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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
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

TOTAL: 45 PERIODS

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 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.

BOOKS FOR STUDY
REFERENCES

PTPH8151  ENGINEERING PHYSICS

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 PHYSICS

UNIT IV  APPLIED OPTICS

UNIT V  SOLID STATE PHYSICS
Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL : 45 PERIODS
OUTCOMES:
- The students will have 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.

TEXT BOOKS:

REFERENCES:

PTCY8152 ENGINEERING CHEMISTRY L T P C
3 0 0 3

OBJECTIVES:
- To understand about the chemical thermodynamics.
- To impart knowledge in the basics of polymer chemistry.
- To develop sound knowledge on kinetics and catalysis.
- To impart basic knowledge on photochemistry and spectroscopy

UNIT I CHEMICAL THERMODYNAMICS
Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Criteria of spontaneity; Helmholtz and Gibbs free energy functions; 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 II POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY
Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

UNIT V NANOCHEMISTRY 9

TOTAL: 45 PERIODS

OUTCOMES:
• The knowledge gained on polymer chemistry, thermodynamics, spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXT BOOKS:

REFERENCE BOOKS:

PTGE8153 ENGINEERING MECHANICS L T P C 3 0 0 3

OBJECTIVE
• To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I BASICS AND STATICS OF PARTICLES 9

UNIT II EQUILIBRIUM OF RIGID BODIES 9
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s
theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS

UNIT IV DYNAMICS OF PARTICLES

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction -. Rolling resistance - Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 45 PERIODS

OUTCOMES:
- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The students should be made to:
- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I  INTRODUCTION

UNIT II  C PROGRAMMING BASICS

UNIT III  ARRAYS AND STRINGS

UNIT IV  FUNCTIONS AND POINTERS

UNIT V  STRUCTURES AND UNIONS
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design C Programs for problems.
- Write and execute C programs for simple applications.

TEXTBOOKS:

REFERENCES:
OBJECTIVE:

- The applications of the conservation laws to flow through pipes and hydraulic machines are studied. 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  8
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  7

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  PUMPS  12

UNIT V  TURBINES  10

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOKS:

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

UNIT I SEMICONDUCTORS AND RECTIFIERS
Classification of solids based on energy band theory, Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Half and Full wave rectifiers, Zener effect, Zener diode Characteristics, Zener diode as a regulator.

UNIT II TRANSISTOR AND AMPLIFIERS
Bipolar junction transistors – CB, CE, CC configurations and characteristics, Biasing circuits – Fixed bias, Voltage divider bias, CE amplifier, Concept of feedback, Negative feedback, voltage series feedback amplifier, Current series feedback amplifier.

UNIT III FET AND POWER ELECTRONIC DEVICES
FET – Configuration and characteristics, FET amplifier, Characteristics and simple applications of SCR, Diac, Triac and UJT.

UNIT IV SIGNAL GENERATORS AND LINEAR ICs

UNIT V DIGITAL ELECTRONICS
Boolean algebra, Logic Gates, Half and Full adders, Decoder, Encoder, Multiplexer, Demultiplexer, Flip flops, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to identify electronics components and use of them to design circuits.

TEXT BOOK:

REFERENCES:
II. Principle of Electrical Machines
III. Various measuring instruments

UNIT I ELECTRICAL CIRCUITS

UNIT II ELECTRICAL MACHINES
Construction and Principle of operation DC machines- Characteristics of DC machines
Construction and Principle of operation of single phase transformers, synchronous machines, three-phase and single-phase induction motors

UNIT III MEASUREMENT AND INSTRUMENTATION
Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type wattmeters – Energy meter – Megger – Instrument transformers (CT & PT) – Wheatstone's bridge for measurement of unknown resistance ,Maxwell's bridge for unknown inductance and Schering Bridge for unknown capacitance

UNIT IV TRANSUDCERS
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.

UNIT V SIGNAL CONDITIONING AND DISPLAY
Instrumentation amplifiers- Filters- A/D and D/A converters - Multiplexing and data acquisition - LED, LCD and CRT displays.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance

TEXT BOOKS:

REFERENCES:
OBJECTIVES

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

OUTCOMES

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

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

UNIT II FOURIER TRANSFORM

UNIT III PARTIAL DIFFERENTIAL EQUATIONS
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – 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

OUTCOMES

- The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

BOOK FOR STUDY

REFERENCES
OBJECTIVE:
- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

UNIT I  BASIC CONCEPTS AND FIRST LAW

UNIT II  SECOND LAW AND AVAILABILITY ANALYSIS

UNIT III  PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE
Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and regenerative cycles, Economiser, Air preheater, Binary and Combined cycles.

UNIT IV  IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS

UNIT V  GAS MIXTURES AND PSYCHROMETRY
Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

(Use of Steam tables, Mollier chart and Psychrometric chart permitted)

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the Thermodynamic Principles to Mechanical Engineering Application.
- Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.
TEXT BOOKS:

REFERENCES:

PTCE8252 STRENGTH OF MATERIALS
(Common to Mechanical, Manufacturing, Industrial and Printing) 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 DEFORMATION 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 9
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:

PTGE8251 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
(Common to Manufacturing, Mechanical,Printing, Production, EEE, CSE,IT,Civil,Textile,Chemical,Industrial )
3 0 0 3

OBJECTIVES:
To the study of nature and the 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
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

TEXT BOOKS:

REFERENCE BOOKS

PTME8301 KINEMATICS OF MACHINES

OBJECTIVE
- To understand the basic components and layout of linkages in the assembly of a System / machine.
- To understand the principles in analyzing 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 and the effects of friction in motion transmission and in machine components.

UNIT I BASICS OF MECHANISMS

UNIT II KINEMATICS OF LINKAGE MECHANISMS

UNIT III KINEMATICS OF CAM MECHANISMS
UNIT IV  GEARS AND GEAR TRAINS

UNIT V  FRICTION IN MACHINE ELEMENTS
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes – Friction in vehicle propulsion and braking.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply fundamentals of mechanism for the design of new mechanisms and analyse them for optimum design.

TEXT BOOK:

REFERENCES:

STANDARDS:

PTME8302  MANUFACTURING TECHNOLOGY – I

OBJECTIVE:
• To introduce the students on 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  JOINING PROCESSES  

UNIT III  BULK DEFORMATION PROCESSES  

UNIT IV  SHEET METAL PROCESSES  

UNIT V  MANUFACTURE OF PLASTIC COMPONENTS  

TOTAL: 45 PERIODS

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:
PTME8303 THERMAL ENGINEERING-I L T P C 3 0 0 3

OBJECTIVE:
- To apply the concepts and laws of thermodynamics for cycle analysis and performance of heat engines - Internal Combustion (IC) engines and Gas Turbines.

UNIT I GAS POWER CYCLES

UNIT II AIR COMPRESSOR

UNIT III INTERNAL COMBUSTION ENGINES AND ITS SYSTEMS
IC engine Classification, components and functions. Actual and theoretical - valve and port timing diagrams, p-v diagrams - for two stroke and four stroke engines. Comparison of two stroke & four stroke engines and SI & CI engines.

UNIT IV INTERNAL COMBUSTION ENGINE FUELS, COMBUSTION & PERFORMANCE

UNIT V GAS TURBINES

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand the various thermal equipment and their cycles of operation
- Knowledge in working of Air Compressors and IC Engines
- Understanding of IC Fuels and their performance
- Knowledge in principle of operations of gas turbines and performance measurements of gas turbines.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

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

UNIT I

FORCE ANALYSIS


UNIT II

BALANCING


UNIT III

SINGLE DEGREE FREE VIBRATION


UNIT IV

FORCED VIBRATION


UNIT V

MECHANISM FOR CONTROL


TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the Students can able to predict the force analysis in mechanical system and related vibration issues and can able to solve the problem
TEXT BOOK:

REFERENCES:

PTME8402 MANUFACTURING TECHNOLOGY – II

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 metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT II TURNING MACHINES
Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle: Swiss type, automatic screw type – multi spindle:

UNIT III RECIPROCATING, MILLING AND GEAR CUTTING MACHINES
UNIT IV ABRASIVE PROCESS AND BROACHING

Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding, internal grinding- micro finishing methods - Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

UNIT V ADVANCED MANUFACTURING TECHNIQUES

Numerical Control(NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micro machining – wafer machining

OUTCOMES:

- Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools and also demonstrate the programming in CNC machining.

TEXT BOOKS:


REFERENCES:


PTME8403 THERMAL ENGINEERING - II

OBJECTIVES:

- To integrate the concepts, laws and methodologies from the first course in thermodynamics into the analysis of cyclic processes.
- To apply the thermodynamic concepts into various thermal applications like Boilers, Compressors and Refrigeration and Air Conditioning Systems and Waste heat recovery systems.

UNIT I STEAM NOZZLE

Types of nozzles, Flow of steam through nozzles, Shapes of nozzles, Effect of friction, Critical pressure ratio, Metastable flow.

UNIT II BOILERS

Types of boilers, Thermal calculations, Heat balance, Mountings and Accessories, Boiler trial, Boiler code, Basic Rankine cycle.

UNIT III STEAM TURBINES

Types, Impulse and reaction principles, Compoundings, Velocity diagrams for impulse and reaction blades, Work done on turbine blades and efficiency of components, Speed regulations, Governors.
UNIT IV  COGENERATION AND WASTE HEAT RECOVERY  

UNIT V  REFRIGERATION AND AIR – CONDITIONING  
Vapour compression Refrigeration cycle, Superheat, Sub cooling, Performance calculations, Working principle of vapour absorption system, Air cycle refrigeration, Thermo electric refrigeration, Psychrometry and Psychrometric properties, Psychrometric chart, Instrumentation, Cooling load calculations and circulating systems, concept of RSHF, GSHF and ESHF, Air conditioning systems.

TOTAL: 45 PERIODS

OUTCOMES:

- Knowing the types and flow characteristics of nozzles
- understanding the types and working of boilers and steam turbines, cogeneration and heat recovery
- Knowledge of refrigeration and air conditioning system

TEXT BOOKS:

REFERENCES:

PTML8251  ENGINEERING MATERIALS AND METALLURGY  L T P C
(Common to Mechanical and Manufacturing)  3 0 0 3

OBJECTIVE:
To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

UNIT I  ALLOYS AND PHASE DIAGRAMS  10

UNIT II  HEAT TREATMENT  11
Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves

UNIT III  FERROUS AND NON-FERROUS METALS

Effect of alloying additions on steel- α and β stabilisers– stainless and tool steels – HSLA, Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys, special non-ferrous metals and alloys of low coefficient of the thermal expansion, high corrosion resistance, heat resistant etc.

UNIT IV  NON-METALLIC MATERIALS


UNIT V  MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

Mechanisms of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Micro and nano-hardness tests, Impact test Izod and charpy, fatigue and creep failure mechanisms.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:


REFERENCES:


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PTME8411  THERMAL ENGINEERING LABORATORY – II

LIST OF EXPERIMENTS:

OBJECTIVES

- To study the heat transfer phenomena predict the relevant coefficient using implementation
- To study the performance of refrigeration cycle / components
HEAT TRANSFER:
1. Thermal conductivity measurement using guarded plate apparatus.
2. Thermal conductivity measurement of pipe insulation using lagged pipe apparatus.
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. Determination of Thermal conductivity of composite wall.
6. Determination of Thermal conductivity of insulating powder.
7. Heat transfer from pin-fin apparatus (natural & forced convection modes)
8. Determination of Stefan – Boltzmann constant.
10. Effectiveness of Parallel / counter flow heat exchanger.

REFRIGERATION AND AIR CONDITIONING LAB
1. Determination of COP of a refrigeration system
2. Experiments on Psychrometric processes
3. Performance test on a reciprocating air compressor
4. Performance test in a HC Refrigeration System
5. Performance test in a fluidized Bed Cooling Tower

TOTAL: 45 PERIODS

OUTCOMES
• Ability to demonstrate the fundamentals of heat and predict the coefficient used in that transfer application and also design refrigeration cycle.

PTME8501 COMPUTER INTEGRATED MANUFACTURING

OBJECTIVE:
• To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

UNIT I INTRODUCTION
Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control

UNIT II PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

UNIT III CELLULAR MANUFACTURING
Group Technology(GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part

UNIT IV FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS) 8

UNIT V INDUSTRIAL ROBOTICS 8

OUTCOMES:
- Knowledge gained in usage of computers and software’s in various manufacturing activities
- Understanding of product and process classifications in electronic automation of shop floor
- Knowledge in FMS and AGVS in manufacturing automation
- Usage of Robots and programming of Robots

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:

PTME8502 DESIGN OF MACHINE ELEMENTS L T P C 3 0 0 3
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


Cylinders and Pressure vessels for industrial applications – Thin and thick cylinders – Spherical vessels

UNIT II  SHAFTS AND COUPLINGS

Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, key ways and splines – crankshafts - Rigid and flexible couplings.

UNIT III  TEMPORARY AND PERMANENT JOINTS

Threaded fastners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV  ENERGY STORING ELEMENTS AND ENGINE COMPONENTS

Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT V  BEARINGS

Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, McKee’s Eqn., Sommerfield Number, Raimondi & Boyd graphs, -- Selection of Rolling Contact bearings - Seals and Gaskets

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:


30

STANDARDS:

PTME8503 METROLOGY AND MEASUREMENTS L T P C
3 0 0 3

OBJECTIVE:
- To provide knowledge on the various Metrological equipments available to measure the dimension of the components and the correct procedure to be adopted while using these instruments.

UNIT I INTRODUCTION
Introduction to Metrology-Standards-Calibration-Terminologies in Measurement-Errors in Measurement-Care of Measuring Instruments- Reliability

UNIT II LINEAR AND ANGULAR MEASUREMENTS

UNIT III ADVANCES IN METROLOGY

UNIT IV THREAD, GEAR METROLOGY AND FORM MEASUREMENT
Thread ,Gear Metrology – Form measurement-Straightness-Flatness, Roundness.Surfacefinish measurement.

UNIT V MEASUREMENT OF POWER, FLOW AND TEMPERATURE

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of this course, the Students can demonstrate different measurement technologies and use of them in Industrial Components
PTME8551 COMPUTER AIDED DESIGN (Common to Mechanical and Manufacturing) 3 0 0 3

OBJECTIVES:
• To provide an overview of how computers are being used in design

UNIT I FUNDAMENTALS OF COMPUTER GRAPHICS
Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - Line drawing -Clipping- viewing transformation

UNIT II GEOMETRIC MODELLING
Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves- Techniques for surface modelling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modelling techniques- CSG and B-rep

UNIT III VISUAL REALISM

UNIT IV ASSEMBLY OF PARTS
Assembly modelling – interferences of positions and orientation – tolerance analysis-mass property calculations – mechanism simulation and interference checking.

UNIT V CAD STANDARDS
Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc. - communication standards.

OUTCOMES:
• Upon completion of this course, the students can able to use computer and CAD software’s for modeling of mechanical components

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To gain practical experience in handling 2D drafting and 3D modelling software systems.
- To study the features of CNC Machine Tool.
- To expose students to modern control systems (Fanuc, Siemens etc.,)
- To know the application of various CNC machines like CNC lathe, CNC Vertical Machining centre, CNC EDM and CNC wire-cut and studying of Rapid prototyping.

1. 3D GEOMETRIC MODELLING

List of Experiments
1. Introduction of 3D Modelling software
Creation of 3D assembly model of following machine elements using 3D Modelling software
2. Flange Coupling
3. Plummer Block
4. Screw Jack
5. Lathe Tailstock
6. Universal Joint
7. Machine Vice
8. Stuffing box
9. Crosshead
10. Safety Valves
11. Non-return valves
12. Connecting rod
13. Piston
14. Crankshaft

1. Manual Part Programming. 21 PERIODS
(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.

3. Computer Aided Part Programming
   e) CL Data and Post process generation using CAM packages.
   f) Application of CAPP in Machining and Turning Centre.

4. Study of CNC EDM, CNC EDM wire-cut and Rapid prototyping.
OUTCOMES
• Ability to develop 2D and 3D models using modeling softwares.
• Ability to understand the CNC control in modern manufacturing system.
• Ability to prepare CNC part programming and perform manufacturing.

PTME8552    FINITE ELEMENT ANALYSIS
             (Common to Mechanical and Manufacturing)    L T P C
             3 0 0 3

OBJECTIVES:
• To introduce the concepts of Mathematical Modeling of Engineering Problems.
• To appreciate the use of FEM to a range of Engineering Problems.

UNIT I          INTRODUCTION
9

UNIT II       ONE-DIMENSIONAL PROBLEMS
9

UNIT III    TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS
9

UNIT IV      TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS
9
Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

UNIT V     ISOPARAMETRIC FORMULATION AND ADVANCED TOPICS
9

OUTCOMES:
• Upon completion of this course, the students can able to understand different mathematical Techniques used in FEM analysis and use of them in Structural and thermal problem

TEXT BOOK:
REFERENCE BOOKS:

PTME8553 INDUSTRIAL MANAGEMENT L T P C
(Common to Mechanical and Manufacturing) 3 0 0 3

OBJECTIVES:
• To develop modern concepts of Industrial Management

UNIT I INTRODUCTION 9

UNIT II FUNCTIONS OF MANAGEMENT 9

UNIT III ORGANIZATIONAL BEHAVIOUR 9

UNIT IV GROUP DYNAMICS 9
UNIT V MODERN CONCEPTS

OUTCOMES:
- Students gain knowledge on the basic management principles to become management(s) professional.

TEXT BOOKS:

REFERENCE BOOKS:

PTME8601 DESIGN OF TRANSMISSION SYSTEMS

OBJECTIVES:
- To gain knowledge on the principles and procedure for the design of Mechanical power Transmission components.
- To understand the standard procedure available for Design of Transmission of Mechanical elements
- To learn to use standard data and catalogues

UNIT I SELECTION OF PRIME MOVERS AND DESIGN FOR FLEXIBLE ELEMENTS
Electric motor classification, Alternating current motors, Polyphase motors, Universal motors, Motor selection: Speed-Torque curves for AC& DC motors, Speed control of electrical motors, Driven machine speed-Torque curves, Motor selection: Matching the motor to the driven machine, Time to accelerate operating speed, Gasoline and diesel engines. Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets. Selection of pulleys and sprockets for the above transmission systems.

UNIT II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS
Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helical gears.
UNIT II  BEVEL, WORM AND CROSS HELICAL GEARS  9
Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears.
Worm Gear: Merits and demerits- terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair.
Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

UNIT IV  GEAR BOXES  9
Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box for machine tool applications – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications.

UNIT V  CAMS CLUTCHES AND BRAKES  9
Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches-shoe and band brakes - external shoe brakes – Internal expanding shoe brake - Electromagnetic clutches

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 transmission components used in Engine and machines

TEXT BOOK:

REFERENCES:

STANDARDS:
1. IS 4460 : Parts 1 to 3 : 1995, Gears – Spur and Helical Gears – Calculation of Load Capacity.
2. IS 7443 : 2002, Methods of Load Rating of Worm Gears

PTME8602 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 8 + 3

UNIT II CONVECTION 7 + 3

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS 9 + 3

UNIT IV RADIATION 9 + 3

UNIT V MASS TRANSFER 6 + 3

OUTCOMES:
- Upon completion of this course, the students can able to understand and apply different heat and mass transfer principles of different applications.

TEXT BOOK:
OBJECTIVE:
Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I  COAL BASED THERMAL POWER PLANTS 10

UNIT II  DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 10

UNIT III  NUCLEAR POWER PLANTS 7

UNIT IV  POWER FROM RENEWABLE ENERGY 10
Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V  ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 8
Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to understand different types of power plant, and its functions and their flow lines and issues related to them.
- Analyse and solve energy and economic related issues in power sectors.
TEXT BOOK:

REFERENCES:

PTME8554 MECHATRONICS (Common to Mechanical and Manufacturing) L T P C 3 0 0 3

OBJECTIVES:
• This syllabus is formed to impart knowledge for the students about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation.

UNIT I INTRODUCTION

UNIT II 8085 MICROPROCESSOR

UNIT III PROGRAMMABLE PERIPHERAL INTERFACE

UNIT IV PROGRAMMABLE LOGIC CONTROLLER
Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC.

UNIT V ACTUATORS AND MECHATRONIC SYSTEM DESIGN

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to design mechatronics system with the help of Microprocessor, PLC and other electrical and Electronics Circuits.
TEXT BOOKS:

REFERENCES:

ME8711 PROJECT WORK

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.

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

PTGE8551 ENGINEERING ETHICS AND HUMAN VALUES

OBJECTIVES:
- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
UNIT I  
HUMAN VALUES


UNIT II  
ENGINEERING ETHICS


UNIT III  
ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

UNIT IV  
SAFETY, RESPONSIBILITIES AND RIGHTS


UNIT V  
GLOBAL ISSUES


TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXTBOOK


REFERENCES:


WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

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

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

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

UNIT III: TESTS OF SIGNIFICANCE

UNIT IV: DESIGN OF EXPERIMENTS
Completely randomized design – Randomized block design – Latin square design - 2² - factorial design - Taguchi’s robust parameter design.

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

OUTCOMES:
After successfully completing the course, students should be able to do the following:
- Use statistical methodology and tools in the engineering problem-solving process.
- Compute and interpret descriptive statistics using numerical and graphical techniques.
- Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution.
- Compute point estimation of parameters, explain sampling distributions, and understand the central limit theorem.

TEXT BOOKS:

REFERENCES:
3. Ross, S.M., “Introduction to Probability and Statistics for Engineers and Scientists”, Elsevier,
PTME8001            ADVANCED INTERNAL COMBUSTION ENGINEERING                L T P C
                                                                                      3 0 0 3

OBJECTIVE:

• To understand the underlying principles of operation of different IC Engines and
components.
• To provide knowledge on pollutant formation, control, alternate fuel etc.

UNIT I            SPARK IGNITION ENGINES
Mixture requirements – Fuel injection systems – Monopoint, Multi-point & Direct injection -
Stages of combustion – Normal and Abnormal combustion – Knock - Factors affecting knock –
Combustion chambers.

UNIT II            COMPRESSION IGNITION ENGINES
Diesel Fuel Injection Systems - Stages of combustion – Knocking – Factors affecting knock –
Direct and Indirect injection systems – Combustion chambers – Fuel Spray behaviour – Spray
structure and spray penetration – Air motion - Introduction to Turbocharging.

UNIT III           POLLUTANT FORMATION AND CONTROL
Pollutant – Sources – Formation of Carbon Monoxide, Unburnt hydrocarbon, Oxides of
Nitrogen, Smoke and Particulate matter – Methods of controlling Emissions – Catalytic
converters, Selective Catalytic Reduction and Particulate Traps – Methods of measurement –
Emission norms and Driving cycles.

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 –
NOx Adsorbers - Onboard Diagnostics.

TOTAL : 45 PERIODS

OUTCOME:

• Upon completion of this course, the students can able to compare the operations
of different IC Engine and components and can evaluate the pollutant formation,
control, alternate fuel

TEXT BOOKS:

REFERENCES:
PTME8002 AUTOMOBILE ENGINEERING L T P C 3 0 0 3

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

UNIT I INTRODUCTON TO AUTOMOTIVES 10
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 10
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 BREAKING SYSTEMS 10
Clutch system, Gear box system, propeller shafting, differential, axles, wheels and tyres and prelimineries of suspension systems.

UNIT IV OTHER AUXILIARY SYSTEMS 10
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 5
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 automobile engineering.
- Have clear understanding on different auxiliary and transmission systems usual.

TEXT BOOK:

REFERENCES:

PTME8003 CASTING AND WELDING PROCESSES L T P C 3 0 0 3

OBJECTIVE:
- The objective of the course is 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  11

UNIT II  FERROUS AND NON FERROUS CASTINGS  10
Steel Casting – The family of cast iron – melting of steels and cast irons – Grey iron foundry practice – Ductile iron – Malleable Iron casting design – Considerations Aluminium ,Magnesium,Copper,Zinc. ,Duplex Stainless Steel and Titanium alloys foundry practice.

UNIT III  FOUNDRY MECHANISATION  8
Mechanical equipments in foundry – plant site location, layout – Plant Engineering – Maintenance – Services – Practical aspects.

UNIT IV  WELDING PROCESS AND TECHNOLOGY  8

UNIT V  WELDING METALLURGY  8

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to compare different types of casting and welding process for effective casting and Welding of Structural components.

TEXT BOOK:

REFERENCES:
2. A.K.Chakrabarti, Casting Technology and Cast Alloys, Prentice –Hall Of India Ltd, 2005
3. T.V.Rama Rao, Metal casting Principles and Practice, New Age International,2010

PTME8004  COMPOSITE MATERIALS AND MECHANICS  L T P C
3 0 0 3

OBJECTIVES
- To understand the fundamentals of composite material strength and its mechanical behavior
- Understanding the analysis of fiber reinforced Laminate design for different
- To understand fabrication and properties of different composites
- Combinations of plies with different orientations of the fiber.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing. Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.
UNIT I INTRODUCTION TO COMPOSITE MATERIALS

UNIT II PROCESSING OF COMPOSITES
Processing of PMCs-handlay-up, spray technique, filament winding,Pultrusion,RTM, bag molding, injection moulding,SMC -Processing of MMCs-solid state, liquid state,vapour state processing, Processing of CMCs –hot pressing-reaction bonding process-infiltration technique, direct oxidation- interfaces

UNIT III INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS

UNIT IV LAMINA STRENGTH ANALYSIS

UNIT V THERMAL ANALYSIS

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to analyse the fiber reinforced Laminate for optimum design
• Apply classical laminate theory to study and analyse the residual stresses in Laminate.

TEXT BOOKS:

REFERENCES:
PTME8005  

DESIGN OF HEAT EXCHANGERS  

L T P C  

3 0 0 3  

OBJECTIVES:  
- To learn the 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 characteristic.  

TOTAL: 45 PERIODS  

OUTCOMES:  
- Upon completion of this course, the students can able to apply the mathematical knowledge for thermal and stress analysis on various parts of the heat exchangers components.  

TEXT BOOKS:  

REFERENCES:  

PTME8006 DESIGN OF PRESSURE VESSELS AND PIPING

OBJECTIVES:

- To understand the Mathematical knowledge to design pressure vessels and piping
- To understand the ability to carry of stress analysis in pressure vessels and piping

UNIT I INTRODUCTION 3

UNIT II STRESSES IN PRESSURE VESSELS 15

UNIT III DESIGN OF VESSELS 15
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 8
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 4

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply the mathematical fundamental for the design of pressure vessels and pipes. Further they can able to analyse and design of pressure vessels and piping.

TEXT BOOK:

REFERENCES

PTME8007 GAS DYNAMICS AND SPACE PROPULSION L T P C
3 0 0 3

OBJECTIVES:
- To understand the differences between incompressible and compressible flow.
- To understand the phenomenon of shock waves and its effect on flow.
- To gain basic knowledge about jet propulsion 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. Use of tables and charts.

UNIT III NORMAL AND OBLIQUE SHOCKS

UNIT IV JET PROPULSION
Theory of jet propulsion – thrust equation – thrust power and propulsive efficiency. Operation, cycle analysis and performance of ram jet, turbojet, turbofan and turbo prop engines.

UNIT V SPACE PROPULSION

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to successfully apply gas dynamics principles in the Jet and Space Propulsion

TEXT BOOKS:

REFERENCES:
1. Radhakrishnan, E., Gas Dynamics, Printice Hall of India, 2008
ME8008 MARKETING MANAGEMENT

OBJECTIVE:
• To understand the various processes involved in Marketing and its Philosophy.
• To learn the Psychology of consumers.
• To formulate strategies for advertising, pricing and selling

UNIT I MARKETING PROCESS 9
Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION 9
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic -Psycho graphic and geographic segmentation, process, patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9
Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV PLANNING AND STRATEGY FORMULATION 9
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9
Characteristics, impact, goals, types, and sales promotions- point of purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TOTAL: 45 PERIODS

OUTCOMES :
• The learning skills of Marketing will enhance the knowledge about Marketer’s Practices and create insights on Advertising, Branding, Retailing and Marketing Research.

TEXT BOOKS:

REFERENCES:
7. Graeme Drummond and John Ensor, Introduction to marketing concepts, Elsevier, Indian Reprint, 2002

PH8009 MATERIALS SCIENCE
(Common to Manufacturing, Industrial, Mining, Mechanical, Aeronautical, Automobile and Production Engineering)

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

UNIT I MECHANICAL PROPERTIES

UNIT II PHASE DIAGRAMS
Solid solutions - Hume Rothery's rules - free energy of solid solution - intermediate phases - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the level rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions - microstructural change during cooling.

UNIT III FERROUS ALLOYS AND HEAT TREATMENT

UNIT IV ELECTRONIC MATERIALS
Classification of solids - energy bands - concept of Fermi level - conductor, semiconductor, insulator - Semiconductors: intrinsic, extrinsic - carrier concentration expression (qualitative) - compound semiconductors (qualitative) - dielectric materials - polarization mechanisms - dielectric breakdown - magnetic materials - ferromagnetic materials &hysterisis - ferrites - superconducting materials, properties, types and applications.
UNIT V NEW MATERIALS AND APPLICATIONS


TOTAL: 45 PERIODS

OUTCOMES:
• 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:

REFERENCE BOOKS:

PTME8010 MECHANICAL VIBRATION AND NOISE CONTROL

OBJECTIVE:
• The student will be able to understand the sources of vibration and noise in automobiles and make design modifications 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 CONTROL TECHNIQUES
Vibration isolation, tuned absorbers, un-tuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.
UNIT V SOURCE OF NOISE AND 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

OUTCOMES:
- Understanding causes, source and types of vibrations in machineries
- Gaining knowledge in sources and measurement standard of noise
- Ability to design and develop vibrations and noise control systems.

TEXT BOOKS:

REFERENCES:

PTME8011 NEW AND RENEWABLE SOURCES OF ENERGY

OBJECTIVE:
At the end of the course, the students are expected to identify the new methodologies / technologies for effective utilization of renewable energy sources.

UNIT I INTRODUCTION

UNIT II SOLAR ENERGY
UNIT III WIND ENERGY

UNIT IV BIO - ENERGY

UNIT V OTHER RENEWABLE ENERGY SOURCES

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources.

TEXT BOOKS:

REFERENCES:
UNIT II MECHANICAL PROCESS 10

UNIT III ELECTRICAL DISCHARGE MACHINING 10

UNIT IV CHEMICAL AND ELECTRO CHEMICAL MACHINING 10

UNIT V HIGH ENERGY MACHINING PROCESS 8

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to demonstrate different unconventional machining processes and know the influence of difference process parameters on the performance and their applications.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

UNIT I  OVERVIEW OF NDT  7
NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection – Unaided and aided.

UNIT II  SURFACE NDE METHODS  8

UNIT III  THERMOGRAPHY AND EDDY CURRENT TESTING (ET)  10
Thermography- Principles, Contact and non contact inspection methods, Techniques for applying liquid crystals, Advantages and limitation - infrared radiation and infrared detectors, Instrumentations and methods, applications.

UNIT IV  ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE)  10
Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A.Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction.

UNIT V  RADIOGRAPHY (RT)  10
Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films - graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to use the various Non Destructive Testing and Testing methods understand for defects and characterization of industrial components

TEXT BOOKS:
REFERENCES:

PTME8014 REFRIGERATION AND AIR CONDITIONING L T P C
3 0 0 3

OBJECTIVES:
• To understand the underlying principles of operation in different Refrigeration & Air conditioning systems and components.
• To provide knowledge on design aspects of Refrigeration & Air conditioning systems

UNIT I INTRODUCTION
Introduction to Refrigeration - Unit of Refrigeration and C.O.P.– Ideal cycles- Refrigerants Desirable properties – Classification - Nomenclature - ODP & GWP.

UNIT II VAPOUR COMPRESSION SYSTEM

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

UNIT IV PSYCHROMETRIC PROPERTIES AND PROCESSES

UNIT V AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION
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; Filters; Air Conditioning Systems with Controls: Temperature, Pressure and Humidity sensors, Actuators & Safety controls.

TOTAL: 45 PERIODS
OUTCOMES:
- Upon completion of this course, the students can able to demonstrate the operations in different Refrigeration & Air conditioning systems and also able to design Refrigeration & Air conditioning systems.

TEXT BOOK:

REFERENCES:

PTME8015 THEORY OF METAL FORMING

OBJECTIVES:
This course aims to impart the knowledge about various metal forming processes. It deals with metal forming concepts like theory of plasticity and special metal forming techniques. After this course a student will have a good exposure about this subject. This also gives the recent trends in the metal forming processes.

UNIT I THEORY OF PLASTICITY

UNIT II CONSTITUTIVE RELATIONSHIPS AND INSTABILITY
Uniaxial tension test – Mechanical properties – Work hardening, Compression test, bulge test, plane strain compression, plastic instability in uniaxial tension stress, plastic instability in biaxial tension stress – Material models – Elasto plasticity, Rigid plasticity, visco plasticity.

UNIT III ANALYSIS OF METAL FORMING
Slab analysis – Slip line method, upper bound solutions, numerical methods, contact problems, effect of friction, thermo elastic- analysis of forging, rolling, extrusion and wire drawing processes – forming load – Net and Near net shape forming – Cold and Hot Forging.

UNIT IV SHEET METAL FORMING
UNIT V  SPECIAL METAL FORMING PROCESSES
Orbital forging, Isothermal forging, Warm forging, Hot and Cold isotrophical pressing, high speed extrusion, rubber pad forming, micro blanking – Overview of Powder Metal Techniques – Powder rolling.

OUTCOMES:
- Students will learn how to determine the loading of the forming tool or machine, and how to determine the critical values of deformation

TEXT BOOKS:

REFERENCES:

PTME8016  TURBO MACHINERY  L T P C
3 0 0 3

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

UNIT I  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

OUTCOMES:
• Upon completion of this course, the students can explain the various systems, principles and applications and different types of turbo machinery components.

TEXT BOOKS:

REFERENCES:

PTME8071  COMPUTATIONAL FLUID DYNAMICS  L T P C
3 0 0 3

OBJECTIVES:
• To introduce Governing Equations of viscous fluid flows
• To introduce numerical modeling and its role in the field of fluid flow and heat transfer
• To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
• To create confidence to solve 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

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


UNIT V  TURBULENCE MODELS AND MESH GENERATION


TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able
- To create numerical modeling and its role in the field of fluid flow and heat transfer
- To use the various discretization methods, solution procedures and turbulence modeling to solve flow and heat transfer problems.

TEXT BOOKS:

REFERENCES:

PTME8072 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

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

UNIT I  LOCATING AND CLAMPING PRINCIPLES:
UNIT II JIGS AND FIXTURES 10
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES 10

UNIT IV BENDING AND DRAWING DIES 10

UNIT V OTHER FORMING TECHNIQUES 7
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke.

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 design jigs, fixtures and press tools.

TEXT BOOK:

REFERENCES:
5. ASTME Fundamentals of Tool Design Prentice Hall of India.
OBJECTIVES:
At the end of the course, the student is expected to
- understand and analyse the energy data of industries
- carry out energy accounting and balancing
- conduct energy audit and suggest methodologies for energy savings and
- utilise the available resources in optimal ways

UNIT I  INTRODUCTION  8
Energy - Power – Past & Present scenario of World; National Energy consumption Data –
Environmental aspects associated with energy utilization – Energy Auditing: Need, Types,
Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II  ELECTRICAL SYSTEMS  12
Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of
Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency
Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy,
LED Lighting and scope of Encon in Illumination.

UNIT III  THERMAL SYSTEMS  12
Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon
measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam
Utilization, Insulators & Refractories.

UNIT IV  ENERGY CONSERVATION IN MAJOR UTILITIES  8
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems –
Cooling Towers – D.G. sets.

UNIT V  ECONOMICS  5
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present
Value, Life Cycle Costing – ESCO concept

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able to analyse the energy data of industries.
- Can carry out energy accounting and balancing
- Can suggest methodologies for energy savings

TEXT BOOK:
   website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of

REFERENCES:
OBJECTIVE:
Study of this subject provides 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
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III  BUSINESS

UNIT IV  FINANCING AND ACCOUNTING

UNIT V  SUPPORT TO ENTREPRENEURS

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:

To impart knowledge in reliability concepts, reliability estimation methods and reliability improvement methods.

UNIT I  RELIABILITY CONCEPT
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

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

UNIT V  RELIABILITY IMPROVEMENT

TOTAL: 45 PERIODS

OUTCOMES:

Upon successful completion of this course, the students can able to apply the concept for reliable component production

REFERENCES:


OBJECTIVE:

This course will give an appreciation of the fundamental principles, design and operation of hydraulic and pneumatic components and systems and their application in manufacturing and mechanical systems.
UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS
Sources of Hydraulic power: Pumping Theory – Pump Classification- Construction, Working, Design, Advantages, Disadvantages, Performance, Selection criterion of Linear, Rotary- Fixed and Variable displacement pumps-Problems

UNIT II HYDRAULIC ACTUATORS AND VALVES

UNIT III HYDRAULIC 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 SYSTEMS

UNIT V TROUBLE SHOOTING AND APPLICATIONS

TOTAL: 45 PERIODS

OUTCOMES:
- Identify hydraulic and pneumatics components.
- Ability to design hydraulic and pneumatic circuits.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To understand the principles of design such that the manufacturing of the product is possible.
- To educate students on various design aspects to be considered for manufacturing the products using different processes.

UNIT I MANUFACTURING METHODOLOGY AND PROCESSES 9
Methodologies and tools, design axioms, design for assembly and evaluation, minimum part assessment, Taguchi method, robustness assessment, manufacturing process rules, designer's tool kit, Computer Aided group Technology, failure mode effects analysis, Value Analysis, Design for minimum number of parts, development of modular design, minimizing part variations, design of parts to be multi-functional, multi-use, ease of fabrication, Poke Yoke principles.

UNIT II GEOMETRIC ANALYSIS 9
Surface finish, review of relationship between attainable tolerance grades and different machining processes, part features-feature of size-control from-placement material condition – MMC – LMC

UNIT III FORM DESIGN OF CASTINGS AND WELDMENTS 9
Redesign of castings based on parting line considerations, minimizing core requirements, redesigning cast members by welded structure, use of welding symbols.

UNIT IV MECHANICAL ASSEMBLY 9
Selective assembly, deciding the number of groups, control of axial play, examples, Grouped datum systems, different types, geometric analysis and applications, design features to facilitate automated assembly, Assembly analysis worst case, Arithmetic method, Monte Carlo method.

UNIT V TRUE POSITION THEORY 9
Virtual size concept, floating and fixed fasteners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, examples. Operation sequence for typical shaft type of components. Preparation of process drawings for different operations, tolerance worksheets and centrality analysis, examples.

TOTAL : 45 PERIODS

OUTCOMES:
- Upon completion of the subject, students will be able to
- understand the concept of mass customization and product family design;
- apply appropriate methods to achieve quality in product design;
- analyze product design for assembly, manufacturing, and end-of-life issues;
- understand how global environmental requirements affect product design;
- analyze product design in terms of environmental impact and suggest improvements.

TEXT BOOKS:
REFERENCE BOOKS:

PTMF8071 ADDITIVE MANUFACTURING TECHNOLOGY L T P C 3 0 0 3

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

UNIT I INTRODUCTION 10

UNIT II CAD & REVERSE ENGINEERING 10

UNIT III LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS 10

UNIT IV POWDER BASED ADDITIVE MANUFACTURING SYSTEMS 10

UNIT V MEDICAL AND BIO-ADDITIVE MANUFACTURING 5

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to compare different method and discuss the effects of the Additive Manufacturing technologies and analyse the characteristics of the different materials in Additive Manufacturing.
TEXT BOOKS:

REFERENCES:

PTMF8074 MEMS AND MICRO SYSTEM FABRICATION L T P C
3 0 0 3

OBJECTIVES:
- To understand the mechanics, scaling and design of micro system
- To learn various micro fabrication processes
- To impart knowledge on microsystems packaging and metrology of micro machined components

UNIT I INTRODUCTION 9

UNIT II MECHANICS, SCALING AND DESIGN 9

UNIT III MICRO SYSTEM FABRICATION PROCESSES 12
Introduction- Photolithography- Ion implantation- Chemical Vapor deposition-Physical Vapor deposition - clean room- Bulk micromachining :etching, isotropic and anisotropic etching, wet and dry etching- Surface micro machining :process, mechanical problems associated with surface micro machining- LIGA process :general description, materials for substrates and photo resists-SLIGA process-Abrasive jet micro machining-Laser beam micro machining-Micro Electrical Discharge Micro Machining –Ultrasonic Micro Machining- Electro chemical spark micro machining- Electron beam micro machining-Focused Ion Beam machining
UNIT IV TOOL BASED MICROMACHINING

UNIT V MICROSYSTEMS PACKAGING AND METROLOGY OF MICRO MACHINED COMPONENTS
Introduction -Microsystems Packaging-Interfaces in Microsystems Packaging-Essential Packaging Technologies-Three dimensional Packaging- Assembly of Microsystems- Signal Mapping and Transduction-Metrology of Micromachined components: SEM, optical microscopy, Scanning white light interferometry, Confocal Laser scanning microscopy, SPM, Molecular measuring machine, Micro coordinate measuring machine

OUTCOMES
- Ability to understand and apply basic science, circuit theory, Electromagnetic field theory control theory and apply them to electrical engineering problems.
- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:
UNIT III   PRODUCT ARCHITECTURE
Product development management - establishing the architecture - creation - clustering - geometric layout development - Fundamental and incidental interactions - related system level design issues - secondary systems - architecture of the chunks - creating detailed interface specifications-Portfolio Architecture.

UNIT IV   INDUSTRIAL DESIGN
Integrate process design - Managing costs - Robust design - Integrating CAE, CAD, CAM tools - Simulating product performance and manufacturing processes electronically - Need for industrial design-impact – design process- investigation of customer needs - conceptualization - refinement - management of the industrial design process.

UNIT V   DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT
Definition - Estimation of Manufacturing cost-reducing the component costs and assembly costs – Minimize system complexity - Prototype basics - Principles of prototyping - Planning for prototypes - Economic Analysis.

TOTAL: 45 PERIODS

OUTCOME
The student would have the
- Ability to launch own ideas and the ideas of others, which enables them to manage to work with innovation and development in large companies
- Ability to 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:

PTMF8651 OPERATIONS RESEARCH

OBJECTIVE:
- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I   LINEAR MODELS

UNIT II   TRANSPORTATION MODELS AND NETWORK MODELS

UNIT III   INVENTORY MODELS
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.
UNIT IV QUEUEING MODELS
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V DECISION MODELS

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems

TEXT BOOK:

REFERENCE BOOKS:

PTMF8652 PROCESS PLANNING AND COST ESTIMATION L T P C
3 0 0 3

OBJECTIVE:
• To introduce the process planning concepts to make cost estimation for various products after process planning

UNIT I INTRODUCTION TO PROCESS PLANNING 10
Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

UNIT II PROCESS PLANNING ACTIVITIES 10
Process parameters calculation for various production processes-Selection jigs and fixtures-selection of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

UNIT III INTRODUCTION TO COST ESTIMATION 8
Importance of costing and estimation –methods of costing-elements of cost estimation –Types of estimates – Estimating procedure- Estimation labor cost, material cost- allocation of over head charges- Calculation of depreciation cost
UNIT IV PRODUCTION COST ESTIMATION
Estimation of Different Types of Jobs - Estimation of Forging Shop , Estimation of Welding Shop ,Estimation of Foundry Shop

UNIT V MACHINING TIME CALCULATION
Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations ,Drilling and Boring - Machining Time Calculation for Milling , Shaping and Planning -Machining Time Calculation for Grinding

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to use the concepts of process planning and cost estimation for various products.

TEXT BOOKS:

REFERENCES:

PTMF8751 INDUSTRIAL ROBOTICS L T P C
3 0 0 3

OBJECTIVES:
- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming
- To learn Robot safety issues and economics.

UNIT I FUNDAMENTALS OF ROBOT
Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification-Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load-Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS
Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION
Requirements of a sensor, Principles and Applications of the following types of sensors-Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach,

**UNIT IV   ROBOT KINEMATICS AND ROBOT PROGRAMMING**  13
Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

**UNIT V   IMPLEMENTATION AND ROBOT ECONOMICS**  5
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

**OUTCOMES:**
- Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

**TEXT BOOKS:**

**REFERENCE BOOKS:**

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**PTMG8651   TOTAL QUALITY MANAGEMENT**  
(Common to Manufacturing, Mechanical, Printing, Production, CSE, Industrial, ECE, IT,EEE, Industrial, Leather, Automobile)

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

- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

OUTCOMES:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

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

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

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

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

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

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

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

TEXTBOOK:

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

PTGE8072 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

TOTAL : 45 PERIODS
OUTCOME:
• Engineering students will acquire the basic knowledge of human rights.

REFERENCES: