, TE and TM wave in circular guides, Wave impedance, attenuation, mode excitation, formation of cylindrical cavity, Application , cavity resonator and Q for dominant mode, Numerical examples. Practical examples of transmission line and waveguides in communication.

TOTAL: 45 PERIODS
OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
  At the end of the course the students will be able to
- Analyze the various types of transmission lines and to discuss the losses associated.
- Understand impedance transformation and matching.
- Use smith chart in problem solving
- Apply knowledge on filter theories and waveguide theories are imparted.

TEXT BOOK:
1. John D Ryder —Networks lines and fieldsl Prentice Hall of India, 2005

REFERENCES:

PTEC7411 COMMUNICATION SYSTEMS LABORATORY L T P C
0 0 3 2

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- It is intended to demonstrate the architecture of analog and digital communication link components to the students
- Students must understand the role of each module present in the communication links
- They have to study by evaluating the comparing the performance of each techniques used in various modules.

1. AM / FM Modulator and Demodulator
2. Time Division Multiplexing
3. Signal Sampling and reconstruction
4. Pulse Code Modulation and Demodulation
5. Delta Modulation and Demodulation
6. Line coding schemes
7. FSK, PSK and DPSK schemes (Simulation)
8. Error control coding schemes (Simulation)
9. Symbol Timing Synchronization
10. Equalization – Zero Forcing & LMS algorithms
11. Spread spectrum communication (Simulation)
12. Communication link simulation

TOTAL: 30 PERIODS
OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Ability to experimentally analyze the performance of various kinds of signaling used in communication systems and their bandwidth requirement.
- They get hands on experience on system construction and performance evaluation
- Ability to study issues from communication links and channels, and their equalization techniques

PTEC7501 ANTENNAS AND WAVE PROPAGATION

L T P C
3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To give insight into the radiation phenomena.
- To give a thorough understanding of the radiation characteristics of different types of antennas
- To create awareness about the different types of propagation of radio waves at different frequencies

UNIT I FUNDAMENTALS OF RADIATION

UNIT II APERTURE AND SLOT ANTENNAS
Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna, Reflector antenna, Aperture blockage, Feeding structures, Slot antennas, Microstrip antennas – Radiation mechanism – Application, Numerical tool for antenna analysis

UNIT III ANTENNA ARRAYS
N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

UNIT IV SPECIAL ANTENNAS

UNIT V PROPAGATION OF RADIO WAVES
Modes of propagation, Structure of atmosphere, Ground wave propagation, Tropospheric propagation, Duct propagation, Troposcatter propagation, Flat earth and Curved earth concept, Sky wave propagation – Virtual height, critical frequency, Maximum usable frequency – Skip distance, Fading, Multi hop propagation

TOTAL : 45 PERIODS
OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
  At the end of the course the students will be able to
• Have insight into the radiation phenomena
• Have a thorough understanding of the radiation characteristics of different types of Antennas.
• Identify the different types of propagation of radio waves at various frequencies.

TEXT BOOKS:
2. R.E.Collin, Antennas and radiowave propagation Mc graw hill 1985

REFERENCES:

PTEC7502 VLSI DESIGN

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To learn the fundamentals of VLSI design
• To understand the IC Manufacturing Process
• To familiarize with VLSI combinational logic circuits design
• To familiarize with VLSI sequential logic circuits design
• To learn the various arithmetic circuits and testing methodologies
• To familiarize with the different FPGA architectures

UNIT I MOS TRANSISTOR PRINCIPLES
MOS Technology and VLSI, Pass transistors, NMOS, CMOS Fabrication process and Electrical properties of CMOS circuits and Device modelling. Characteristics of CMOS inverter, Scaling principles and fundamental limits. Propagation Delays, CMOS inverter scaling, Stick diagram, Layout diagrams, Elmore’s constant, Logical Effort. Case study: Study of technology development in MOS
UNIT II  COMBINATIONAL LOGIC CIRCUITS  9
Static CMOS logic Design, Design techniques to improve the speed, power dissipation of CMOS logic, low power circuit techniques, Ratioed logic, Pass transistor Logic, Transmission CPL, DCVSL, Dynamic CMOS logic, Domino logic, Dual Rail logic, NP CMOS logic and NOR array logic.

UNIT III  SEQUENTIAL LOGIC CIRCUITS  9
Static and Dynamic Latches and Registers, Timing Issues, Pipelines, Clocking strategies, Memory Architectures, and Memory control circuits.

UNIT IV  DESIGNING ARITHMETIC BUILDING BLOCKS & TESTING  9
Data path circuits, Architectures for Adders, Accumulators, Multipliers, Barrel Shifters, Need for testing- Manufacturing test principles- Design for testability. Case study: Analysis of area, power and delay for 16 bit adder and 8 bit multiplier

UNIT V  IMPLEMENTATION STRATEGIES  9
Full Custom and Semicustom Design, Standard Cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures. Demo: Complete ASIC flow using Backend tool and fabrication flow Overall case study: Development of IC in commercial aspects (design, testing and fab cost)

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• At the end of the course students will be in a position to understand the basics of VLSI design, testing and different FPGA architectures.

TEXT BOOK:

REFERENCES

PTEC7503  WIRELESS COMMUNICATION  L T P C
3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To illustrate the behavior of the wireless channel and its impact on system design
• To understand the design aspects of a cellular system
• To study the various digital signaling techniques and multipath mitigation techniques
• To understand the relevance of multiple antenna techniques.
UNIT I  WIRELESS CHANNELS
Large scale path loss – Path loss models: Free Space and Two-Ray models- Link Budget design – Small scale fading - Parameters of mobile multipath channels – Time dispersion parameters- Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading, Practical illustration of Wireless Channel behavior,

UNIT II  CELLULAR ARCHITECTURE
Introduction to RF Spectrum and its commercial aspects, Multiple Access techniques- FDMA, TDMA, CDMA – Capacity calculations–Cellular concept-Frequency reuse- channel assignment - hand off - interference & system capacity - trunking & grade of service – Coverage and capacity improvement, Relevance to today’s communication demands.

UNIT III  DIGITAL SIGNALING FOR FADING CHANNELS
Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR, Technology Examples

UNIT IV  MULTIPATH MITIGATION TECHNIQUES
Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms, Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

UNIT V MULTIPLE ANTENNA TECHNIQUES
MIMO systems – spatial multiplexing- System model- Pre-coding- Beam forming - transmitter diversity, receiver diversity - Channel state information-capacity in fading and non-fading channels, Relevance to upcoming wireless communication technologies

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• The student would be capable of characterizing a wireless channel and evolve the system design specifications
• The student would be capable of designing a cellular system based on resource availability and traffic demands
• The student would be able to identify suitable signaling and multipath mitigation techniques for the wireless channel and system under consideration
• The student would be capable of exploiting multiple antenna techniques for capacity/performance gains.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientists, national/international policies with a futuristic vision along with socio-economic impact and issues
• To learn the Hardware Description Language (Verilog/VHDL)
• To learn the fundamental principles of VLSI circuit design in digital and analog domain
• To familiarize fusing of logical modules on FPGAs
• To provide hands on design experience with hardware/software based embedded system.

I FPGA BASED EXPERIMENTS:
1. Design and simulation of Full adder and full subtractor
2. Design and simulation of multiplexer, Decoder and 4 bit comparator
3. Design and simulation of 8 bit adder
4. HDL based design entry and simulation of Ripple counter, synchronous counter and BCD counter
5. Design and simulation of simple state machines
6. 4 bit multiplier design and simulation using HDL
7. Synthesis, P&R and post P&R simulation of the components simulated in (1-6) above. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
8. Hardware fusing and testing of each of the blocks simulated in (1-6). Use of either chiposcope feature (Xilinx) or the signal tap feature (Altera) is a must. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

II IC Design Experiments (Based on Cadence/MAGMA/Tanner)
9. Design and simulation of a simple five transistor differential amplifier – Measure gain, ICMR and CMRR
10. Layout generation, parasitic extraction and resimulation of the five transistor differential amplifier
11. Synthesis and standard cell based design of circuits simulated in 9 above. Identification of critical paths, power consumption
12. For experiment 11 above, P & R, Power and clock routing and post P & R simulation
13. Analysis of results of static timing analysis

TOTAL: 60 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
At the end of the course, the student should be able to
• Write HDL code for basic as well as advanced digital integrated circuits.
• Import the logic modules into FPGA Boards.
• Synthesis, Place and Route the digital IPs.
• Design, simulate and extract the layout of Analog IC Blocks using EDA tools.
OBJECTIVES:
- To the study of nature and the facts about environment.
- To find and implement 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
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
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

OUTCOMES:
Upon successful completion of the course, students will be able to:
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 environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

REFERENCES:

PTEC7601 OPTICAL COMMUNICATION

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the principle of light propagation through optical fibers
- To understand signal distortion mechanisms in the fiber
- To introduce optical transmitters and receivers for fiber /free space links
- To introduce optical network concepts and components involved.
UNIT I  OPTICAL FIBERS
Relevance of optical communication in backhaul/backbone networks and interconnects, fiber optics and free space optics, optical fiber structure and parameters, ray and mode theory of light propagation in optical fibers, fiber materials, fiber fabrication techniques, passive optical components - Optical couplers, filters, isolators.

UNIT II  TRANSMISSION CHARACTERISTICS

UNIT III  OPTICAL TRANSMITTERS
Materials for optical sources, light-emitting diodes, semiconductor laser diodes, longitudinal modes, gain and index-guiding, power-current characteristics, spectral behaviour, longitudinal mode control and tunability, noise, direct and external modulation, Laser sources and transmitters for free space communication.

UNIT IV  OPTICAL RECEIVERS
Principles of optical detection, spectral responsivity, PIN, APD, preamplifier types, receiver noises, Signal to Noise Ratio (SNR) and Bit Error Rate (BER), Principles of coherent detection, link power and rise time budget, relevance of power and rise time budget in practical link/network planning.

UNIT V  OPTICAL NETWORKING PRINCIPLES

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Insight about the fibers types characteristics and light propagation.
• Thorough knowledge about fiber optic link transmitter and receiver types and design
• Optical networking concepts with components are explored and compared with conventional ideas.

TEXT BOOKS:

REFERENCES:
2. DC Characteristics of LED and PIN Photodiode. – Determination of External Power Efficiency of LED and Responsivity and Dark current of the PIN photo diode.
4. APD Characteristics – Determination of Threshold Voltage and Average gain estimation. Comparison of APD and PIN photo diode
6. Determination of Capacity of a Digital Fiber Optic Link – Maximum Bit Rate estimation for Glass and Plastic fiber links
7. Determination of Mode Characteristics of a Reflex Klystron Oscillator
8. VSWR and Impedance Measurement and Impedance Matching
9. Characterisation of Directional Couplers and Multiport junctions
10. Gunn Diode Characteristics

TOTAL: 30 PERIODS
UNIT IV  DIRECTING  9
Foundations of individual and group behaviour – motivation – motivation theories – motivational
 techniques – job satisfaction – job enrichment – leadership – types and theories of leadership –
 communication – process of communication – barrier in communication – effective communication –
 communication and IT.

UNIT V  CONTROLLING  9
System and process of controlling – budgetary and non-budgetary control techniques – use of
 computers and IT in Management control – Productivity problems and management – control and
 performance – direct and preventive control – reporting.

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

TEXT BOOKS:
    2009.
    2004.

REFERENCES:

PTEC7001  ADHOC AND WIRELESS SENSOR NETWORKS  L T P C
3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations,
  case studies, simulations, contributions of scientist, national/international policies with a futuristic
  vision along with socio-economic impact and issues
• To equip the students with knowledge of 4G networks and its applications
• To teach the students about various MAC and Routing protocols of Ad hoc and WSN.
• To educate the students on introduction and application of 6lowpan.

UNIT I  INTRODUCTION AND APPLICATIONS  9
Introduction to Ad hoc Networks, Characteristic features, Need for Ubiquitous Computing network,
Applications of Ad hoc, Mobility Models: - Brownian Model, Column model, Random Walk Model,
Random Waypoint model, Random Gauss Markov Model, Reference point Group Mobility Model.

UNIT II  ROUTING PROTOCOLS  9
Need for Different routing Protocols, Proactive Vs Reactive Routing, Unicasting: Dynamic Source
Routing, Ad Hoc On-Demand Distance Vector Routing, Temporally Ordered Routing Algorithm, Signal
Multicasting: Tree Based Algorithm: CAMP, Mesh based Algorithm: On-Demand Multicast Routing
Protocol.
UNIT III  OVERVIEW OF WIRELESS SENSOR NETWORKS

UNIT IV  NETWORKING OF SENSORS

UNIT V  INTRODUCTION AND APPLICATION OF 6LOWPAN

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• The student would have gained the knowledge on ad hoc and sensor networks
• The student would have the ability to design new MAC and Routing protocols for Ad hoc and sensor network.
• The students have attained the capability to learn new operating systems used for WSN.

REFERENCES:
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To bring out the concepts related to stationary and non-stationary random signals
• To emphasize the importance of true estimation of power spectral density
• To introduce the design of linear and adaptive systems for filtering and linear prediction
• To introduce the concept of wavelet transforms in the context of image processing

UNIT I  DISCRETE-TIME RANDOM SIGNALS

UNIT II  SPECTRUM ESTIMATION
Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

UNIT III  LINEAR ESTIMATION AND PREDICTION
Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters.

UNIT IV  ADAPTIVE FILTERS

UNIT V  WAVELET TRANSFORM
Short Time Fourier Transform, Multiresolution analysis, Continuous and discrete wavelet transform, Application of wavelet transform.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• To identify appropriate spectrum estimation method based on type of random signal
• To design filters for processing random signal
• To implement multi resolution approach for signals

TEXT BOOKS:

REFERENCE:
OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To teach the importance of improving capacity of wireless channel using MIMO
- To teach the characteristic of wireless channel
- To teach techniques for channel improvements using space-time block and Trellis codes
- To teach advanced MIMO system like layered space time codes, MU-MIMO System and MIMO-OFDM systems

UNIT I INTRODUCTION

The crowded spectrum, need for high data rate, MIMO systems – Array Gain, Diversity Gain, Data Pipes, Spatial MUX, MIMO System Model. MIMO System Capacity – channel known at the TX, Channel unknown to the TX – capacity of deterministic channels, Random channels and frequency selective channels.

UNIT II RADIO WAVE PROPAGATION

Radio wave propagation – Macroscopic fading - free space and out door, small scale fading Fading measurements – Direct pulse measurements, spread spectrum correlation channel sounding frequency domain channel sounding, Antenna Diversity – Diversity combining methods.

UNIT III SPACE TIME BLOCK CODES

Delay Diversity scheme, Alamoti space time code – Maximum likelihood decoding maximum ratio combining. Transmit diversity space time block codes for real signal constellation and complex signal constellation - decoding of STBC.

UNIT IV SPACE TIME TRELLIS CODES

Space time coded systems, space time code word design criteria, design of space time T C on slow fading channels, design of STTC on Fast Fading channels, performance analysis in slow and fast fading channels, effect of imperfect channel estimation and Antenna correlation on performance, comparison of STBC & STTC.

UNIT V LAYERED SPACE TIME CODES

LST transmitter – Horizontal and Vertical LST receiver – ML Rx, Zero forcing Rx; MMSE Rx, SIC Rx, ZF V-blast Rx- MMSE V-blast Rx, Iterative Rx - capacity of MIMO – OFDM systems – capacity of MIMO multi user systems.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student has gained the knowledge about the importance of MIMO in today's communication
- The student had understood and appreciate the various methods for improving the data rate of wireless communication system.

TEXT BOOKS:

REFERENCES:

PTEC7006 COGNITIVE RADIO COMMUNICATION

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce the concept of software defined radios and their architectures
• To introduce the concept of cognitive radio communication and the components involved
• To introduce the cognitive radio architecture and the functions and issues involved in communication system design.

UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO
Definitions and potential benefits, software radio architecture evolution – foundations, technology tradeoffs and architecture implications.

UNIT II SDR ARCHITECTURE
Essential functions of the software radio, architecture goals, quantifying degrees of programmability, top level component topology, computational properties of functional components, interface topologies among plug and play modules, architecture partitions.

UNIT III INTRODUCTION TO COGNITIVE RADIOS
Marking radio self-aware, the cognition cycle, organization of cognition tasks, structuring knowledge for cognition tasks, Enabling location and environment awareness in cognitive radios – concepts, architecture, design considerations.

UNIT IV COGNITIVE RADIO ARCHITECTURE
Primary Cognitive Radio functions, Behaviors, Components, A–Priori Knowledge taxonomy, observe – phase data structures, Radio procedure knowledge encapsulation, components of orient, plan, decide phases, act phase knowledge representation, design rules.

UNIT V NEXT GENERATION WIRELESS NETWORKS
The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• The students will be able to understand and compare different SDR architectures.
• The students will be able to identify the role of SDR and Cognitive radio communication in XG networks.
TEXT BOOK:

REFERENCES:

PTEC7004 CAD FOR VLSI L T P C
3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To understand the suite of tools available for support and design of VLSI circuits
• To introduce rules and planning methodologies for synthesizing VLSI circuits
• To introduce different modeling schemes for synthesizing VLSI circuits

UNIT I VLSI DESIGN METHODOLOGIES 9

UNIT II DESIGN RULES 9

UNIT III FLOOR PLANNING 9
Floor planning concepts - shape functions and floorplan sizing - Types of local routing problems - Area routing - channel routing - global routing - algorithms for global routing.

UNIT IV SIMULATION 9
Simulation - Gate-level modeling and simulation - Switch-level modeling and simulation - Combinational Logic Synthesis - Binary Decision Diagrams - Two Level Logic Synthesis.

UNIT V MODELLING AND SYNTHESIS 9

TOTAL: 45 PERIODS
OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Apply VLSI design methodologies and design rules for digital circuits.
• Use floor planning concepts for digital circuits.
• Apply Gate level and Switch level modeling and Simulate digital circuits

TEXT BOOK:

REFERENCE:

PTEC7005 CMOS ANALOG IC DESIGN L T P C 3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To study the DC biasing conditions of various MOS amplifier configurations
• To understand the small signal model of various MOS circuits
• To study the noise modeling and analysis procedure associated with various MOS circuits
• To study OPAMP circuits and its stability conditions
• To study in general negative feedback concept in MOS circuits

UNIT I BASIC BUILDING BLOCKS 9
NMOS and PMOS device operation in saturation and sub-threshold regions, device transconductance, output impedance and equivalent circuit. Introduction to Device models for simulation. CG, CG, and source follower circuits. gm/Id design methodology

UNIT II MULTIPLE TRANSISTOR STAGES 9
Cascode circuits. folded cascode circuits, Differential amplifier circuits, quantitative analysis of differential pair, CMRR, Differential pair with MOS loads, Gilbert Cell, Current Mirrors.

UNIT III FREQUENCY RESPONSE, NOISE 9

UNIT IV OPERATIONAL AMPLIFIERS 9
Two stage op-amps, gain boosting, common mode feedback, input range limitation, slew rate, power supply rejection, noise in op-amps.

UNIT V FEEDBACK AND STABILITY 9
Properties of feedback circuits, topologies, effect of loading and noise in feedback circuits. Stability in multipole systems, phase margin, frequency compensation in two stage op-amps, other compensation techniques.

TOTAL: 45 PERIODS
OUTCOMES:
Students who complete this course would be in a position

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- To carry out design of the various building blocks used in CMOS analog ICs. These include current mirror, cascades, common source amplifiers, differential amplifiers, two stage OTAs, source followers.
- To carry out the paper design based on hand calculations for the above important building blocks. This is normally the first mandatory step in the complete design and fabrication of CMOS Analog ICs, and enables the student to carry out circuit simulations and layout design. In conjunction with other similar courses in this area,
- Equip the students with the skills required to pursue design and/or research carriers in the broad field of electronics and communication.

TEXT BOOK:

NPTEL Course: http://nptel.ac.in/courses/117106030/#

REFERENCE:

PTEC7007 COMMUNICATION NETWORKS

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the layered communication architectures
- To understand various physical, data link and routing layer protocols
- To understand application layer protocols and security issues.
- To understand various digital switching techniques.

UNIT I NETWORK FUNDAMENTALS AND PHYSICAL LAYER
Communication Network Evolution and Recent Trends, definition of layers, services, interface and protocols, OSI reference model - layers and duties. TCP/IP reference model – layers and duties. Physical layer - general description, characteristics, signaling media types, topologies, examples physical layer (RS232C, ISDN, ATM, SONET)

UNIT II DATA LINK LAYER AND NETWORK INTERCONNECTION

UNIT III MESSAGE ROUTING TECHNOLOGIES
Circuit switching, packet switching, message switching. Internet protocols; IPV4, IPV6, ARP, RARP, ICMP, IGMP, VPN. Network Routing Algorithms:- Distance vector routing, OSPF, Dijikstra’s, Bellaman Ford, Congestion control algorithms.
UNIT IV  END-END PROTOCOLS AND SECURITY  9

UNIT V  DIGITAL SWITCHING  9
Switching functions, Space Division Switch, Time Division Switch, STS switching, TST switching, No 4 ESS Toll switch, digital cross connect systems, Recent advances in Switching Approaches, Introduction to Software Defined Networking

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would be well versed on the layered communication architectures
- The student would have gained an understanding of the need for different protocols at the different layers and their interworking.
- The student will have an exposure to the various digital switching techniques, and would be able to appreciate the evolving trends.

TEXT BOOKS:

REFERENCES:

PTEC7008  CONTROL SYSTEMS ENGINEERING  L T P C 3 0 0 3

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues.
- To introduce the elements of control system and their modeling using various Techniques.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems.
- To introduce the state variable analysis method.

UNIT I  CONTROL SYSTEM MODELING  9
Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph
UNIT II          TIME RESPONSE ANALYSIS  
Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

UNIT III          FREQUENCY RESPONSE ANALYSIS  

UNIT IV          STABILITY ANALYSIS  

UNIT V          STATE VARIABLE ANALYSIS  

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Compute the transfer function of different physical systems. (Level – III (Application))
• Analyze the time domain specifications and calculate the steady state error. (Level – IV (Analysis))
• Illustrate the frequency response characteristics of open loop and closed loop system response. (Level – II (Comprehension))
• Analyze the stability using Routh and root locus techniques. (Level – IV (Analysis))
• Illustrate the state space model of a physical system and discuss the concepts of sampled data control system. (Level – II (Comprehension))

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To teach the importance of security for networks
- To teach the basics of number theory and Galois field concepts
- To teach symmetric and asymmetric key in crypto systems
- To teach authentication and key management techniques
- To teach security specific to network layer

UNIT I
NUMBER THEORETIC AND ALGEBRAIC ALGORITHMS
Significance of network and data security in todays communication scenario – Overall Classification - Integer Arithmetic Modular Arithmetic – matrices – Linear congruence- Substitution ciphers – Transposition ciphers – Stream cipher- Block ciphers – Algebraic structures – GF(2^n) fields.

UNIT II
MODERN SYMMETRIC KEY CIPHERS
Modern block ciphers – Modern stream ciphers – DES – AES – uses of modern block ciphers and stream cipher, Application Examples

UNIT III
ASYMMETRIC KEY ENCIPHERMENT

UNIT IV
INTEGRITY AUTHENTICATION AND KEY MANAGEMENT

UNIT V
NETWORK SECURITY

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student have gained the importance of security for networks, use of number theory and Galois field concepts.
- The student would have ability to design new symmetric and Asymmetric key crypto system
- The student would have ability to develop new authentication and key management techniques.

TEXT BOOKS:
REFERENCES:

PTEC7010 DIGITAL SWITCHING AND TRANSMISSION  L  T  P  C
3  0  0  3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce different types of signaling in digital telephony
• To introduce various transmission schemes for telephony and broadband
• To introduce modeling and analysis techniques for data transmission

UNIT I    INTRODUCTION
Overview of existing Voice, Data and Multimedia Networks and Services; Review of Basic Communication principles; Synchronous and Asynchronous transmission, Line Codes

UNIT II   TRUNK TRANSMISSION
Multiplexing & Framing - types and standards; Trunk signaling; Optical Transmission-line codes and Muxing: SONET/SDH; ATM; Microwave and Satellite Systems.

UNIT III LOCAL LOOP TRANSMISSION
The Analog Local Loop; ISDN local loop; DSL and ADSL; Wireless Local Loop; Fiber in the loop; Mobile and Satellite Phone local loop.

UNIT IV  SWITCHING
Evolution; Space switching, Time switching and Combination Switching; Blocking and Delay characteristics; Message, Packet and ATM switching; Advances in switching techniques – shared memory fast packet switches, shared medium fast packet switches and space division fast packet switches, Photonic switching - Optical TDM, WDM.

UNIT V   TELETRAFFIC ENGINEERING
Telecom Network Modeling; Arrival Process; Network Blocking performance; Delay Networks-Queuing system analysis and delay performance.

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• The student have gained the ability to understand the different type of signaling, transmission schemes and switching techniques used in digital telephony.
• They have gained the ability to model and analyze the different techniques for data transmission.
TEXT BOOKS:

REFERENCES:

PTGE7071 DISASTER MANAGEMENT L T 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 stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.
UNIT IV DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

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

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

PTEC7011 ELECTRO MAGNETIC INTERFERENCE AND COMPATIBILITY

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To tutor the basics of EMI,EMC
- To instill knowledge on the EMI coupling mechanism and its mitigation techniques
- To impart comprehensive insight about the current EMC standards and about various measurement techniques
UNIT I BASIC CONCEPTS
Definition of EMI and EMC; Intra and Inter system EMI; Sources and victims of EMI, Conducted and Radiated EMI emission and susceptibility; Transient & ESD; Case Histories; Radiation Hazards to humans.

UNIT II COUPLING MECHANISM
Common made coupling; Differential mode coupling; Common impedance coupling; Ground loop coupling; Field to cable coupling; Cable to cable coupling; Power mains and Power supply coupling.

UNIT III EMI MITIGATION TECHNIQUES
Shielding – principle, choice of materials for H, E and free space fields, and thickness; EMI gaskets; Bonding; Grounding – circuits, system and cable grounding; Filtering; Transient EMI control devices and applications; PCB Zoning, Component selection, mounting, trace routing.

UNIT IV STANDARDS AND REGULATION
Units of EMI; National and International EMI Standardizing Organizations – IEC, ANSI, FCC, CISPR, BIS, CENELEC; FCC standards; EN Emission and Susceptibility standards and specifications; MIL461E Standards.

UNIT V TEST METHODS AND INSTRUMENTATION
EMI test sites - Open area site; TEM cell; Shielded chamber; Shielded Anechoic chamber; EMI test receivers; Spectrum Analyzer; Transient EMI Test wave Simulators; EMI coupling Networks - Line impedance Stabilization Networks; Feed through capacitors; Antennas and factors; Current probes and calibration factor; MIL-STD test methods; Civilian STD Test methods, Government policies.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
  Upon Completion of the course, the students will be able to
• To design a EMI free system
• To reduce system level crosstalk
• To design high speed Printed Circuit board with minimum interference
• To make our world free from unwanted electromagnetic environment

TEXT BOOKS:

REFERENCES:
2. C.R. Paul, —Introduction to Electromagnetic CompatibilityII, John wiley & sons Inc. 2006
PTGE7072 ENGINEERING ETHICS AND HUMAN VALUES (Common to all branches) L T P C 3 0 0 3

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

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

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

UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY

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

TOTAL: 45 PERIODS

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

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

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

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT


UNIT II REQUIREMENTS AND SYSTEM DESIGN


UNIT III DESIGN AND TESTING


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


UNIT V BUSINESS DYNAMICS ENGINEERING SERVICES INDUSTRY


TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to:
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

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

REFERENCES:

PTEC7012 FOUNDATIONS FOR NANO - ELECTRONICS

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- The objectives of the course is to introduce quantum mechanics concepts, approximations and statistical mechanics for understanding nano systems

UNIT I INTRODUCTION TO QUANTUM MECHANICS
Particles, waves, probability amplitudes, schrodinger equation, wave packets solutions, operators, expectation values, eigen functons, piecewise constant potentials.

UNIT II SIMPLE HARMONIC OSCILLATORS AND APPROXIMATIONS
SHM Operators, SHM wavepacket solutions, Quantum LC circuit, WKB approximations, variational methods.

UNIT III SYSTEMS WITH TWO AND MANY DEGREES OF FREEDOM
Two level systems with static and dynamic coupling, problems in more than one dimensions, electromagnetic field quantization, density of states.
UNIT IV  STATISTICAL MECHANICS  9
Basic concepts, microscopic, quantum systems in equilibrium, statistical models applied to metals and semiconductors

UNIT V  APPLICATIONS  9
Hydrogen and Helium atoms, electronic states, Atomic force microscope, Nuclear Magnetic Resonance, carbon nanotube properties and applications

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• The student would have gained the knowledge on quantum mechanics concepts, approximations and statistical mechanics for understanding nano systems

TEXT BOOKS:
2. Rainer Waser, “Nanoelectronics and Information Technology”, Wiley 2005

REFERENCES:

PTGE7076  FUNDAMENTALS OF NANO SCIENCE  L T P C
3  0  0  3

OBJECTIVES:
• To learn about basis of nanomaterial science, preparation method, types and application

UNIT I  INTRODUCTION  8
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  9
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  12
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, TiO_2, MgO, ZrO_2, NiO, nanoalumina, CaO, AgTiO_2, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dotspreparation, properties and applications

UNIT IV  CHARACTERIZATION TECHNIQUES  9
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  7

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:

REFERENCES:

UNIT I  HUMAN RIGHTS  9
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:

PTEC7013 INFORMATION THEORY

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To teach different types of entropy
• To teach entropy in the context of data compression
• To teach channel capacities over different channels

UNIT I QUANTITATIVE STUDY OF INFORMATION

UNIT II CAPACITY OF NOISELESS CHANNEL
Fundamental theorem for a noiseless channel, Data compression, Kraft inequality, Shannon-Fano codes, Huffman codes, Asymptotic equipartition, Rate distortion theory.

UNIT III CHANNEL CAPACITY
Properties of channel capacity, Jointly typical sequences, Channel Coding Theorem, converse to channel coding theorem, Joint source channel coding theorem
UNIT IV DIFFERENTIAL ENTROPY AND GAUSSIAN CHANNEL

AEP for continuous random variables, relationship between continuous and discrete entropy, properties of differential entropy, Gaussian channel definitions, converse to coding theorem for Gaussian channel, channels with colored noise, Gaussian channels with feedback

UNIT V NETWORK INFORMATION THEORY

Gaussian multiple user channels, Multiple access channel, Encoding of correlated sources, Broadcast channel, Relay channel, Source coding and rate distortion with side information, General multi-terminal networks.

OUTCOMES:

• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• This course helps to understand insight of source coding
• Students will understand the limitations of the channel
• It helps to understand the data rate that can be offered by the channel in the presence of AWGN

TOTAL : 45 PERIODS

TEXT BOOK:


REFERENCE:


PTEC7014 INTRODUCTION TO WEB TECHNOLOGY

OBJECTIVES:

• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce the features of object oriented programming languages using Java
• To design and create user interfaces using Java frames and applets
• To have a basic idea about network programming using Java
• To create simple Web pages and provide client side validation
• To create dynamic web pages using server side scripting

UNIT I JAVA FUNDAMENTALS


UNIT II JAVA NETWORKING FUNDAMENTALS

UNIT III  CLIENT SIDE TECHNOLOGIES  

UNIT IV  SERVER SIDE TECHNOLOGIES  

UNIT V  APPLICATION DEVELOPMENT ENVIRONMENT  
Overview of MVC architecture - Java Server Faces: Features - Components - Tags - Struts: Working principle of Struts - Building model components - View components - Controller components - Forms with Struts - Presentation tags - Developing Web applications

Hibernate: Configuration Settings - Mapping persistent classes - Working with persistent objects - Concurrency - Transactions - Caching - Queries for retrieval of objects - Spring: Framework - Controllers - Developing simple applications

OUT COMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The students gained the knowledge about Java and basic Web concepts and enable the student to create simple Web based applications.

TEXT BOOK:

REFERENCES:

PTGE7075  INTELLECTUAL PROPERTY RIGHTS  
OBJECTIVE:
- To give an idea about IPR, registration and its enforcement.

UNIT I  INTRODUCTION  
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.

TOTAL :45 PERIODS

OUTCOME:

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

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce principles of various measurement techniques using analog and digital equipments
• To teach Importance of signal generators and analyzers in measurements
• To emphasize the need for data acquisition systems and optical domain measurement techniques

UNIT I SCIENCE OF MEASUREMENT

UNIT II TRANSDUCERS

UNIT III SIGNAL CONDITIONING AND SIGNAL ANALYZERS

UNIT IV DIGITAL INSTRUMENTS

UNIT V DATA DISPLAY AND RECORDING SYSTEMS

OUTCOMES:

• Discuss about the principles of various measurement techniques.
• Analyze the transducers and its impact.
• Explain about the signal conditioning system and signal analyzers.
• Illustrate the digital measurement equipments.
• Emphasize the need for data acquisition, recording and display systems.

TEXT BOOKS:

REFERENCE:
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues.
• To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters.
• To study about the various assist devices used in the hospitals.
• To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

UNIT I  ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING  9
The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II  BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT  9
pH, PO₂, PCO₂, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT III  ASSIST DEVICES  9
Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

UNIT IV  PHYSICAL MEDICINE AND BIOTELEMETRY  9
Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

UNIT V  RECENT TRENDS IN MEDICAL INSTRUMENTATION  9
Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world.

Upon completion of the course, students will be able to:
• Discuss the application of electronics in diagnostic and therapeutic area.
• Measure biochemical and various physiological information.
• Describe the working of units which will help to restore normal functioning

TEXT BOOKS:

REFERENCES:

62
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce probability related study of the characteristics of text, voice, image and video data
• To introduce various compression schemes for text, voice, image and video
• To analyse the compression schemes
• To introduce communication protocols for voice over internet and multimedia networking

UNIT I MULTIMEDIA COMPONENTS
Introduction- Multimedia skills- Multimedia components and their characteristics- Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION

UNIT III TEXT AND IMAGE COMPRESSION
Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding- text compression –static Huffman coding dynamic Huffman coding –arithmetic coding –Lempel Ziv-Welsh Compression-image compression

UNIT IV VoIP TECHNOLOGY

UNIT V MULTIMEDIA NETWORKING
Multimedia networking- Applications-streamed stored and audio-making – Best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Various components of multimedia have been studied
• Compressions and decompressions of multimedia components are explored
• The adaptation of compression techniques in various state-of-the-art technologies were observed

TEXT BOOKS:
REFERENCES:

PTCS7071 OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVE
- To learn the concepts of operating systems.
- To learn about the various issues in operating systems.
- To familiarize with the important mechanisms in operating systems.
- To appreciate the emerging trends in operating systems

UNIT I OPERATING SYSTEMS OVERVIEW

UNIT II PROCESS MANAGEMENT

UNIT III STORAGE MANAGEMENT

UNIT IV I/O SYSTEMS
UNIT V CASE STUDY

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:

PTEC7018 PARALLEL AND DISTRIBUTED PROCESSING

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To study the principles of parallel processing
- To understand the concept of shared memory architecture in multiprocessing
- To study the parallel programming models.

UNIT I PARALLEL ARCHITECTURE
Parallel Computer Models, Program and Network properties, Principles of scalable performance

UNIT II PROCESSORS AND MEMORY HIERARCHY, BUS
Advanced processor Technology, Super scalar and vector processor, Memory hierarchy technology, Virtual Memory Technology, Backplane Bus systems.

UNIT III PIPELINING AND SUPER SCALAR TECHNIQUES
Linear Pipeline, Nonlinear pipeline, Instruction pipeline, Arithmetic pipeline, Superscalar and super pipeline design, Parallel and scalable architectures- Multiprocessor and Multicomputers.

UNIT IV SOFTWARE FOR PARALLEL PROGRAMMING
Parallel programming models, languages, compliers- Parallel Program Development and Environments.
UNIT V  DISTRIBUTED SYSTEMS
Models, Hardware concepts, communication, synchronization mechanism, case study: MPI and PVM, Distributed file systems.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Use different Processor and memory hierarchy technology.
• Apply various types of Pipelining methodologies.
• Identify models, Languages and compilers for Parallel Programming
• Design distributed systems

TEXT BOOKS:

REFERENCES:

PTEC7019  PRINCIPLES OF DIGITAL IMAGE PROCESSING  L T P C
3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To study the formation of an image and its acquisition
• To introduce the use and application of transforms in image processing
• To study techniques for improving quality of information in spoilt images
• To introduce schemes for compressing images to save storage space

UNIT I  DIGITAL IMAGE FUNDAMENTALS
Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II  IMAGE ENHANCEMENT
Point processing, Histograms, Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra Harmonic mean filters, Homomorphic filtering, Color image enhancement.
UNIT III  IMAGE RESTORATION  9

UNIT IV  IMAGE SEGMENTATION  9
Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation–Region growing – Region splitting and Merging – Segmentation by morphological watersheds – Hybrid methods

UNIT V  IMAGE COMPRESSION  9
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• To utilize appropriate preprocessing techniques for manipulation of images
• To design automated techniques for image based applications

TEXT BOOKS:

REFERENCES:

PTEC7022  REAL - TIME AND EMBEDDED SYSTEMS  L T P C  3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To study the architecture and programming of ARM processors.
• To introduce the basic concepts of hard real time multiprocessing.
• To introduce the analytical concepts for effective programming.
• To study about the basics of the buses used for embedded system networking.
UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9
Complex systems and microprocessors – Embedded system design process – Formalism for system design– Design example: Model train controller- ARM Processor Fundamentals- Instruction Set and Programming using ARM Processor.

UNIT II COMPUTING PLATFORM 9
CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption- CPU buses – Memory devices – I/O devices – Component interfacing- System Level Performance Analysis- Parallelism. Design Example: Data Compressor.

UNIT III PROGRAM DESIGN AND ANALYSIS 9
Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Program Optimization- Analysis and optimization of execution time, power, energy, program size – Program validation and testing- Example: Software Modem.

UNIT IV PROCESS AND OPERATING SYSTEMS 9

UNIT V HARDWARE ACCELERATORS & NETWORKS 9

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Ability to design and develop ARM processor based systems.
• Ability to develop embedded system for entertainment, communication and medical applications.
• Ability to implement distributed embedded computing platform and proper scheduling of the process.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To inculcate understanding of the basics required for circuit representation of RF networks
• To deal with the issues in the design of microwave amplifier
• To instill knowledge on the properties of various microwave components
• To deal with the microwave generation and microwave measurement techniques

UNIT I  TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION  9
Low frequency parameters-impedance, admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Introduction to component basics, wire, resistor, capacitor and inductor.

UNIT II  MICROWAVE TRANSISTOR AMPLIFIER DESIGN AND MATCHING NETWORKS  9
Amplifier power relation, stability considerations, gain considerations, noise figure, impedance matching networks, frequency response, Τ and Π matching networks, microstripline matching networks.

UNIT III  PASSIVE MICROWAVE DEVICES AND CIRCUITS  9
Open, short and matched terminations; coupling probes and loops; power divider; directional coupler; attenuators; phase shifter; circulator; isolator; Impedance matching Devices– Tuning screw, stub and quarter-wave transformers

UNIT IV  MICROWAVE GENERATION  9
High frequency effects in Tubes, Two cavity klystron amplifier; Reflex klystron oscillator; TWT amplifier, Backwards wave oscillator; Magnetron oscillator – Theory and applications. Solid state devices: Gunn diode oscillator; BARITT, TRAPATT and IMPATT diode oscillator and amplifier, YIG Devices (Yttrium-Iron Garnet).

UNIT V  MICROWAVE MEASUREMENTS  9
Measuring Instruments – VSWR meter, Power meter, Spectrum Analyser, Network Analyser – principles; Measurement of Impedance, frequency, power, VSWR, Q factor, dielectric constant, S-Parameter. Hazards of microwaves, permitted power levels for practical applications.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Upon completion of the course, students will be able to:
  • Explain the active & passive microwave devices & components used in Microwave communication systems.
  • Analyze the multi-port RF networks and RF transistor amplifiers.
  • Generate Microwave signals and design microwave amplifiers.
  • Measure and analyze Microwave signal and parameters.

TEXT BOOKS:
REFERENCES:

PTEC7021 RF MICROELECTRONICS

OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce radio transceiver architectures
- To understand the design issues in CMOS LNAs, Mixers, Oscillators, PLLs, Synthesizers and Power Amplifiers.

UNIT I TRANSCEIVER ARCHITECTURES
Heterodyne and Homodyne architectures, Discrete and CMOS realization passive components for RF, Impedance Matching, Distortion, IIP3 and Blocking Effects, Noise Figure, Noise matching conditions. Friis Formula for cascaded blocks.

UNIT II CMOS LNAS AND MIXERS
Noise Figure of and impedance matching issues CS, CG and differential LNAs, Passive mixers and conversion loss, Active mixers, Gilbert cells, linearity and Noise Figure of mixers.

UNIT III OSCILLATORS
Negative transconductance, nonlinearity and Differential LC tuned oscillators, Ring oscillators and Colpitts oscillator, Quadrature oscillators—Phase noise.

UNIT IV PLLS AND SYNTHESIZERS
Phase Detectors, charge pumps and their transfer functions, Synthesizers based on first, second and third order PLLs and stability issues, Introduction to integer and fractional N synthesizers.

UNIT V POWER AMPLIFIERS
Class A, B, C, D, E, F and AB power amplifiers, Linearization and impedance matching issues of power amplifiers.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Upon completion of the course, students will be able to
  - Understand radio transceiver architectures
  - Design and Analyze CMOS LNAs, Mixers, Oscillators, PLLs,
  - Synthesizers and Power Amplifiers.
TEXT BOOKS:

PTEC7023 ROBOTICS L T P C
3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce the electronics and software aspects in the design of robots
• To bring out the different languages for programming robot
• To specify robot requirements in the industry
• To introduce latest state of the art robots

UNIT I SCOPe OF ROBOTS
The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots – Economic and Social Issues- applications.

UNIT II ROBOT COMPONENTS

UNIT III ROBOT PROGRAMMING
Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.

UNIT IV ROBOT WORK CELL
Robot Cell Design and Control - Remote Center compliance - Safety in Robotics.

UNIT V FUTURE TRENDS

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Ability to design and develop robotic based systems.
• Ability to develop system for industrial automation and medical applications.
• Ability to provide automatic solution for replacing humans in life threatening area.

TEXT BOOKS:
REFERENCES:

PTEC7024 SATELLITE COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:
• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To enable the student to understand the necessity for satellite based communication, the essential elements involved and the transmission methodologies.
• To enable the student to understand the different interferences and attenuation mechanisms affecting the satellite link design
• To expose the student to the advances in satellite based navigation, GPS and the different application scenarios.

UNIT I SATELLITE ORBITS AND TRAJECTORIES 8
Orbital Mechanics—Orbit Equations, Kepler’s Laws, Orbital Period, Orbits and their types, look angle calculation; Satellite Launch.

UNIT II SATELLITE SUBSYSTEM 10
Satellite Subsystems—AOCS, TTC&M, Power, Transponders, Antennas; earth control-Effects of earth-Perturbation, suntransit, moontransit, satellite power design, MTBF. Basic Equations; System Noise and G/T ratio; Uplink, Downlink and Design for a specified C/N ratio, with GEO and LEO examples; Atmospheric and Rain effects on link performance.

UNIT III LINK DESIGN, MODULATION AND ERROR CONTROL 10
Single link design-double link design aspects, PAM, baseband processing, Digital Modulation for satellite links- BPSK,QPSK and QAM; TDM standards for satellite systems; Error control requirements for satellite link—ARQ, Concatenated Codes,Interleaving, Turbo codes.

UNIT IV MULTIPLE ACCESS FOR SATELLITE COMMUNICATIONS 9
FDM-FM-FDMA - TDMA-structure and system design; Onboard Processing systems; DAMA and PAMA; CDMA-system design and capacity.

UNIT V SOME APPLICATIONS 8
Remote sensing, navigation, scientific and military application, VSAT—Network Architecture, Access Control protocols and techniques, VSAT Earth stations; Satellite Mobile Telephony—Global star, DBS/DTH Television, GPS, Weather satellites.

TOTAL: 45 PERIODS
OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• The student would be able to demonstrate an understanding of the basic principles of satellite orbits, placement and control, satellite link design and the communication system components.
• The student would be able to demonstrate an understanding of the different communication, sensing and navigational applications of satellite and their implementation.

TEXT BOOKS:

REFERENCES:
UNIT III NEURAL NETWORKS

UNIT IV NEURO FUZZY MODELING

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE

TOTAL : 45 PERIODS

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• Upon completion of the course, the student should be able to:
  • Apply various soft computing frame works.
  • Design of various neural networks.
  • Use fuzzy logic.
  • Discuss hybrid soft computing

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To introduce speech production and related parameters of speech
• To show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech
• To understand different speech modeling procedures such as Markov and their implementation issues
• To introduce speech recognition and synthesis techniques

UNIT I        BASIC CONCEPTS

UNIT II       SPEECH ANALYSIS

UNIT III      SPEECH MODELING

UNIT IV       SPEECH RECOGNITION
Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

UNIT V        SPEECH SYNTHESIS
Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

TOTAL: 45 PERIODS

OUTCOMES:

• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• To design fundamental algorithms for speech synthesis, coding and recognition
• To design systems for realizing multimedia applications with basic speech signal processing techniques

TEXT BOOKS:
REFERENCES:

PTGE7074 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

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

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

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

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II
UNIT V QUALITY MANAGEMENT SYSTEM


TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOK:


REFERENCES:


PTEC7027 VLSI SIGNAL PROCESSING L T P C

3 0 0 3

OBJECTIVES:

• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To design DSP architectures that are suitable for VLSI implementation for a given algorithm
• To learn high-level algorithms that reduce the number of multipliers, area of implementation and power consumption.
• To address issues related to high performance VLSI architectures such as pipelining styles.

UNIT I PIPELINING AND PARALLEL PROCESSING

Introduction to DSP Systems, Typical DSP algorithms, Data flow graph representations, Loop bound and Iteration bound, Longest Path Matrix algorithm; Pipelining and Parallel processing of FIR digital filters, Pipelining and Parallel processing for low power.
UNIT II RETIMING AND ALGORITHMIC STRENGTH REDUCTION
Retiming - definitions and properties; Unfolding – an algorithm for Unfolding, properties of unfolding, sample period reduction and parallel processing application; Algorithmic strength reduction in filters and transforms – 2-parallel FIR filter, 2-parallel fast FIR filter, DCT algorithm architecture transformation, Odd-Even Merge-Sort architecture, Parallel Rank-Order filters.

UNIT III FAST CONVOLUTION AND COMBINED PIPELINING AND PARALLEL PROCESSING OF IIR FILTERS

UNIT IV BIT-LEVEL ARITHMETIC ARCHITECTURES
Bit-Level Arithmetic Architectures- parallel multipliers with sign extension, parallel carry-ripple array multipliers, parallel carry-save multiplier, 4x4 bit Baugh-Wooley carry-save multiplication tabular form and implementation, Bit-serial FIR filter, CSD representation, CSD multiplication using Horner’s rule for precision improvement, Distributed Arithmetic

UNIT V NUMERICAL STRENGTH REDUCTION AND WAVE PIPELINING
Numerical Strength Reduction – subexpression elimination, Multiple Constant Multiplications, Synchronous pipelining and Clocking styles, Clock skew in edge-triggered single-phase clocking, Wave pipelining.

OUTCOMES:
• Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
• To develop efficient DSP algorithms suitable for VLSI implementations
• To effectively modify and develop DSP architectures for VLSI implementations

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To understand the working of Wi-fi, 3G systems such as UMTS, CDMA 2000
- To learn 4G networks
- To know about ad hoc and sensor network
- To learn about WLAN, WWAN, Wimax and LTE

UNIT I     WIRELESS LOCAL AREA NETWORKS
Introduction to wireless LANs - IEEE 802.11 WLANs - Physical Layer- MAC sublayer- MAC Management Sublayer- Wireless ATM - HIPERLAN- HIPERLAN-2

UNIT II    3G OVERVIEW & 2.5G EVOLUTION
Migration path to UMTS, UMTS Basics, Air Interface, 3GPP Network Architecture, CDMA2000 overview- Radio and Network components, Network structure, Radio network, TD-CDMA, TD-SCDMA.

UNIT III  ADHOC & SENSOR NETWORKS
Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

UNIT IV    INTERNETWORKING BETWEEN WLANS AND 3G WWANS
Internetworking objectives and requirements, Schemes to connect WLANs and 3G Networks, Session Mobility, Internetworking Architectures for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution system.

UNIT V     4G & BEYOND
4G features and challenges, Technology path, IMS Architecture, WiMAX, LTE, Convergent Devices, 4G technologies, Advanced Broadband Wireless Access and Services, Multimedia, MVNO.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Analyze different routing techniques in ad hoc and sensor network
- Demonstrate internetworking between different wireless networks
- Describe 4G features and challenges

TEXT BOOKS:
REFERENCES:
4. Dharma Prakash Agrawal & Qing-An Zeng, —Introduction to Wireless and Mobile Systems‖