

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD
FACULTY OF ENGINEERING AND TECHNOLOGY
Second Year Mechanical Engineering
Semester-I
BSH201-Engineering Mathematics-III
SE (ALL)

Teaching Scheme

Theory: 4 hours/week

Tutorial: 1 hours/week/Batch of 30
Students

Examination Scheme

Class Test: 20 Marks

Theory: 80 Marks

Duration of theory examination: 3 Hrs

Objectives:

- To develop Logical understanding of the subject
- To develop mathematical skill so that students are able to apply mathematical methods & Principle's in solving problems from Engineering fields
- To produce graduates with mathematical knowledge & computational skill.

Unit 1: Linear Differential Equations:

(6 Hrs)

Linear Differential Equations with constant coefficients General method, shortcut methods to find particular integral, Homogenous Linear differential equations (Cauchy's & Legendre's form), method of variation of parameters.

Unit 2: Application of LDE:

(6 Hrs)

To Electrical circuits & to Mechanical system (Analogous study of two systems), To Civil Engineering, Free oscillations / vibrations, Forced oscillation /vibrations, Damped Free oscillations / vibrations, Damped Forced oscillations / vibrations.

Unit 3: Statistics & Probability:

(8 Hrs)

Measures of Dispersion, Moments, coefficient of skewness and Kurtosis, Probability distribution for random variables, Binomial, Poisson and Normal distributions, Curve fitting: Principle of least squares, Fitting of linear curve, parabola, exponential curve.

Unit4: Vector Differentiation:

(6 Hrs)

Differentiation of vectors, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function. Irrotational and solenoidal vector field.

Unit 5: Vector Calculus (Integral calculus):

(6 Hrs)

The line integral, Surface integral, volume integral, Gauss Divergence theorem, Stoke's theorem, Green's theorem.

Unit 6: Numerical Methods:

(8 Hrs)

Solution of transcendental equations by Newton Raphson method, Gauss Seidel method to solve simultaneous linear equations, Lagranges Interpolation formula for unequal intervals, Numerical Differentiation: - Newton's forward and Newton's Backward difference formulae, Solution of ordinary differential equation by Euler's modified method, and Runge-Kutta IVth order method.

Note: All Theorems are without proofs

Section A: Unit 1, 2, 3

Section B: Unit 4, 5, 6

Reference Books:

1. **A Text Book of Engineering Mathematics (Volume-I, II,III)** by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. **Higher Engineering Mathematics** by B. S. Grewal, Khanna Publications, New Delhi.
3. **Advanced Engineering Mathematics** by H.K. Das, S. Chand & Company.
4. **Higher Engineering Mathematics** by B.V. Ramana (Tata McGraw-Hill).
5. **Advanced Engineering Mathematics** by Erwin Kreyszig, Wiley Eastern Ltd.
6. **Engineering Mathematics A Tutorial Approach** by Ravish R Singh, Mukul Bhat ,Mc Graw Hill

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

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MED202-THERMODYNAMICS-I

Teaching Scheme

Theory: 4 hours/week

Examination Scheme

Class Test: 20 Marks

Theory: 80 Marks

Duration of theory examination: 3 Hrs

Unit1: FIRST LAW OR THERMODYNAMICS APPLIED TO FLOW PROCESS (7 Hrs)

Concept of Flow work, control volume and steady flow process, assumptions, Steady flow energy equation on time and mass basis, difference between steady flow and non flow process, study and applications of SFEE to some steady flow devices viz nozzles, diffusers, throttling valve, turbine, compressors, I.C. Engine, Heat Exchangers etc. Limitations of First law of Thermodynamics, Concept of PMM-I (Descriptive and Numerical Treatment)

Unit2: SECOND LAW OF THERMODYNAMICS (7 Hrs)

Various statements, Heat engine, Refrigerator and Heat pump. COP of Heat pump and Refrigerator, Reversed heat engine, Equivalence of Kelvin-Planck and Clausius statements, PMM-II, Carnot theorem, Thermodynamic temperature scale. (Descriptive and Numerical Treatment)

Unit3: ENTROPY (6 Hrs)

Concept of Entropy, Clausius Theorem, Clausius inequality, temperature-entropy diagrams, Entropy changes for an ideal gas during reversible processes, entropy of isolated system in real processes, Principle of increase of Entropy, total entropy changes, Applications of Entropy principle, Available and unavailable energy.(Descriptive treatment).

Unit4: POWER CYCLE (7 hrs)

Concept of air standard cycle, assumptions, Carnot, Otto, Diesel and dual air standard cycles with representation on P-V & T-S planes, mathematical analysis for efficiency, mean effective pressure and power output, comparison. Brayton cycles, Atkinson cycle, Ericsson Cycle. (Descriptive and Numerical Treatment)

Unit5: PROPERTIES OF STEAM OR PURE SUBSTANCE (7 Hrs)

Pure substance, phase, phase transformation of water at constant pressure, p-v phase diagram, critical point, Triple point, Different stages, Entropy of steam, steam tables, processes of steam, Enthalpy-Entropy diagram, steady flow process and determination of dryness fraction of steam (Descriptive and Numerical Treatment)

Unit6: FUELS AND COMBUSTION: (6 Hrs)

Definition of Fuel, calorific values, Definition of combustion, mass fraction, mol fraction, combustion equation, stoichiometric air, excess air, and deficient air, analysis of product of combustion, gravimetric and volumetric analysis and their conversion, determination of actual and excess air quantity from combustion analysis and stoichiometric and actual air to fuel ratios. Orsat apparatus, method to determine flue gas analysis – CO, CO₂, CO₂. (Descriptive and Numerical Treatment)

RECOMMENDED BOOKS

1. Nag P.K., "Engineering Thermodynamics", TMH Publishing Co. New Delhi
2. Rajput R.K., "A Text Book of Engineering Thermodynamics", Laxmi Publication, New Delhi
3. Ballaney P.L., "Thermal Engineering",
4. Domkundwar & Domkundwar, "Introduction to Thermal Power Engineering", Dhanpatrai and Sons, New Delhi
5. Rao, "Engineering Thermodynamics",
6. Radhakrishnan, "Fundamentals of Engineering Thermodynamics", PHI

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MED203-MACHINE DRAWING

Teaching Scheme

Lectures: 4 Hrs/week

Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

Duration of Theory Examination: 4 Hrs.

OBJECTIVES:

- Enhancing imagination, visualization, and interpretation skills
- To make students to draw correct production drawing.
- To understand the standard practice followed in industries for drawings.
- To understand the methodology of communicating all the required information that will allow a manufacturer to produce parts.

COURSE CONTENT: (First Angle projection to be adopted)**Unit 1: Engineering curves****(06Hrs)**

Construction of ellipse, parabola, hyperbola, cycloid, epicycloids, hypocycloids and Involutés.
Normal and Tangents to curves.

Unit 2: Isometric and Auxiliary views :**(08 Hrs)**

Isometric view of complex machine parts. Auxiliary view of inclined objects and surfaces of Complex objects and machine parts.

Unit 3: Intersection of Solids :**(06 Hrs)**

Intersection of solids, prism to prism, cylinder to cylinder, cylinder to cylinder, cone to cylinder, cone to prism, curves on forged parts.

Unit 4: Drawing standards:**(08 Hrs)**

Conventional Representation -: Conventions used to represent materials in section and machine elements in machine drawings.

Dimensioning -: General Principles of Dimensioning, methods of Dimensioning, Arrangement of Dimensions, standard abbreviations used in dimensioning.

Limits, Fits and Tolerances:- Limit system, Types and representation of Tolerances, Fits, GD&T
Welding symbols : Weld joints and symbols, Conventional signs, position and dimensioning of weld symbol in drawing.

Machining Symbols : surface roughness, indication of surface roughness on production drawing, indication of machining allowances.

Unit 5: Assembly Drawing: . (06Hrs)

Drawings assembled views for the part drawings of following assemblies. Importance of BOM, Preparation of BOM

- a) Engine parts – stuffing box, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly etc.
- b) Machine parts - Screws jacks, Machine Vices , Plummer block, Tool Post, Tailstock, etc.
- c) Valves : Steam stop valve, spring loaded safety valve, feed check valve and air cock.

Unit 6: Detailed Part Drawings : (06Hrs)

Drawing of parts details given assembled views - screw jack - connecting rod ends - cross heads – Jigs and fixtures, press tools, gauges, etc.

PATTERN OF QUESTION PAPER

(Note: The theory paper of MD will include the detailed syllabus covered in MD Theory)

SECTION A (All Questions compulsory) – Questions to be based on unit 1 to unit 3.

1. Question no 1 for 16 Marks
2. Question no. 2 OR Question no 2 for 12 marks
3. Question no 3 OR Question no 3 for 12 marks

SECTION B (All Questions compulsory) – Questions to be based on unit 4 to unit 6)

1. Question no 4 for 15 Marks (Based on unit 4)
2. Question no. 5 OR Question no 5 for 25 marks (Based on unit 5 & 6)

TEXT BOOKS:

1. Elementary Engineering Drawing N D Bhatt Charotar Publication House
2. Machine Drawing-By N.D. Bhatt.
3. Machine Drawing by Sidheswar, N., Kanniah, P. and Sastry, V.V.S., Tata McGraw Hill.
4. Machine Drawing by K.I. Narayana, P. Kannaiah, K.Venkata Reddy, New Edge publications
5. Machine Drawing by Ajeet Singh (Tata McGraw Hill)
6. Machine Drawing by Sonaversity publications.
7. Machine Drawing – P.S.Gill.
8. Machine Drawing – Luzzader

MED204-STRENGTH OF MATERIALS

Teaching Scheme
Lectures : 4 Hrs/Week

Examination Scheme
Theory Exam: 80 Marks
Class Test : 20 Marks
Duration of Theory Exam: 3 Hrs

SECTION – A

Unit 1 : (9 hrs)

Simple Stresses and Strains : Stress and strain, (tensile, compressive & shear), Hooke's Law, Modulus of elasticity, Modulus of rigidity, Stress-strain diagram for ductile and brittle material, Working stress, Factor of safety, Principle of superposition, Stresses in composite bars. Thermal stresses and strains in simple and composite members. Linear and Lateral strains, Poisson's ratio, Volumetric strain, Bulk modulus, Interrelationship between elastic constants.

Unit 2 : (4 hrs)

Shear Force and Bending Moment Diagrams for Beams : Shear force and bending moment in determinate beams due to concentrated loads, U.D.L., U.V.L. and couples, Relation between S.F. and B.M., Determination of position of point of contraflexure and maximum bending moment.
Construction of loading diagram & BMD from SFD, Construction of loading diagram & SFD from BMD.

Unit 3 : (4 + 3 = 7 hrs)

Bending Stresses in Beams : Theory of simple bending, Assumptions, Flexural formula, Moment of resistance and Section modulus. Determination of bending stresses and bending stress distribution diagram for the beams with commonly used sections like rectangular, square, circular, symmetrical and unsymmetrical I, T-sections etc. Flitched beams.

Shear Stresses in Beams : Shear stress in beams subjected to bending, Shear stress distribution formula, Maximum and average shear stress, Determination of shear stresses and shear stress distribution diagram for beams with commonly used sections like circular, symmetrical and unsymmetrical I, T-sections etc.

SECTION – B

Unit 4 : (3 + 4 = 7 hrs)

Direct and Bending Stresses in Columns : Bending stresses in column due to eccentric loading, (eccentricity about one axis and two axis), Condition for no tension, Core or Kernel of sections.

Torsion of Circular Shafts : Theory of torsion of circular shafts, Assumptions, Torsion formula, Determination of torsional shear stress and angular twist for solid, hollow and composite circular shafts-shafts in series and parallel.

Unit 5 : (4 + 3 + 2 = 9 hrs)

Principal Stresses and Strains : Principal planes and principal stresses, Maximum shear stress, Determination of positions of principal planes, planes of maximum shear (2 D cases only),
Graphical method : Mohr's circle of stresses.

Thin Cylinders and Spheres : Circumferential (Hoop) stress and longitudinal stress, Change in dimensions of thin cylinders and spheres due to internal fluid pressure.

Strain Energy : Strain energy, Proof resilience, Modulus of resilience, Strain energy in a uniform bar due to gradual load, suddenly applied load and impact load. Strain energy due to shear stress.

Unit 6 :**(4 hrs)**

Slope and deflection of beams : Relation between bending moment and slope, determination of slope and deflection of statically determinate beams (simply supported, cantilever and overhanging beams) subjected to point loads, uniformly distributed loads, moments by double integration method, McCauley's method.

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Text Books :

1. Ramamrutham S., Strength of materials, Dhanpat Rai & Co. (P) Ltd., Delhi
2. Basu A. R., Strength of materials, Dhanpat Rai & Co. (P) Ltd., Delhi
3. Khurmi R. S. & Gupta J. K., Strength of materials, S. Chand & Co.Ltd.,New Delhi
4. Rajput R. K., Strength of materials, S. Chand & Co.Ltd., New Delhi
5. Bansal R.K. , Strength of materials, Laxmi publications (P) Ltd., New Delhi

Reference Books:

1. Timoshenko & Young, Strength of materials, CSB Publishers
2. Gere & Timoshenko, Mechanics of materials, CSB Publishers
3. Singer & Pytel, Strength of materials, Harper & Row publications
- 4) E.P. Popov - Introduction to Mechanics of Solids, Prentice Hall Publication.
- 5) Beer and Johnston - Strength of materials, CBS Publication.
- 6) S.S. Rattan Strength of material – Tata McGraw Hill Publication Co. Ltd.

MED205-PRODUCTION PROCESSES-I

Teaching Scheme

Lectures: 4 Hrs

Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

Duration of Theory paper: 3Hrs.

OBJECTIVE

- Introduction of primary production processes.
- To introduce the student to manufacturing methods in Mechanical Engineering.

PURPOSE

- This subject will give a broad classification and information of the primary shaping and joining processes that are employed in manufacturing a product.
- Convey all the required information that will be helpful in design and development for manufacturer for production.

COURSE CONTENT

INTRODUCTION: Classification of manufacturing processes, scope of study, industrial safety concepts.
(no question be asked on this topic in the exam) (1)

Unit1: FOUNDRY: (8 Hrs)

Pattern making : patterns and core boxes, Pattern materials, Types of patterns, core boxes, pattern allowances.

Moulding sand: Constituents , types of moulding sands, properties, conditioning, testing of moulding sand.

Sand mould: Moulding boxes, sand mould, gating system, types of gate, Risers, Metal flow. Classification of sand moulds, steps involved in making a general sand mould., core making.

Melting Furnaces: Types of Melting furnaces: pit furnace, open hearth furnace, gas fired furnace, cupola, electric furnaces – Direct Arc, Indirect Arc and coreless induction furnace. Molten metal handling.

Casting methods : sand mould and permanent mould casting, slush casting, shell molding, Investment or lost wax casting, Die casting methods, equipments and pressure and vacuum casting methods. Centrifugal casting, continuous casting, .

Cleaning and inspection of castings. Defects in castings. Inspection methods.

Unit2: MECHANICAL WORKING OF METALS: (6 Hrs)

Classification of cold and hot working methods. Advantages and effects of these processes.

Different types of hot working processes, Rolling, types of rolling mills, spinning, forging, extrusion, piercing, manufacture of seamless pipe and tubing.

Machine forging: Types of power hammers and forging machines and presses. Closed and open die forging. Inspection methods and Defects.

Cold working processes: cold rolling, roll forming, pipe and tube production, spinning, embossing, wire and tube drawing, extrusion, coining, cold forging, rotary swaging.

Unit3: SHEET METAL WORKING: (5 Hrs)

Sheet metals used in manufacturing. Operations: shearing, slitting, nibbling, blanking, punching, piercing, hand forming, bending, flanging, ribbing, hemming, lancing, curling, edge formation, Types of sheet metal joints.

Press working, types of presses and machines used in sheet metal. Manual, mechanical, hydraulic power presses. Press brake, roll bending.(Block diagram, working principles and applications). Introduction to Press tools and die.

Unit4: PROCESSING OF PLASTICS: (5 Hrs)

Types of plastics, polymers, additives. Classifications of plastics forming and fabrication processes. Study

of casting, Compression moulding, Transfer moulding, Injection moulding, Extrusion moulding, calendaring, Rotational moulding, Blow moulding, laminating plastics (high and low pressure). Plastic moulding dies.

Unit5: JOINING PROCESSES:

(10 Hrs)

Classification of joining processes. Concept of welding. Weldability.

Gas welding methods, gas cutting, equipment, working principle, and its application.

Arc welding: Electric arc Welding equipments, AC and DC power sources, wire feed mechanism and its control systems, filler metals, fluxes, safety equipments.

Classification of arc welding, study of shielded metal arc, submerged arc, MIG, TIG, carbon arc, electroslog, elecctrogas and plasma arc welding. (working principle advantages, disadvantages, specific equipment and its application)

Resistance welding: - Types, spot, seam, projection etc., process applications and limitations.

Special welding processes: Friction Welding, Thermit Welding. Ultrasonic, Electron Beam, Laser welding, under water welding (Introductory treatment is expected for the special welding processes)

Welding defects, Testing and Inspection of welds: Various welding defects, weld testing methods.

Unit6: SURFACE TREATMENT:

(5 Hrs)

Purpose of surface treatment. Cleaning methods: mechanical and chemical cleaning, finishing methods and surface coatings, types of coatings ,powder coating. Metallic coating: electroplating, galvanizing, metal spraying, anodizing , polishing.

BOOKS RECOMMENDED:

TEXT BOOKS:

- a) Workshop Technology vol -1, B S Raghuwanshi, Dhanpat Rai and Sons 2001
- b) Workshop Technology Vol-I, Hajra Chaudhary, Dhanpat Rai and Sons 2001
- c) Manufacturing Process II H.S. Bawa, Tata Mc Graw hill Publishing Co. Ltd. 2004
- d) Production Technology, Jain R.K., Khanna Publications .
- e) Introduction to basic manufacturing processes and workshop Technology, by Rajender Singh, New Age International ltd,publication. 2010

REFERENCES BOOKS:

- a) Processes and Materials of Manufacture By R.A. LindBerg PH Pub 2001
- b) Workshop Technology, O.P. Khanna Dhanpat Rai and Sons 2001

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Theory examination: 3 Hrs.

Theory examination: 80

Objectives:

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Unit 1: Function of complex variable (Differential calculus): (7 Hrs)

Introduction, Analytic function Cauchy Riemann equations in Cartesian and Polar form, Harmonic function, Taylor's series & Laurent's series (without proof), Conformal mapping (geometrical representation of function of complex variable), bilinear transformation.

Unit 2: Function of complex variable: (Integral calculus): (7 Hrs)

Line integral, contour integral: Cauchy's integral theorem, Cauchy's integral formula (without proof), Residues, Cauchy's residue theorem, Integration along unit circle and along upper half of semi circle.

Unit 3: Application of PDE: (6 Hrs)

solutions of partial differential equation by method of separations of variables, Application to vibration of string, one dimensional heat flow equations, Laplace equation in two dimensions with boundary conditions.

Unit 4: Laplace transform: (6 Hrs)

Definition, Transforms of elementary functions, Properties & theorems of Laplace transforms(without proof), transforms of periodic function, Heaviside unit step function, displaced unit step function, Dirac delta function, error function, Bessel' function of zero order.

Unit 5: Inverse Laplace transform and its applications : (6 Hrs)

Inverse Laplace transforms by using properties, ii) partial fractions, iii) Convolution theorem, Applications to solve linear differential equations with constant coefficients (Initial value problems), Simultaneous Linear differential equations.

Unit 6: Fourier Transform and its applications: (8 Hrs)

Fourier integral, Fourier sine and cosine integral, complex form of Fourier integral, Fourier transforms Fourier sine and cosine transform and inverse Fourier transforms Finite Fourier sine and cosine transforms. Solution of one dimensional heat equation by using Fourier transform.

Note: All Theorems are without proofs

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Section B: Unit 4, 5, 6

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MED253-THEORY OF MACHINES-I

Teaching Scheme

Lectures: 4 Hrs

Examination Scheme

Theory: 80 Marks

Class Test :20 Marks

Duration of Theory Examination :4 Hrs.

OBJECTIVE

Student will be able to:

1. Know different machine elements and mechanisms.
2. Understand Kinematics and Dynamics of different machines and mechanisms.
3. Select Suitable Drives and Mechanisms for a particular application.
4. Appreciate concept of balancing.
5. Develop ability to come up with innovative ideas.

OUTCOMES:

1. Students shall be able to define and identify links, pairs, and mechanisms, etc.
2. Students shall be capable of selecting, suitable mechanism for required motion transformation.
3. Students shall be capable to determine velocity and acceleration using graphical and numerical methods.
4. Students shall be capable to determine inertia force and inertia torque using graphical and numerical methods.
5. Students shall be capable of identify the types and application of brakes and dynamometers.

6. Students shall be capable to solve problems on brakes and dynamometers.
7. Students shall be capable to identify and select the type of cam follower for required application
8. Students shall be capable to draw cam profile for giving required motion to the follower
9. Students shall be capable to solve problems on balancing the rotating and reciprocating masses in engines.

Unit1: Introduction and Definitions: (4 Hrs)

Scope of the subject, Statics and kinetics, kinematics and dynamics. Definitions: Resistant body, Kinematic link or element; Kinematic pair; Classification of Kinematic Pairs and their types; Kinematic chain; degree of freedom; relation between no. of links & joints. Basic structure, mechanisms, types of mechanisms, inversion of a mechanism Kinematic chains: single slider crank chain, double slider crank chain and four bar chains.

Unit2: Velocity Acceleration Analysis : (8 Hrs)

Velocity analysis of mechanisms using Relative velocity method, Instantaneous centre method (using Kennedy's theorem), and relative velocity method for determination of linear and angular velocities and their directions. Acceleration analysis of mechanisms using relative acceleration method. Problems involving Coriolis component of acceleration. Determination of linear and angular acceleration for mechanisms having maximum four links. Ritterhaus construction method and Klein's construction method for simple engine mechanisms and offset engine mechanisms. Modified Klein's construction method for four bar mechanisms. Analytical method for acceleration analysis for engine mechanisms.

Unit3: Dynamics of Engine Mechanisms : (6 Hrs)

Dynamically Equivalent systems, application of dynamically equivalent system for connecting rod of the engine, determination of inertia force and inertia torques on the crank shaft of horizontal and vertical engine mechanisms.

Unit4: Brakes and Dynamometers : (8 Hrs)

Function of Brakes and Dynamometers, Different types of brakes such as Short shoe brakes, Band brakes and Band & block brakes. Types of Dynamometers: Absorption type and Transmission type. Absorption type dynamometers such as Prony brake, Rope brake dynamometers. Transmission type dynamometers such as Belt transmission, Epicyclic gear train dynamometers, Torsion dynamometers.

Unit5: Cams (7 Hrs)

Types of Cams and Followers, types of specified motions such as uniform velocity, uniform and equal/unequal acceleration and retardation, simple harmonic motion and cycloidal motion, drawing radial cam profiles using these motions,

Unit6: Balancing: (7 Hrs)

Balancing of revolving masses, when they are acting in one or more planes. Static and dynamic balancing. Balancing of reciprocating engines. Primary and secondary forces and couples acting on single cylinder two cylinder engines. Balancing of non-identical and identical in-line engines. Balancing of radial engines, V-Engines. Balancing of engines such as V-8 & W-12 engines.

Books and References:

1. Theory of Machines – Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh & Mallik
4. Theory of Machines and Mechanisms- Rao & Duggipati
5. Theory of Machines-S.S. Rattan
6. Kinematics of Machines-Dr. Sadhu Singh
7. Mechanics of Machines – V. Ramamurti
8. Theory of Machines – Khurmi & Gupta
9. Theory of Machines – R. K. Bansal
10. Theory of Machines – V. P. Singh

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MED254-THERMODYNAMICS-II

Teaching Scheme

Theory: 4 hours/week

Examination Scheme

Class Test: 20 Marks

Theory: 80 Marks

Duration of theory exam: 3 Hrs

Unit1: STEAM GENERATORS AND PERFORMANCE OF BOILERS (7 Hrs)

Classification, constructional details of process and power boilers, equivalent evaporation, boiler efficiency, energy balance, steam generation controls, introduction to IBR laws, principle and working of high pressure boilers. (Descriptive and Numerical Treatment)

Unit2: BOILER DRAUGHT (6 Hrs)

Introduction, classification, determination of height and diameter of chimney, efficiency of chimney, condition for maximum discharge, artificial, forced and induced draught, Advantages. (Descriptive and Numerical Treatment)

Unit3: STEAM NOZZLES (7 Hrs.)

Types of nozzles, equation of continuity of nozzle, isentropic flow through nozzle, use of Mollier chart, velocity of steam leaving a nozzle, effect of friction, mass of steam discharged, nozzle efficiency, critical pressure ratio and maximum discharge, supersaturated flow through the nozzle, effect of back pressure on nozzle characteristics. (Descriptive and Numerical Treatment)

Unit4: STEAM CONDENSERS (6 Hrs.)

Classifications, comparison between Jet and Surface condensers, vacuum, vacuum efficiency, Daltons law of partial pressure, vacuum measurement, mass of circulating water required in a condenser, air removal, capacity of air extraction pumps, introduction to cooling towers. (Descriptive and Numerical Treatment)

Unit5: VAPOUR POWER CYCLES (7 Hrs)

Carnot cycle, ideal Rankine cycle, modified Rankine cycle, Reheat and Regenerative cycles with bleeding of steam, thermal efficiency, specific steam consumption, work ratio, power output, effect of superheat, inlet pressure and back pressure on performance of Rankine cycle. (Descriptive and Numerical Treatment)

Unit6: AIR COMPRESSORS:**(7 hrs)**

- (a) Classifications and working principles, reciprocating compressors. Terminologies used effect of clearance volume, actual indicated diagram, and multistage compression. (Descriptive and Numerical Treatment)
- (b) Rotary compressors, working principles Centrifugal compressor, and axial flow compressor. Comparison between reciprocating and rotary compressors. Vacuum pumps, air motor. (Descriptive Treatment)

RECOMMENDED BOOKS

1. Nag P.K., "Engineering Thermodynamics", TMH Publishing Co. New Delhi
2. Rajput R.K., "A Text Book of Engineering Thermodynamics", Laxmi Publication, New Delhi
3. Ballaney P.L., "Thermal Engineering",
4. Domkundwar & Domkundwar, "Introduction to Thermal Power Engineering", Dhanpatrai and Sons, New Delhi
5. Rao, "Engineering Thermodynamics",
6. Radhakrishnan, "Fundamentals of Engineering Thermodynamics", PHI

MED-255: ELECTRICAL MACHINES AND APPLIED ELECTRONICS**Teaching Scheme**

Theory: 04 hrs/week

Examination scheme

Theory Examination : 80Marks

Class Test: 20Marks

Duration of Exam: 3 Hrs

Unit 1: Concept of general electrical drives and applications:**(05)**

Classification and comparison of electric drive system, cooling and heating of electric motors, selection of an electric drive for particular application such as steel mill, paper mill, cement, textile mill, electric traction, coal mining, thermal power station etc

Unit 2: DC Motors:**(05)**

Construction, working principle, types, characteristics, starting and breaking of DC Motors, comparison of electrical and mechanical breaking methods, conventional speed control methods, thyristorised armature voltage control of DC motor using phase control and chopper circuit.

Unit 3: AC Motors:**(10)**

Construction, working principle, types, characteristics of 3phase Induction Motor, Torque equation, applications, starting and breaking of 3 phase induction motor, conventional speed control methods. Thyristorised stator voltage control of 3phase induction motor, V/F control, slip power recovery scheme.

Special purpose machines: introduction, construction and working principle of DC servomotors, stepper motors, brushless DC motor, Universal motor, 1phase induction motor.

Unit 4: Sensors:**(06)**

Definition, classification of sensors, selection criteria of sensors, thermocouple, airflow sensor, LVDT, LDR, Proximity switch, piezo sensors, shaft encoder decoder, load cell, etc. different applications of sensors.

Unit 5: Actuators:**(06)**

Definition, classification of actuators, opto-couplers, solenoid valves, Relays and its types, starters, Buzzer, Alarm, 7 segment display, LCD display.

Unit 6: Industrial Electronics and applications:**(08)**

Theory and working principle of transistor, SCR, MOSFET, DIAC, TRIAC, Protection circuits, Heat sink, Light dimmer circuit, flash circuit, Temperature controller, sequential timer circuit.

Reference books:

- 1) Electric motor Drives- Modeling, analysis and control by R.Krishnan, Low price Edition, Pearson
- 2) Utilization of Electric Energy: H.Pratab
- 3) Power Electronics by M.H.Rashid
- 4) Power Electronics by Khanchandani

Text books:

- 1) Electrical Technology (AC and DC drives) by B.L.Thereja vol-II and vo-III
- 2) Electric machines by IJ Ngrath and D.P. Kothari (second edition) TMH.
- 3) Power electronics by Bhimbira

MED256-PRODUCTION PROCESSES- II

Teaching Scheme

Theory: 4 hours/week

Examination Scheme

Class Test: 20 Marks

Theory: 80 Marks

Duration of theory exam: 3 Hrs

OBJECTIVE

- Introduction to the Production processes.
- To introduce the student to the manufacturing methods in Mechanical Engineering.

PURPOSE

- Production Processes covers an introduction to the machining processes used in the Production fields of mechanical engineering.
- The students are expected to know all the basic manufacturing machining processes and their applications so that they can be useful in the product design and manufacturing process.
- Convey all the required information that will be helpful in design and development for manufacturer for production.

Unit1:INTRODUCTION, METAL CUTTING & CUTTING TOOLS. ADVANCES (6 Hrs)

Introduction to machine tools, their classification. Types of cutting tools used in machine tools (single point, multiple point etc), orthogonal and oblique cutting, types of chips, single point cutting tool nomenclature, cutting speed, feed and depth of cut and its effect on tool life., chip breakers, machinability, cutting tool materials, heat generated in machining , cutting fluids, economics of machining. Mechanization, automation and computer application in machine tools. CIM, CNC machines. (Introduction, concept and applications)

Unit2: LATHE: (6 Hrs)

Types, construction of centre lathe, operations, tool holding and workpiece holding devices. Procedure and calculation of taper turning, thread cutting. Attachments and lathe accessories.

Unit3: MILLING MACHINE: (8 Hrs)

Types, Construction of universal milling machine, milling tools (cutters), tool and workpiece holding devices, universal dividing head (working and applications). Operations on milling, calculations and procedure of gear cutting, helical cutting . Hobbing : gear hobbing.

Unit4: SHAPER SLOTTER AND PLANER:**(4 Hrs)**

Types, construction. Operations carried .

Unit5: DRILLING, BORING & GRINDING MACHINES**(10 Hrs)**

Drilling – , twist drill nomenclature, types of drilling machines, work holding devices, tool holding devices,
Boring – Introduction, classification of boring machines, Jig boring, boring bars, boring heads, boring defects,

Introduction, grinding wheels, manufacturing of artificial abrasives, bonds and bonding processes, grit, grade and structure of grinding wheels, types of wheels, method of specifying grinding wheel, selection of grinding wheels, dressing and truing of grinding wheels, types of grinding machines.

Broaching- Introduction, principle parts of broach, broaching machines, application of broach, advantages of broaches, limitations of broaches and broaching tools.

Unit6: NON TRADITIONAL MACHINING**(6 Hrs)**

Introduction, classification of machining processes, Study of principle of working, equipment and applications of abrasive jet machining (AJM), ultra sonic machining (USM), Chemical machining (CHM), electrochemical machining (ECM), Electrochemical grinding (ECG), electro discharge machining (EDM), electron beam machining (EBM), laser beam machining (LBM), plasma arc machining (PAM), ion beam machining.

REFERENCE

- a) Gerling, “All about Machine Tools”
- b) Krar S.F., “Technology of Machine Tools”
- c) Boothroyd, “Fundamentals of Metal Machining and Machine Tools”
- d) Raghuvanshi B.S., “Workshop Technology”, Vol I
- e) Hazra Choudhary, “Elements of Workshop Technology”, Vol I
- f) Jain R.K. “Production Technology”
- g) Bawa H.S. “Workshop Technology” Vol I

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 and 6 be made compulsory and should have at least ten bits of two marks out of which FIVE to be solved.
4. Two questions from remaining questions from each section be asked to solve having weightage of 15 marks

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FACULTY OF ENGINEERING AND TECHNOLOGY
Second Year Mechanical Engineering
Semester-I

MED221 LAB-I THERMODYNAMICS-I

Teaching Scheme

Practical : 2 Hrs/Week

Examination Scheme

Term work: 25 Marks

Practical: 25 Marks

All the experiments from the following list should be conducted /studied during the course and record for the same should be submitted:

1. Determination of C.V. of solid / liquid fuels by using calorimeter.
2. Determination of C.V. of gaseous fuels by using calorimeter
3. Study of determination of dryness fraction of steam.
4. Study and performance of flue gas analysis by using Orsat apparatus
5. Study of Redwood's Viscometer and determination of viscosity of lubricants
6. Determination of Cloud point and Pour point of lubricants
7. Assignments based on descriptive as well as at least five numerical from 1, 2, 4, 5 and 6 units.

Term work

The term work will consist of submitting a file for all the experiments with neatly written records of the study and diagrams. The term work will be assessed by the subject teacher.

Practical Examination

The Practical Examination will comprise of performing the experiments and viva voce on the Syllabus. The practical examination will be assessed by two examiners, one will be the subject teacher and other examiner appointed by Dr. B.A.M.U. Aurangabad.

MED222-LAB-II MACHINE DRAWING

Teaching Scheme

Practical: 4 Hrs/Week

Examination Scheme

Term work: 50 Marks

Practical: 50 Marks

OBJECTIVES:

- To make student to draw correct production drawing.
- To understand standard practice followed in industries for drawings.
- To understand the methodology of communicating all the required information that will allow a manufacturer to produce parts.
- To learn preparation of product drawing and assembly drawing using 2D CAD tools.

TERM-WORK: (First Angle projection to be adopted)

A. SKETCHBOOK SHOULD CONTAINED

- 1) Engineering Curves
- 2) Drawing standards :

Conventions are used to represent materials in section and machine elements. Methods of Dimensioning, Arrangement of Dimensions, standard abbreviations used in dimensioning. Limit system, representation of tolerances in Drawing, Types of Fits, GD&T symbols. Welding symbols, Machining symbols.

B. TOTAL 5 NUMBERS OF DRAWING SHEETS

1. One drawing sheet on Auxiliary views (Minimum Two problems)
2. One drawing sheet on Intersection of Solids (Minimum Two problems)
3. One drawing sheet on details to assembly drawing (Based on unit 5 of MD theory syllabus)
4. Two drawing sheets on assembly to details (Based on unit 6 of MD theory syllabus)

C. PRACTICALS IN CAD

By using any 2-D CAD packages Computer Aided Drawing of

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types using various type of lines in engineering drawing, saving the file .
2. Layout drawing using different layer and line colors. Name the details using text commands, Make a title Block.
3. Two exercises on Drawing of simple machine components with dimensions.
4. One exercise on Assembly to Details or Details to Assembly

Practical Examination should be based on Viva-Voce on the above syllabus.

TEXT BOOKS:

1. Elementary Engineering Drawing N D Bhatt Charotar Publication House
2. Machine Drawing-By N.D. Bhatt.
3. Machine Drawing by Sidheswar, N., Kanniah, P. and Sastry, V.V.S., Tata McGraw Hill.
4. Machine Drawing by K.I. Narayana, P. Kannaiah, K.Venkata Reddy, New Edge publications
5. Mahine Drawing by Sonaversity publications.
6. Engineering Drawing and Graphics + AutoCAD by K. Venugopal, New Age International Pub.
7. Engineering Drawing with an Introduction to AutoCAD by D.A. Jolhe, Tata-McGraw-Hill Co.

MED223-LAB-III STRENGTH OF MATERIALS

Teaching Scheme

Practical: 2 Hrs/Week

Examination Scheme

Term work: 25 Marks

List of the Experiments

1. Tension test on metals.
2. Compression test on materials.
3. Shear test on metals.
4. Modulus of rupture test.
5. Impact test on metals.
6. Hardness test on metals.
7. Torsion test on metals.
8. Deflection of beams.
9. Bucking of columns.
10. Deflection of springs.

Term work

The term work will consist of submitting a file for all the experiments with neatly written records of the study and diagrams. The term work will be assessed by the subject teacher.

MED224-LAB IV WORKSHOP-III

Teaching Scheme

Practical: 2 Hrs

Examination Scheme

Term work: 25 Marks

Practical: 50 Marks

Duration of exam: 8 hrs.

COURSE CONTENT

TURNING SHOP:

Study of different simple operations to be carried on the lathe machine. plane turning, facing, step turning, taper turning, knurling.

JOB: Preparing a job on lathe machine performing the above operations

PATTERN MAKING:

Study of patterns-material, type of patterns and cores, allowances, pattern making tools, method.

JOB: At least one pattern in Wood, involving details like allowances, core prints (if required) parting line of multi piece pattern etc. in the cope, drag.

FOUNDRY SHOP:

Sand moulding, types of sands, preparing sand for moulding, equipments, sand moulds (cope, drag, check etc.)

JOB: Preparing sand moulds for single, multi-piece patterns in at least two or multi-piece moulding boxes and details like runners, risers, gates etc mould cavity finishing, obtain wax casting. Demonstration of at least one casting using ferrous or non-ferrous metal for every batch.

TERM WORK

Term work shall consist of submission of the above jobs, a File containing the write-up (principle, tools, operations and application) of the three sections and a Workshop Diary in regular format which should have the record of job drawing, tools used, operations to be performed on the job, dates etc., certified by each Section Instructor and the Workshop Superintendent.

Assessment of the term work shall be done by the Workshop Superintendent and a teachers appointed by the Head of the Institute.

PRACTICAL EXAMINATION

The Practical Examination will comprise of two jobs. One Job in Turning Shop is compulsory and another in any one of the remaining shops. The job of foundry will be a wax casting obtained from the mould. The jobs should involve all the operations studied during the semester. Duration will be Four hours for each job. Question paper will be set by University.

The jobs will be assessed by two examiners, one will be the Internal and other will be External examiner appointed by University.

Recommended books:

- 1) *Workshop Technology, Vol I, and Vol II* by Hazra Chaudhury; Media Promotors & Pub
- 2) *Workshop Technology, Vol I and Vol II*, by Raghuvanshi; Dhanpatrai and Sons.

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Second Year Mechanical Engineering
Semester-II

MED271-Lab-V THEORY OF MACHINES-I

Teaching Scheme

Practical: 2 Hrs

Examination Scheme

Term work: 25 Marks

Practical: 25 Marks

Practical:

1. Study of Kinematics and Definition
2. Solution of min.2 problem on topic Velocity Analysis, using Relative velocity method
3. Solution of min.2 problem on topic Velocity Analysis, using Instantaneous centre method
4. Solution of min.2 problem on topic Velocity & Acceleration analysis, using Relative acceleration method
5. Solution of min.2 problem on topic Velocity & Acceleration analysis, using Short cut methods.
6. Solution of min.2 problem on topic Dynamics of Engine Mechanisms, determination of inertia force and inertia torque.
7. Solution of min.2 problem on topic Cams
8. Study of Brakes
9. study of dynamometers

Term work

The term work will consist of submitting a file for all the experiments with neatly written records of the study and diagrams. The term work will be assessed by the subject teacher.

Practical Examination

The Practical Examination will comprise of performing the experiments and viva voce on the Syllabus. The practical examination will be assessed by two examiners, one will be the subject teacher and other examiner appointed by Dr. B.A.M.U. Aurangabad.

MED272-Lab-VI THERMODYNAMICS-II

Teaching Scheme

Practical: 2 hours/week

Examination Scheme

Term work: 25 Marks

Practical: 25 Marks

The list of experiments

- [1] Study of any two boilers
- [2] Study of boiler mounting and accessories
- [3] Study of condensers
- [4] Study of cooling towers
- [5] Performance of single/multistage reciprocating air compressor
- [6] Technical visit to steam power plant.
- [7] Assignments based on descriptive as well as at least five numerical from 1, 2, 3, 5 and 6 units.

Term work

The term work shall consist of Performing / Studying following experiments. The candidate shall submit the report of each experiment and the assignments.

Practical Examination

The Practical Examination will comprise of performing the experiments and viva voce on the Syllabus. The practical will be assessed by two examiners, one will be the subject teacher and other will be examiner appointed by Dr. B.A.M.U. Aurangabad.

RECOMMENDED BOOKS

1. Nag P.K., "Engineering Thermodynamics", TMH Publishing Co. New Delhi
2. Rajput R.K., "A Text Book of Engineering Thermodynamics", Laxmi Publication, New Delhi
3. Ballaney P.L., "Thermal Engineering",
4. Domkundwar & Domkundwar, "Introduction to Thermal Power Engineering", Dhanpatrai and Sons, New Delhi
5. Rao, "Engineering Thermodynamics",
6. Radhakrishnan, "Fundamentals of Engineering Thermodynamics", PHI

MED273:Lab-VII ELECTRICAL MACHINES AND APPLIED ELECTRONICS

Teaching Scheme

Practical: 02 hrs/week

Examination scheme

Term work: 25 Marks

List of Experiments:

- 1) To perform speed control of DC motor
- 2) Speed control of 3phase Induction Motor
- 3) To Perform load test on DC series motor
- 4) Rheostatic speed breaking of DC shunt motor
- 5) To study single phase induction motor
- 6) To identify different parts and understand working of starters used for 3phase induction motors
- 7) To Study different sensors
- 8) To study different actuators
- 9) To study different types of heating
- 10) To study power devices

Term work

The term work will consist of submitting a file for all the experiments with neatly written records of the study and diagrams. The term work will be assessed by the subject teacher.

MED274-Lab-III WORKSHOP PRACTICE-IV

Teaching Scheme

Practical: 2 hours/week

Examination Scheme

Term work: 25 Marks

Practical: 50 Marks

Duration of exam: 8 Hrs.

COURSE CONTENT

TURNING SHOP:

Study of different advanced operations on the lathe machine, like taper turning by different methods thread cutting along with calculations, drilling, boring, internal threading, internal taper turning, facing, use of at least one attachment (like grinding attachment, taper turning attachment, milling attachment etc.).

JOB: Preparing at least one job on lathe machine to perform the above operations.

WELDING:

study of different arc welding processes.

Job: Preparation of at least one job using shielded metal arc welding and MIG or TIG welding.

BLACK SMITHY:

Study of forging parameters, forging tools, different operations like sizing, bending, upsetting, taper etc.

JOB: Prepare one job involving the above hand forging operations.

TERM WORK

Term work shall consist of submission of the above jobs, a File containing the write-up (principle, tools, operations and application) of the three sections and a Workshop Diary in regular format which should have the record of job drawing, tools used, operations to be performed on the job, dates etc., certified by each Section Instructor and the Workshop Superintendent.

Assessment of the term work shall be done by the Workshop Superintendent and a teachers appointed by the Head of the Institute.

PRACTICAL EXAMINATION

The Practical Examination will comprise of two jobs. One Job in Turning Shop is compulsory and another in any one of the remaining shops. The jobs should involve all the operations studied during the semester. Duration will be Four hours for each job. Question paper will be set by University.

The jobs will be assessed by two examiners, one will be the Internal and other will be External examiner appointed by University.

Recommended books:

- 1) *Workshop Technology, vol I, by Hazra Chaudhury; Media Promotors & Pub*
- 2) *Workshop Technology, vol I, by Raghuvanshi; Dhanpatrai and Sons.*