

Syllabus for B.E. (Mechanical Engineering) II Year

MATH-201-E : MATHEMATICS-III

L T P
3 1 -

Class Work : 50 Marks
Exam. : 100 Marks
Total : 150 Marks
Duration of exam. : 3 Hours

Part-A

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

Part-B

Functions of Complex Variable : Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeros and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

Part-C

Probability Distributions and Hypothesis Testing : Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit.

Linear Programming : Linear programming problems formulation, Solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

TEXT BOOKS :

1. Advanced Engg. Mathematics : F Kreyszig.
2. Higher Engg. Mathematics : B.S. Grewal.

REFERENCE BOOKS :

1. Advance Engg. Mathematics : R.K. Jain, S.R.K. Iyenger.
2. Advanced Engg. Mathematics : Michael D. Greenberg.
3. Operation Research : H.A. Taha.
4. Probability and statistics for Engineers : Johnson. PHI.

Note: Examiner will set eight questions, taking two from Part-A, three from Part-B and three from Part-C. Students will be required to attempt five question taking atleast one from each part.

HUM-201-E ECONOMICS

L T P
3 1 -

Class Work : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam. : 3 Hrs.

COURSE OBJECTIVE : The purpose of this course is to :

1. Acquaint the student in the basic economic concepts and their operational significance and
2. Stimulate him to think systematically and objectively about contemporary economic problems.

UNIT-I

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve
Economic laws and their nature. Relation between Science, Engineering, Technology and Economics.

UNIT-II

Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility
- its practical application and importance.

UNIT-III

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve,
Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical
importance & applications of the concept of elasticity of demand.

UNIT-IV

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and
External economics and diseconomies of scale.

Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost,
real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

UNIT-V

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition
(Main features of these markets)

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand
and supply on prices.

UNIT-VI

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning,
merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT,
WTO, GATT & TRIPS agreement.

TEXT BOOKS :

1. Principles of Economics : P.N. Chopra (Kalyani Publishers).
2. Modern Economic Theory – K.K. Dewett (S.Chand)

REFERENCE BOOKS :

1. A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2. Micro Economic Theory – M.L. Jhingan (S.Chand)
3. Micro Economic Theory - H.L. Ahuja (S.Chand)
4. Modern Micro Economics : S.K. Mishra (Pragati Publications)
5. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6. Indian Economy : Rudar Dutt & K.P.M. Sundhram

NOTE: Eight questions are to be set atleast one question from each unit and the students will have to attempt five questions in all.

ME- 201 E THERMODYNAMICS

L	T	P	Sessional	: 50 Marks
3	1	-	Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam.	: 3 hrs.

- Unit I** Basic Concepts: Macroscopic and Microscopic Approaches, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Property – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Quasi-static, Reversible and Irreversible Processes, Working Substance. Concept of Thermodynamic Work and Heat, Equality of Temperature, Zeroth Law of Thermodynamic and its utility. Problems.
- Unit II** First Law of Thermodynamics: Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, PMMFK, Steady flow energy equation, 1st Law Applied to Non-flow process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process. Problems.
- Unit III** Second Law of Thermodynamics: Limitations of First Law, Thermal Reservoir, Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and their Equivalence, PMMSK. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot Theorem and its Corollaries, Thermodynamic Temperature Scale. Entropy, Clausius Inequality, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics. Problems.
- Unit IV** Availability and Irreversibility: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Dead state of a system, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility, Second law efficiencies of processes & cycles. Problems.
- Unit V** Pure Substance: Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling, Saturated and Superheat Steam, Solid – Liquid – Vapour Equilibrium, T-V, P-V and P-T Plots During Steam Formation, Properties of Dry, Wet and Superheated Steam, Property Changes During Steam Processes, Temperature – Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam. Problems.
- Unit VI** Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avogadro's law and Universal Gas Constant, P-V-T surface of an Ideal Gas. Vander Waal's Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states. Mixture of Gases, Mass, Mole and Volume Fraction, Gibson Dalton's law, Gas Constant and Specific Heats, Entropy for a mixture of non-reactive gases. Problems.
- Unit VII** Thermodynamic Relations: Maxwell Relations, Clapeyron Equation, Relations for changes in Enthalpy and Internal Energy & Entropy, Specific Heat Capacity Relations, Joule Thomson coefficient & inversion curve.

Text Books:

1. Engineering Thermodynamics – Jones and Dugan, PHI, New Delhi.
2. Fundamentals of Engineering Thermodynamics – E. Radhakrishnan, PHI, New Delhi.

Reference Books :

1. Theory and Problems of Thermodynamics – Y. V.C. Rao, Wiley Eastern Ltd., New Delhi.
2. Engineering Thermodynamics – C P Arora, Tata McGraw Hill
3. Engineering Thermodynamics – P K Nag, Tata McGraw Hill

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME- 203 E STRENGTH OF MATERIALS –I

L	T	P	Sessional	: 50 Marks
3	1	-	Theory	: 100 Marks
Marks			Total	: 150

Duration of Exam. : 3 Hrs.

- Unit I** Simple Stresses & Strains: Concept & types of Stresses and strains, Poison's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.
- Unit II** Compound Stresses & Strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal-planes, Mohr's circle of stresses, Numerical.
- Unit III** Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.
- Unit IV** Torsion Of Circular Members: Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.
- Unit V** Bending & Shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with combined bending, torsion & axial loading of beams. Numericals.
- Unit VI** Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordom's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.
- Unit VII** Slope & Deflection: Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.
- Unit VIII** Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

Text Books:

1. Strength of Materials – G.H.Ryder - Macmillan, India
2. Strength of Materials– Andrew Pytel and Fredinand L.Singer, Addison – Wesley

Reference Books :

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials A Rudimentary Apprach – M.A. Jayaram, Sapna Book House, Bangalore

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME 205 E ENGINEERING MECHANICS

L T P
3 1 -

Sessional :50 Marks
Theory :100 Marks
Total marks :150 Marks
Duration of exam: 3 Hrs

- Unit-I** Review of Basic Force Systems: Dimensions and units of mechanics, idealization of mechanics, laws of mechanics, vector algebra review, moment of a force about a point and axis, the couple and couple moment, addition and subtraction of couples, moment of a couple about a line, translation of a force to a parallel position, resultant of a force system, Problems (vector method).
- Unit-II** Equilibrium: Introduction, free body diagram, control volumes, general equations of equilibrium, two point equivalent loading, static in-determinacy, simple truss, method of joints, method of sections, co-planer cable-loading a function of x, coplanar cables- loading the weight of the cable itself. Problems.
- Unit-III** Properties of Surfaces & Moments and Products of inertia : First moment of an area and the centroid, principal axes, formal definition of inertia quantities, relation between mass-inertia terms and area-inertia terms, translation of coordinate axes, transportation properties of the inertia terms, a brief introduction to tensors, the inertia of ellipsoid and principal moments of inertia, Problems (vector method).
- Unit-IV** Kinematics of Particles and Rigid Bodies: Velocity and acceleration in path and cylindrical coordinates, motion of a particle relative to a pair of translating axes, translation and rotation of rigid bodies, Chasles theorem, moving references, velocity and acceleration for different references, inertia and coriolis forces. Problems(vector method).
- Unit-V** Particle Dynamics, Energy Methods & Momentum Methods: Newton's law for rectangular coordinates & cylindrical coordinates, rectifier translation, central force motion, Newton's law for path variables, work energy equations, work energy equations for a systems of particles, linear and angular momentum equations for a systems of particles. Problems(vector method).
- Unit-VI** Variational Mechanics: Hamiton principle, Lagrange equations, principle of virtual work, methods of minimum potential energy, stability.

Text Book:

1. Engineering Mechanics - Statics & Dynamics by I.H. Shames, PHI, New Delhi.
2. Engineering Mechanics – Timoschenko.

Reference Books :

1. Statics & Dynamics by J.L. Meriam, JohnWiley & Sons (P) Ltd. New York.
2. Statics & Dynamics by Beer & Johnson, MGH, New Delhi.

NOTE : In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME- 207 E MACHINE DRAWING

L T P
1 - 4

Theory : 100 Marks
Sessional : 50 Marks
Total : 150 Marks
Duration of Exam .: 4 hrs.

PART-A

Introduction to BIS Specification SP : 46 – 1988 Code of Engineering drawing – Limits , fits and Tolerance (Dimensional and Geometrical tolerance) , Surface finish representation.

Gear: Gear terminology, I.S. convention representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

PART-B

Orthographic views from isometric views of machine parts / components. Dimensioning, Sectioning. Exercises on Coupling, Crankshaft, Pulley, Piston and Connecting rod , Cotter and Knuckle joint. Riveted Joint and Welded Joint.

PART-C

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies : Lathe Tail stock , Machine vice , Pedestal bearing , Steam stop valve , Drill jigs and Milling fixture.

- NOTE :**
- (1) In the semester examination , the examiner will set total six questions in all, taking two questions from each part. The students will be required to attempt three questions in all, taking one question from each part
 - (2) The questions from Part-A and Part-B will carry 20 marks each. Question from Part-C will carry 60 marks.

Text Books:

- 1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.
- 2. A Text Book of Machine Drawing - P S Gill Pub.: S K Kataria & Sons.
- 3. Engineering Graphics with Auto CAD 2002 - James D. Bethune, Pearson Education.

Reference Books :

- 1. A Text Book of Machine Drawing Laxmi Narayana and Mathur, M/s. Jain Brothers, New Delhi.
- 2. Machine drawing by N Sidheshwar, Kannaiah, V S Sastry, TMH., New Delhi.

L T P
3 1 -

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3hrs

UNIT – I : DIODES :

P-N junction, P-N junction as a rectifier, V-I characteristics, Breakdown diodes, Light emitting diodes, Load – Line concept, Clipping, Clamping, Rectifiers.

UNIT – II : TRANSISTORS :

Operation and Characteristics of a Transistor, Common Emitter, Common Collector and Common Base Configurations of a transistor, Biasing and Transistor as an amplifier and oscillator..

UNIT – III : OP-AMPS :

Basic Characteristics of an OP-AMP, Applications of OP-AMP (Inverter, Non-Inverter, Integrator, Differentiator, Logarithmic amplifier, Square wave generator).

UNIT – IV : POWER AMPLIFIERS :

Class A, Class B and Class C Amplifiers.

UNIT – V : STABILISED POWER SUPPLIES :

Regulated power supply, series voltage regulator.

UNIT – VI : DIGITAL GATES :

Binary numbers, OR, AND, NAND, NOR, NOT, EX-OR Gates.

TEXT BOOK : Integrated Electronics Milman & Halkias (MGH).

REFERENCE BOOKS :

1. Digital Electronics by R.P.Jain (MGH).
2. Microelectronics – Ramana (MGH).
3. Electronics Principles Malvino, TMH.

NOTE : 1. Five out of eight questions are to be attempted.
2. At least one question should be set from each unit.

ME- 209 E STRENGTH OF MATERIAL-I LAB

L T P
- - 2

Sessional : 25 Marks
Exam : 25 Marks
Total : 50 Marks
Duration of exam : 3 Hrs.

List of Experiments :

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the Erichsen sheet metal testing machine & perform the Erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the shear test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12. To determine Mechanical Advantage and Efficiency of Worm and Worm Gear of Single, Double and Triple start.
13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.
14. To find Moment of Inertia of a Fly Wheel.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

EE-219-E ELECTRONICS ENGINEERING LAB

L T P
0 0 2

Class Work : 25
Exam : 25
Total : 50
Duration of Exam : 3hrs

LIST OF EXPERIMENTS :

1. Study of V-I Characteristics of Diode.
2. Study of a Clipping and Clamping circuits.
3. Study of a Half wave rectifier.
4. Study of a Full wave rectifier.
5. Study and Analysis of a Transistor in Common Emitter Configuration.
6. Study of OP-AMP as Inverter and Comparator.
7. Study of OP-AMP as Differentiator.
8. Study of OP-AMP as Integrator.
9. Study of OP-AMP as Square wave generator.
10. Realization of Truth Tables of AND, OR, NOT Gates.
11. Realization of Truth Tables of NAND, NOR and EX-OR Gates.

Note : At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

ME – 211 E COMPUTER AIDED DRAFTING LAB.

L T P
- - 2

Sessional : 25 Marks
Practical : 25 Marks
Total : 50 Marks
Duration of Exam : 3 hrs.

The students will be required to carry out the following exercises using educational soft-wares (AutoCad-2002, I-DEAS, Pro-Engineer etc).

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.
4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.
5. Draw quarter sectional isometric view of a cotter joint.
6. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.
7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.
8. Draw a spiral by extruding a circle.

L T P
3 1 -

Class Work : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam. : 3 Hrs.

UNIT-I

Meaning of management, Definitions of Management, Characteristics of management, Management Vs. Administration. Management-Art, Science and Profession. Importance of Management. Development of Management thoughts. Principles of Management. The Management Functions, Inter-relationship of Managerial functions.

UNIT-II

Nature and Significance of staffing, Personnel management, Functions of personnel management, Manpower planning, Process of manpower planning, Recruitment, Selection; Promotion - Seniority Vs. Merit. Training - objectives and types of training.

UNIT-III

Production Management : Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

UNIT-IV

Marketing Management - Definition of marketing, Marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

UNIT-V

Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the concept of capital structure and various sources of finance.

BOOKS RECOMMENDED :**TEXT BOOKS :**

1. Principles and Practice of Management - R.S. Gupta, B.D.Sharma, N.S. Bhalla. (Kalyani Publishers)
2. Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)

REFERENCE BOOKS :

1. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
2. Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).
3. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).
4. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)
5. Management - James A.F. Stoner & R.Edward Freeman, PHI.

NOTE: Eight questions are to be set atleast one question from each unit and the students will have to attempt five questions in all.

ME-202 E MANUFACTURING TECHNOLOGY

L T P
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs

- Unit I** Metal Casting Processes: Advantages and limitations, sand mold making procedure. Patterns and Cores: Pattern materials, pattern allowances, types of pattern, color coding. Molding materials: Molding sand composition, sand preparation, sand properties and testing, Sand molding processes
- Unit II** Cores: Types of cores, core prints, chaplets, and chills. Gating systems: Gates and gating systems risers. Melting practice: Cupola, charge calculations. Casting cleaning and casting defects, Fettling, defects in castings and their remedies, methods of testing of castings for their soundness.
- Unit III** Special Casting Processes: Shell molding, precision investment casting, permanent mold casting, die casting, centrifugal casting, continuous casting,
- Unit IV** Metal Forming Processes: Nature of plastic deformation, hot working and cold working .Principles of rolling, roll passes, roll pass sequences. Forging: Forging operations, smith forging, drop forging, press forging, forging defects.
- Unit V** Extrusion and other processes: Extrusion principle, hot extrusion, cold extrusion, wire drawing, swaging, tube making. Sheet metal operations: Press tools operations, hearing action, drawing dies, spinning, bending, stretch forming, embossing and coining.
- Unit VI** Gas and Arc Welding: Classification: oxy- acetylene welding equipment and techniques. Electric arc welding: Electrodes, manual metal arc welding, inert gas shielded arc welding, tungsten inert gas welding (TIG), metal inert gas welding(MIG), submerged arcwelding (SAW).
- Unit VII** Resistance Welding: Principles, resistance spot welding, resistance seam welding, upset welding, flash welding,
- Unit VIII** Other Welding Processes: Introduction thermit welding, electro slag welding, electron beam welding, forge welding, friction welding, diffusion welding, brazing and soldering.

Text Books:

1. Principles of Manufacturing Materials & Processes – Campbell J. S., Publisher – Mc Graw Hill.
2. Manufacturing Science - Ghosh A; Mallik A.K. Affiliated East-West Press Pvt. Ltd., New Delhi

Reference Books:

1. Foundry Technology - K.P. Sinha, D.B. Goel, Roorkee Publishing House.
2. Welding and Welding Technology, Richard L. Little Tata McGraw Hill Ltd.
3. Principle of Metal casting - Rosenthal, Tata McGraw Hill, New Delhi
4. Manufacturing Processes and Systems: Ostwald Phillip F., Munoz Jairo, John Wiley & Sons
5. Manufacturing Technology-Foundry, Forming and Welding - P.N. Rao, Tata McGraw Hill
6. Elements of Manufacturing Processes – B.S. Nagendra Parasher, RK Mittal, PHI N. Delhi

Note: In the semester examination, the examiner will set 8 questions, at least one question from each unit, and students will be required to attempt only 5 questions.

ME- 204 E MATERIAL SCIENCE

L	T	P	Sessional	: 50 Marks
3	1	-	Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam	: 3 Hrs

- Unit I** Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numericals related to crystallography.
- Unit II** Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects & effects of imperfections on metal properties.
- Unit III** Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram.
- Unit IV** Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.
- Unit V** Deformation of Metal: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth.
- Unit VI** Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.
- Unit VII** Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: Mechanism and effect of corrosion, prevention of corrosion.
- Unit VIII** Plastic, Composite and Ceramics: Polymers, formation of polymers, polymer structure and crystallinity, polymers to plastics types, reinforced particles-strengthened and dispersion strengthened composites. Ceramic materials: Types of ceramics, properties of ceramic, ceramic forming techniques, mechanical behavior of ceramic.

Text Books:

1. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp.
2. Material Science - Narula, Narula and Gupta. New Age Publishers

Reference Books:

1. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons
3. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi.
4. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi

Note: In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt 5 questions.

ME- 206 E STRENGTH OF MATERIALS-II

L T P
3 1 -

Sessional : 50Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam: 3Hrs.

- Unit I** Strain Energy & Impact Loading: Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beams in bending, beam deflections, strain energy of shafts in twisting, energy methods in determining spring deflection, Castigliano's & Maxwell's theorems, Numericals.
- Unit II** Theories of Elastic Failure: Various theories of elastic failures with derivations and graphical representations, applications to problems of 2- dimensional stress system with (i) Combined direct loading and bending, and (ii) combined torsional and direct loading, Numericals.
- Unit III** Unsymmetrical Bending: Properties of beam cross section, product of inertia, ellipse of inertia, slope of the neutral axis, stresses & deflections, shear center and the flexural axis Numericals.
- Unit IV** Thin Walled Vessels : Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels & their derivations under internal pressure, wire wound cylinders, Numericals.
- Unit V** Thick Cylinders & Spheres : Derivation of Lamé's equations, radial & hoop stresses and strains in thick, and compound cylinders and spherical shells subjected to internal fluid pressure only, wire wound cylinders, hub shrunk on solid shaft, Numericals.
- Unit VI** Rotating Rims & Discs: Stresses in uniform rotating rings & discs, rotating discs of uniform strength, stresses in (i) rotating rims, neglecting the effect of spokes, (ii) rotating cylinders, hollow cylinders & solid cylinders. Numericals.
- Unit VII** Bending of Curved Bars : Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature, stresses in crane hooks, rings of circular & trapezoidal sections, deflection of curved bars & rings, deflection of rings by Castigliano's theorem stresses in simple chain link, deflection of simple chain links, Problems.
- Unit VIII** Springs: Stresses in open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs, concentric springs, Numericals.

Text Books:

1. Strength of Materials – G.H.Ryder, Third Edition in SI Units 1969 Macmillan, India.
2. Mechanics of Materials – (Metric Edition) : Ferdinand P. Beer and E. Russel Johnston, Jr. Second Edition, McGraw Hill.

Reference Books :

1. Book of Solid Mechanics – Kazmi, Tata Mc Graw Hill
2. Strength of Materials – D.S. Bedi - S. Chand & Co. Ltd.
3. Advanced Mechanics of Solids and Structures – N. Krishan Raju and D.R.Gururaje- Narosa Publishing House.
4. Strength of Materials – Andrew Pytel and Fredinand L. Singer Fourth Edition, Int. Student Ed. Addison – Wesley Longman.

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME- 208 E FLUID MECHANICS

L T P
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs.

- Unit I** Fluid Properties and Fluid Statics: Concept of fluid and flow, ideal and real fluids, continuum concept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, stability of floating and submerged bodies, relative equilibrium. Problems.
- Unit II** Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net. Problems.
- Unit III** Fluid Dynamics: Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orificemeter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications. Problems.
- Unit IV** Potential Flow: Uniform and vortex flow, flow past a Rankin half body, source, sink, source-sink pair and doublet, flow past a cylinder with and without circulation. Problems.
- Unit V** Viscous Flow: Flow regimes and Reynold's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings. Problems.
- Unit VI** Flow Through Pipes: Major and minor losses in pipes, Hagen-Poiseuille law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes. Problems.
- Unit VII** Boundary Layer Flow: Boundary layer concept, displacement, momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies, lift and drag on a cylinder and an airfoil, Problems.
- Unit VIII** Turbulent Flow: Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes. Problems.

Text Books:

1. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill
2. Mechanics of Fluids – I H Shames, Mc Graw Hill

References Books:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
3. Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME- 210 E ENERGY CONVERSION

L T P
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs.

- Unit I** **Fuels and Combustion:** Classification of fuels- solid, liquid & gaseous fuels, Combustion equations, Stoichiometric air-fuel ratio, Excess air, Exhaust gas analysis, Orsat apparatus. Enthalpy and internal energy of combustion, Enthalpy of formation, Adiabatic flame temperature, Gibb's and Helmholtz functions, Calorific values of fuel, Problems.
- Unit II** **Steam Boilers and Draft:** Classification, comparison between fire and water tube boilers, Essentials of a good boiler, Constructional and operational details of Locomotive& Lancashire Boilers, High pressure boilers- Benson, Lamont, Loeffler and Velox boilers, Boiler mountings and accessories, Boiler performance, Natural& Artificial drafts, Chimney height, Maximum draft and chimney efficiency, Boiler heat balance sheet, Problems.
- Unit III** **Vapour Power Cycles:** Carnot and Rankine vapour cycles, effect of operating conditions on thermal efficiency of Rankine cycle, Rankine cycle with superheat, reheat and regeneration, Binary vapour cycle, Problems..
- Unit IV** **Flow Through Nozzles:** Velocity and heat drop, mass discharge through a nozzle, critical pressure ratio and its significance, effect of friction and nozzle efficiency, supersaturated flow, design pressure ratio, Problems.
- Unit V** **Steam Turbines:** Classification, Impulse Turbine- Flow through blades, velocity diagram, power output and efficiency, maximum blade efficiency of single stage impulse turbine, blade friction, compounding of impulse turbine. Reaction Turbine- Flow through impulse reaction blades, degree of reaction, velocity diagram, power output, efficiency and blade height, comparison of impulse and impulse reaction turbines. Losses in steam turbines, stage efficiency, overall efficiency and reheat factor. Governing of steam turbines, Problems.
- Unit VI** **Steam Condensers:** Elements of a condensing plant, types of condensers, comparison of jet and surface condensers. Condenser vacuum, sources of air leakage & its disadvantages, vacuum efficiency and condenser efficiency, Problems.
- Unit VII** **Air Compressors:** Working of a single stage reciprocating air compressor; calculation of work input; Volumetric efficiency; Isothermal efficiency; Advantages of multi stage compression; Two stage compressor with Inter-cooling; Perfect Inter cooling; Optimum intercooler pressure, Problems.

Text Books :

1. Thermal Engineering – P L Ballaney, Khanna Publishers
2. Thermodynamics and Heat Engines vol. II – R Yadav, Central Publishing House

Reference Books :

1. Applied Thermodynamics for Engineering Technologists – T D Eastop and A McConkey, Pearson Education
2. Heat Engineering – V P Vasandani and D S Kumar, Metropolitan Book Co Pvt Ltd

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME- 212 E MATERIAL SCIENCE LAB.

L	T	P
-	-	2

Sessional	: 25 Marks
Theory	: 25 Marks
Total	: 50 Marks
Duration of Exam: 3 Hrs	

List of Experiments:

1. To study crystal structures of a given specimen.
2. To study crystal imperfections in a given specimen.
3. To study microstructures of metals/ alloys.
4. To prepare solidification curve for a given specimen.
5. To study heat treatment processes (hardening and tempering) of steel specimen.
6. To study microstructure of heat-treated steel.
7. To study thermo-setting of plastics.
8. To study the creep behavior of a given specimen.
9. To study the mechanism of chemical corrosion and its protection.
10. To study the properties of various types of plastics.
11. To study Bravais lattices with the help of models.
12. To study crystal structures and crystals imperfections using ball models.

Note:

3. At least ten experiments are to be performed in the semester.
4. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

			Sessional	: 25 Marks
			Practical/Viva	: 25 Marks
L	T	P	Total	: 50 Marks
-	-	2	Duration of Exam.	: 3 Hrs.

List of Experiments:

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orificemeter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturimeter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoulli's Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vortex flow.

Note:

1. **At least ten experiments are to be performed in the semester.**
2. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.**

ME- 216 E ENERGY CONVERSION LAB

			Sessional	: 25 Marks
			Practical/Viva	: 25 Marks
L	T	P	Total	: 50 Marks
-	-	2	Duration of Exam.	: 3 Hrs.

List of Experiments:

1. To study low pressure boilers and their accessories and mountings.
2. To study high pressure boilers and their accessories and mountings.
3. To prepare heat balance sheet for given boiler.
4. To study the working of impulse and reaction steam turbines..
5. To find dryness fraction of steam by separating and throttling calorimeter.
6. To find power out put & efficiency of a steam turbine.
7. To find the condenser efficiencies.
8. To study and find volumetric efficiency of a reciprocating air compressor.
9. To study cooling tower and find its efficiency.
10. To find calorific value of a sample of fuel using Bomb calorimeter.
11. Calibration of Thermometers and pressure gauges.

Note:

1. **At least ten experiments are to be performed in the semester.**
2. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.**

ME- 218 E MANUFACTURING PRACTICE

L T P
- - 3

Sessional	: 25 Marks
Practical/Viva	: 25 Marks
Total	: 50 Marks
Duration of Exam	: 3 Hrs

List of Experiments:

1. To make a pattern for a given casting with all the necessary allowances, parting line, running system details. Prepare the mold and make the casting. Investigate the casting defects and suggest the remedial measures.
2. To make a component involving horizontal and vertical welding and study the welding defects and suggests their remedies.
3. To prepare a job on surface grinder/cylindrical grinder and measure the various parameters of the finished piece.
4. To cut external threads on a lathe.
5. Manufacture and assembly of a unit consisting of 2 to 3 components to have the concept of tolerances and fits (shaft and bush assembly or shaft, key and bush assembly or any suitable assembly).
6. Leveling of machine tools and testing their accuracy.
7. Disassembly and assembly of small assemblies such as tail stock, bench vice, screw jack etc.
8. Development and manufacture of complex sheet-metal components such as funnel etc.
9. Multi slot cutting on milling machine by indexing.
10. Drilling and boring of a bush.
11. Modeling of 3D runner system and creation of drawing for manufacturing of the casting patterns.
12. Development of blank size for complex sheet metal components using CAD/CAE software and compare results with manual calculation method.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list including exercises 11 and 12. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.