ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
R - 2014
B.E. MECHANICAL ENGINEERING (PART-TIME)
I - VII SEMESTERS CURRICULUM AND SYLLABUS

SEMESTER I

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# ELECTIVES FOR B.E. MECHANICAL ENGINEERING (PART TIME)

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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 TRANSFORM


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 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.

BOOKS FOR STUDY


REFERENCES

OBJECTIVE:
- To enrich the understanding of various types of materials and their applications in engineering and technology.

UNIT I CONDUCTING MATERIALS 9

UNIT II SEMICONDUCTING MATERIALS 9

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9
Superconductivity : properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High $T_c$ superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

UNIT V ADVANCED ENGINEERING MATERIALS 9

TOTAL : 45 PERIODS

OUTCOMES:
- The students will be able to understand the fundamentals of materials and their applications in Engineering and Technology.

TEXT BOOKS:
1. M. Arumugam, Materials Science, Anuradha publishers, 2010

REFERENCES:
4. A. Marikani, Engineering Physics, PHI Learning Pvt., India, 2009
OBJECTIVES:
- To make the students conversant with water technology
- To make the student acquire sound knowledge of electrochemistry and corrosion of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of importance in polymers and energy sources.
- To develop an understanding of the basic concepts and its applications to engineering materials such as abrasives, refractories cement and glass materials.
- To acquaint the students with the basics fuel and combustion and their properties and applications.

UNIT I  WATER TECHNOLOGY  9
Introduction to boiler feed water-requirements-formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation -softening of hard water -external treatment zeolite and demineralization - internal treatment- boiler compounds (phosphate, calgon, carbonate, colloidal) - caustic embrittlement-boiler corrosion-priming and foaming- desalination of brackish water –reverse osmosis

UNIT II  ELECTROCHEMISTRY AND CORROSION  9

UNIT III  POLYMERS AND ENERGY SOURCES  9
Polymers – Classification- Polyethylene, Polypropylene, Polyvinyl chloride, Polystyrene- Polyamide, Polyethylene Terephthalate, Polycarbonate, Acrylonitrile Butadiene styrene - Solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H2 -O2 fuel cell- applications.

UNIT IV  ENGINEERING MATERIALS  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 alumina, magnesite and silicon carbide, Portland cement- manufacture and properties - setting and hardening of cement, special cement-waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

UNIT V  FUELS AND COMBUSTION  9

TOTAL : 45 PERIODS
OUTCOMES:

- The knowledge gained on water technology, thermodynamics, electrochemistry and corrosion, polymers and energy sources and engineering materials and fuel and combustion will provide a strong platform to understand advanced concepts on these subjects at higher level learning.

TEXT BOOKS:

REFERENCE BOOKS:

PTGE6253 ENGINEERING MECHANICS

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

UNIT II EQUILIBRIUM OF RIGID BODIES

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.

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:

PTGE6252   BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

OBJECTIVES:
- To explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
- To explain the fundamentals of semiconductor and applications.
- To explain the principles of digital electronics
- To impart knowledge of communication.

UNIT I   ELECTRICAL CIRCUITS & MEASURMENTS


UNIT II   ELECTRICAL MECHANICS

UNIT III  SEMICONDUCTOR DEVICES AND APPLICATIONS

UNIT IV  DIGITAL ELECTRONICS
Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V  FUNDAMENTALS OF COMMUNICATION ENGINEERING

TOTAL : 60 PERIODS

OUTCOMES:
• ability to identify the electrical components explain the characteristics of electrical machines.
• ability to identify electronics components and use of them to design circuits.

TEXT BOOKS:

REFERENCES:

PTMA6351  TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

OBJECTIVE:
• 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
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  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
Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem –Formation of
difference equation – Solution of difference equation using Z-transform.

TOTAL: 45 PERIODS

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.

TEXT BOOK
Delhi, 2012

REFERENCES
1. Glyn James, Advanced Modern Engineering Mathematics, Prentice Hall of India, Fourth
2008.

PTME6302  MANUFACTURING TECHNOLOGY – I  L T P C
3 0 0 3

OBJECTIVES:
• To introduce 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  9
Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding
sand Properties and testing – Cores –Types and applications – Moulding machines– Types and
applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting
processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - CO₂
process – Stir casting; Defects in Sand casting
UNIT II JOINING PROCESSES 9
Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.

UNIT III METAL FORMING PROCESSES 9

UNIT IV SHEET METAL PROCESSES 9

UNIT V MANUFACTURE OF PLASTIC COMPONENTS 9

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:
OBJECTIVES:
- 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, 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  8

UNIT III  DIMENSIONAL ANALYSIS  9
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV  PUMPS  10

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 BOOK:

REFERENCES:
OBJECTIVES:

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

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

UNIT I BASIC CONCEPTS AND FIRST LAW


UNIT II SECOND LAW AND AVAILABILITY ANALYSIS


UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE


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

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:

CE6306  STRENGTH OF MATERIALS  L T P C
3 0 0 3

OBJECTIVES:
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 method 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 and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theorem.

TOTAL (L:45+T:15): 60 PERIODS
OUTCOMES:
- Upon completion of this course, the students can apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problems and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

REFERENCES:

PTME6402 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 9
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 9
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:

UNITIII SHAPER, MILLING AND GEAR CUTTING MACHINES 9

UNIT IV ABRASIVE PROCESS AND BROACHING 9
Abrasive processes: grinding wheel – specifications and selection, types of grinding process–cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines
UNIT V  CNC MACHINING  
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining

TOTAL : 45 PERIODS

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:

PTME6401  KINEMATICS OF MACHINERY  L T P C
3 0 0 3

OBJECTIVES:
• 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  9

UNIT II  KINEMATICS OF LINKAGE MECHANISMS  9
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 in brakes- Band and Block brakes.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
• 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

UNIT II HEAT TREATMENT

UNIT III FERROUS AND NON-FERROUS METALS

UNIT IV NON-METALLIC MATERIALS
Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes) - Engineering Ceramics – Properties and applications of $\text{Al}_2\text{O}_3$, SiC, Si$_3$N$_4$, PSZ and SIALON – Composites-Classifications-Metal Matrix and FRP - Applications of Composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION 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:
OBJECTIVES:

- To integrate the concepts, laws and methodologies from the first course in thermodynamics into analysis of cyclic processes
- To apply the thermodynamic concepts into various thermal applications like IC engines, Steam Turbines, Compressors and Refrigeration and Air conditioning systems

(Use of standard refrigerant property data book, Steam Tables, Mollier diagram and Psychrometric chart permitted)

UNIT I GAS POWER CYCLES 8
Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure, and air standard efficiency - Comparison of cycles.

UNIT II INTERNAL COMBUSTION ENGINES 10

UNIT III STEAM NOZZLES AND TURBINES 9
Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow, Impulse and Reaction principles, compounding, velocity diagram for simple and multi-stage turbines, speed regulations –Governors.

UNIT IV AIR COMPRESSOR 9
Classification and working principle of various types of compressors, work of compression with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency of reciprocating compressors, Multistage air compressor and inter cooling –work of multistage air compressor

UNIT V REFRIGERATION AND AIR CONDITIONING 9

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to apply the different gas power cycles and use of them in IC and R&AC applications.

TEXT BOOKS:

REFERENCES:
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
Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – 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 (Atmospheric chemistry-Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry; Mitigation procedures- Control of particulate and gaseous emission, Control of SO₂, NOₓ, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies – 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 overutilization of surface and ground 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. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; 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. Introduction to Environmental Biochemistry: Proteins –Biochemical
degradation of pollutants, Bioconversion of pollutants. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV  SOCIAL ISSUES AND THE ENVIRONMENT  7

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT  6

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:

REFERENCES:
UNIT I  STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS


UNIT II  SHAFTS AND COUPLINGS

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

UNIT III  TEMPORARY AND PERMANENT JOINTS

Threaded fasteners - 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, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contact bearings.

TOTAL: 45 PERIODS

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

TEXT BOOK:

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:


PTME6502 HEAT AND MASS TRANSFER

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.
(Use of standard HMT data book permitted)

UNIT I CONDUCTION

UNIT II CONVECTION

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS

UNIT IV RADIATION

UNIT V MASS TRANSFER

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:
REFERENCE BOOKS:

PTME6504 METROLOGY AND MEASUREMENTS L T P C
3 0 0 3

OBJECTIVES:
- To provide knowledge on various Metrological equipments available to measure the dimension of the components.
- To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.

UNIT I BASICS OF METROLOGY

UNIT II LINEAR AND ANGULAR MEASUREMENTS

UNIT III ADVANCES IN METROLOGY

UNIT IV FORM MEASUREMENT
Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

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

TEXT BOOKS:

REFERENCES:

PTME6412 THERMAL ENGINEERING LABORATORY L T P C
0 0 3 2

OBJECTIVES:
- To study the value timing-V diagram and performance of IC Engines
- To Study the characteristics of fuels/Lubricates used in IC Engines
- To study the Performance of steam generator/ turbine

LIST OF EXPERIMENTS
I.C. ENGINE LAB
2. Actual p-v diagrams of IC engines.
5. Morse Test on Multi-cylinder Petrol Engine.
6. Retardation Test on a Diesel Engine.
7. Determination of Flash Point and Fire Point of various fuels / lubricants.

STEAM LAB
1. Study on Steam Generators and Turbines.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to conduct experiment on IC engine to study the characteristic and performance of IC design/ steam turbines.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>I.C Engine – 2 stroke and 4 stroke model</td>
<td>1 set</td>
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<tr>
<td>2</td>
<td>Apparatus for Flash and Fire Point</td>
<td>1 No.</td>
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<tr>
<td>3</td>
<td>4-stroke Diesel Engine with mechanical loading</td>
<td>1 No.</td>
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<tr>
<td>4</td>
<td>4-stroke Diesel Engine with hydraulic loading</td>
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<tr>
<td>5</td>
<td>4-stroke Diesel Engine with electrical loading</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Multi-cylinder Petrol Engine</td>
<td>1 No.</td>
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</tbody>
</table>
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 (Use of P S G Design Data Book permitted)

UNIT I DESIGN OF FLEXIBLE ELEMENTS
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.

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 III BEVEL, WORM AND CROSS HELICAL GEARS

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

UNIT V CAMS, CLUTCHES AND BRAKES
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-Electromagnetic clutches. Band and Block brakes - external shoe brakes – Internal expanding shoe brake.

OUTCOMES:
• Upon completion of this course, the students can able to successfully design transmission components used in Engine and machines
TEXT BOOKS:

REFERENCES:

PTME6602 AUTOMOBILE ENGINEERING

OBJECTIVES:
- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I VEHICLE STRUCTURE AND ENGINES
Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines –components-functions and materials, variable valve timing (VVT).

UNIT II ENGINE AUXILIARY SYSTEMS
Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT III TRANSMISSION SYSTEMS
Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints ,Differential and rear axle, Hotchkiss Drive and Torque Tube Drive.
UNIT IV  STEERING, BRAKES AND SUSPENSION SYSTEMS  9
Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control.

UNIT V  ALTERNATIVE ENERGY SOURCES  9
Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

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 BOOKS:

REFERENCES:

PTME6702  MECHATRONICS  L T P C
3 0 0 3

OBJECTIVES:
• To impart knowledge about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation.

UNIT I  INTRODUCTION  12

UNIT II  8085 MICROPROCESSOR AND 8051 MICROCONTROLLER  10
Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontroller – Block diagram,

UNIT III  PROGRAMMABLE PERIPHERAL INTERFACE  8
UNIT IV  PROGRAMMABLE LOGIC CONTROLLER  7
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  8

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:

PTMG6851  PRINCIPLES OF MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
• To enable the students to study the evolution of Management, to study the functions and principles of management and 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

UNIT IV DIRECTING

UNIT V CONTROLLING
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.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

REFERENCES:

PTME6604 GAS DYNAMICS AND JET PROPULSION L T P C
3 0 0 3

OBJECTIVES:
- To understand the basic difference between incompressible and compressible flow.
- To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and Rocket Propulsion.
(Use of Standard Gas Tables permitted)

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS
Energy and momentum equations of compressible fluid flows – Stagnation states, Mach waves and Mach cone – Effect of Mach number on compressibility – Isentropic flow through variable ducts – Nozzle and Diffusers
UNIT II FLOW THROUGH DUCTS
Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties.

UNIT III NORMAL AND OBLIQUE SHOCKS
Governing equations – Variation of flow parameters across the normal and oblique shocks – Prandtl – Meyer relations – Applications.

UNIT IV JET PROPULSION
Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operating principle, cycle analysis and use of stagnation state 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:

PTME6701 POWER PLANT ENGINEERING

OBJECTIVES:
- 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:
UNIT I INTRODUCTION

UNIT II PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

UNIT III CELLULAR MANUFACTURING

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

UNIT V INDUSTRIAL ROBOTICS

OUTCOMES:
- Upon completion of this course, the student can able to understand the use of computers in process planning and use of FMS and Robotics in CIM

TEXT BOOK:

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.

LIST OF EXPERIMENTS

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
* Students can also be trained in manual drawing of some of the above components


(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.

TOTAL: 45 PERIODS
OUTCOMES
- Ability to develop 2D and 3D models using modeling softwares.
- Ability to discuss the modern control systems used in CAM
- Ability to operate part programming and perform manufacturing.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARDWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Computer Server</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Computer nodes or systems (High end CPU with atleast 1 GB main memory) networked to the server</td>
<td>30</td>
</tr>
<tr>
<td>3.</td>
<td>A3 size plotter</td>
<td>1</td>
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<tr>
<td>4.</td>
<td>Laser Printer</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>CNC Lathe</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>CNC milling machine</td>
<td>1</td>
</tr>
<tr>
<td>SOFTWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>CAD/CAM software (Pro-E / Unigraphics / CATIA / Soidworks)</td>
<td>15 licenses</td>
</tr>
<tr>
<td>8.</td>
<td>CAM Software for machining centre and turning centre(CNC Programming and tool path simulation for FANUC / Sinumeric and Heidenhain controller)</td>
<td>15 licenses</td>
</tr>
<tr>
<td>9.</td>
<td>Licensed operating system</td>
<td>Adequate</td>
</tr>
<tr>
<td>10.</td>
<td>Support for CAPP</td>
<td>Adequate</td>
</tr>
</tbody>
</table>

PTMG6863  ENGINEERING ECONOMICS

OBJECTIVES:
- To enable students to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making.

UNIT I  INTRODUCTION TO ECONOMICS

UNIT II  VALUE ENGINEERING
Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor - Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.
UNIT III  CASH FLOW  9
Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV  REPLACEMENT AND MAINTENANCE ANALYSIS  9
Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V  DEPRECIATION  9

TOTAL: 45 PERIODS

OUTCOMES:
• Upon successful completion of this course, students will acquire the skills to apply the basics of economics and cost analysis to engineering and take economically sound decisions.

TEXT BOOKS:

REFERENCES:

PTME6811  PROJECT WORK  L T P C  0 0 9 6

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.

The students in a group of 3 to 4 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 of the supervisor. 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 based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

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 solution by formulating proper methodology.

PTMG6072 MARKETING MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
• To enable students to deal with newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation. The course will enable a student to take up marketing as a professional career.

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 MARKETING 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

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:
PTME6001   QUALITY CONTROL AND RELIABILITY ENGINEERING   L T P C

3 0 0 3

OBJECTIVES:

- To introduce the concept of SQC
- To understand process control and acceptance sampling procedure and their application.
- To learn the concept of reliability.

UNIT I      INTRODUCTION AND PROCESS CONTROL FOR VARIABLES

Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality control: Quality cost-Variation in process causes of variation -Theory of control chart- uses of control chart – Control chart for variables – X chart, R chart and chart - process capability – process capability studies and simple problems. Six sigma concepts

UNIT II      PROCESS CONTROL FOR ATTRIBUTES

Control chart for attributes –control chart for non conformings – p chart and np chart – control chart for nonconformities– C and U charts, State of control and process out of control identification in charts, pattern study.

UNIT III     ACCEPTANCE SAMPLING


UNIT IV      LIFE TESTING – RELIABILITY


UNIT V       QUALITY AND RELIABILITY


TOTAL: 45 PERIODS

Note: Use of approved statistical table permitted in the examination.

OUTCOMES:

- Upon successful completion of this course, the students can able to apply the concept of SQC in process control for reliable component production

TEXT BOOKS:

REFERENCES:

PTME6002 REFRIGERATION AND AIR CONDITIONING  L  T  P  C
3 0 0 3

OBJECTIVES:
- To understand the underlying principles of operations 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 REFRIGERATION 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
Properties of moist Air-Gibbs Dalton law, Specific humidity, Dew point temperature, Degree of saturation, Relative humidity, Enthalpy, Humid specific heat, Wet bulb temperature Thermodynamic wet bulb temperature, Psychrometric chart; Psychrometric of air-conditioning processes, mixing of air streams.

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:

PTME6003 RENEWABLE SOURCES OF ENERGY

OBJECTIVES:
- 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:

PTME6004 UNCONVENTIONAL MACHINING PROCESESSES L T P C
3 0 0 3

OBJECTIVES:
• To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

UNIT I INTRODUCTION 6

UNIT II MECHANICAL ENERGY BASED PROCESSES 9

UNIT III ELECTRICAL ENERGY BASED PROCESSES 9

UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 11

UNIT V THERMAL ENERGY BASED PROCESSES 10
Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

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:

PTGE6083 DISASTER MANAGEMENT

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 Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

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

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

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

TOTAL: 45 PERIODS

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

TEXTBOOK:

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

PTME6005 PROCESS PLANNING AND COST ESTIMATION L T P C
3 0 0 3

OBJECTIVES:
- To introduce the process planning concepts to make cost estimation for various products after process planning

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

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

UNIT III INTRODUCTION TO COST ESTIMATION

UNIT IV PRODUCTION COST ESTIMATION 8
Estimation of Different Types of Jobs – Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop

UNIT V MACHINING TIME CALCULATION 9
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:

PTME6006 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS L T P C 3 0 0 3

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: 8

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 fixtureing systems – Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES 10

UNIT IV BENDING AND DRAWING DIES


UNIT V OTHER FORMING TECHNIQUES

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 BOOKS:

REFERENCES:
5. ASTME Fundamentals of Tool Design Prentice Hall of India.

PTME6007 COMPOSITE MATERIALS AND MECHANICS

OBJECTIVES:
- To understand the fundamentals of composite material strength and its mechanical behavior
- Understanding the analysis of fiber reinforced Laminate design for different 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, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING

Definition –Need – General Characteristics, Applications. Fibers – Glass, Carbon, Ceramic and Aramid fibers. Matrices – Polymer, Graphite, Ceramic and Metal Matrices – Characteristics of fibers

UNIT II FLAT PLATE LAMINATE CONSTITUTE EQUATIONS
10

UNIT III LAMINA STRENGTH ANALYSIS
5

UNIT IV THERMAL ANALYSIS
8

UNIT V ANALYSIS OF LAMINATED FLAT PLATES
10

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:
OBJECTIVES

- To understand the basics of welding and to know about the various types of welding processes

UNIT I  GAS AND ARC WELDING PROCESSES:  9
Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electroslag welding processes - advantages, limitations and applications.

UNIT II  RESISTANCE WELDING PROCESSES:  9
Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes - advantages, limitations and applications.

UNIT III  SOLID STATE WELDING PROCESSES:  9
Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes - advantages, limitations and applications.

UNIT IV  OTHER WELDING PROCESSES:  9

UNIT V  DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS  9
Various weld joint designs – Weldability of Aluminium, Copper, and Stainless steels. Destructive and non destructive testing of weldments.

TOTAL : 45 HOURS

OUTCOMES:

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

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
At the end of the course, the student is expected to
• understand and analyse the energy data of industries
• carryout energy accounting and balancing
• conduct energy audit and suggest methodologies for energy savings and
• utilise the available resources in optimal ways

UNIT I INTRODUCTION

UNIT II ELECTRICAL SYSTEMS

UNIT III THERMAL SYSTEMS

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

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

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

TEXT BOOKS:

REFERENCES:
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
Classification – Liquid based system – Stereolithography Apparatus (SLA) - Principle, process, advantages and applications - Solid based system – Fused Deposition Modeling - Principle, process, advantages and applications, Laminated Object Manufacturing

UNIT IV  POWDER BASED ADDITIVE MANUFACTURING SYSTEMS  10

UNIT V  MEDICAL AND BIO-ADDITIVE MANUFACTURING  5
Customized implants and prosthesis: Design and production. Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE) – Case studies

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:

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:
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


UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING

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

RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:


REFERENCES:

OBJECTIVES

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

UNIT I INTRODUCTION

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

UNIT II GENERAL METHODS OF PREPARATION

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

UNIT III NANOMATERIALS

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, 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 dots-preparation, 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

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS


REFERENCES

OBJECTIVES:

- To understand the various systems, principles, operations and applications of different types of turbo machinery components.

UNIT I PRINCIPLES
Energy transfer between fluid and rotor-classification of fluid machinery, dimensionless parameters-specific speed-applications-stage velocity triangles-work and efficiency.

UNIT II CENTRIFUGAL FANS AND BLOWERS
Types- stage and design parameters-flow analysis in impeller blades-volute and diffusers, losses, characteristic curves and selection, fan drives and fan noise.

UNIT III CENTRIFUGAL COMPRESSOR
Construction details, impeller flow losses, slip factor, diffuser analysis, losses and performance curves.

UNIT IV AXIAL FLOW COMPRESSOR
Stage velocity diagrams, enthalpy-entropy diagrams, stage losses and efficiency, work done simple stage design problems and performance characteristics.

UNIT V AXIAL AND RADIAL FLOW TURBINES
Stage velocity diagrams, reaction stages, losses and coefficients, blade design principles, testing and performance characteristics.

OUTCOMES:

- Upon completion of this course, the students can able to explain the various systems, principles and applications and different types of turbo machinery components.

TEXT BOOKS:

REFERENCES:

OBJECTIVES:

- To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.
To illustrate some of the simple instruments used for condition monitoring in industry.

UNIT I PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING

UNIT II MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE
Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

UNIT III CONDITION MONITORING
Condition Monitoring – Cost comparison with and without CM – On-load testing and offload testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis

UNIT IV REPAIR METHODS FOR BASIC MACHINE ELEMENTS
Repair methods for beds, slide ways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

UNIT V REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT
Repair methods for Material handling equipment - Equipment records –Job order systems -Use of computers in maintenance.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the programme, the students can able to implement the maintenance function and different practices in industries for the successful management of maintenance activities
- To identify the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.

TEXT BOOKS:

REFERENCES:
OBJECTIVES

- To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of Micro fabrication techniques.
- To introduce various sensors and actuators
- To introduce different materials used for MEMS
- To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT I INTRODUCTION


UNIT II SENSORS AND ACTUATORS-I


UNIT III SENSORS AND ACTUATORS-II


UNIT IV MICROMACHINING


UNIT V POLYMER AND OPTICAL MEMS

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL : 45 PERIODS

OUTCOMES

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

TEXT BOOKS:


REFERENCES:
PTME6013  
DESIGN OF PRESSURE VESSELS AND PIPING  
L T P C  
3 0 0 3

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 BOOKS:


REFERENCES:

ME6016

ADVANCED I.C ENGINES

L T P C
3 0 0 3

OBJECTIVES:
- 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

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

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:
OBJECTIVES:

- To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

UNIT I INTRODUCTION
Objectives and benefits of planning and control-Functions of production control-Types of production-job- batch and continuous-Product development and design-Marketing aspect - Functional aspects-Operational aspect-Durability and dependability aspect aesthetic aspect. Profit consideration-Standardization, Simplification & specialization- Break even analysis-Economics of a new design.

UNIT II WORK STUDY
Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study – work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT III PRODUCT PLANNING AND PROCESS PLANNING
Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning-Steps in process planning-Quantity determination in batch production-Machine capacity, balancing-Analysis of process capabilities in a multi product system.

UNIT IV PRODUCTION SCHEDULING

UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC
Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system -Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to prepare production planning and control activities such as work study, product planning, production scheduling, Inventory Control.
- They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

TEXT BOOKS:
REFERENCES:

PTMG6071 ENTERPRENEURSHIP DEVELOPMENT L T P C

3 0 0 3

OBJECTIVES:
• To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I ENTERPRENEURSHIP

UNIT II MOTIVATION
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, 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:

PTME6014 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 8

UNIT II FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION 9

UNIT III FINITE VOLUME METHOD FOR CONVECTION DIFFUSION 10
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

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:
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

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

TEXT BOOK:

REFERENCES:

PTME6017 - DESIGN OF HEAT EXCHANGERS

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 9
Types- Merits and Demerits- Design of compact heat exchangers, plate heat exchangers, performance influencing parameters, limitations.

UNIT V CONDENSERS AND COOLING TOWERS 9
Design of surface and evaporative condensers – cooling tower – performance characteristics.

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:

PTME6019 NON DESTRUCTIVE TESTING AND MATERIALS 3 0 0 3
OBJECTIVES:
• 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.Eddy Current Testing-Generation of eddy currents, Properties of eddy
currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.

UNIT IV  ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE)  10

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

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: