

BE-301 ENGINEERING MATHEMATICS – I

Unit I

Numerical analysis: Errors & Approximations, Solution of Algebraic & Transcendental Equations (Regula Falsi, Newton-Raphson, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods, Jacobi's and Gauss-Siedel Iterative methods
Definite Integrals : Definite Integrals as a limit of a sum, its application in Summation of Series.

Unit II

Calculus : Expansion of functions by Maclaurin's and Taylor's theorem. Partial differentiation, Euler's theorem and its application in approximation and errors, Maxima and Minima of function of two variables, Curvature : Radius of curvature.

Unit III

Differential Equations : Solution of Ordinary Differential Equations (Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square). Linear Differential Equations with Constant Coefficients, Cauchy's Homogeneous differential Equation, Simultaneous differential Equations, Method of Variation of Parameters

Unit IV

Matrices : Rank, Nullity, Solution of Simultaneous equation by elementary transformation, Consistency of System of Simultaneous Linear Equation, Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem and its Application to find the inverse.

Unit V

Graph Theory : Graphs, Subgraphs, Degree and Distance, Tree, cycles and Network, Algebra of Logic, Boolean Algebra, Principle of Duality, Basic Theorems, Boolean Expressions and Functions. Elementary Concept of Fuzzy Logic

References:

- 1) Higher Engineering Mathematics by B.S. Grewal, Khanna Publication.
- 2) Engineering Mathematics volume I & III by D.K. Jain
- 3) Engineering Mathematics volume I by D.C. Agrawal

ME-302 Production Technology

Unit I

Metrology :Standards of Measurements, Linear and angular instruments; slip gauges, comparators, sine bar, angle gauges, clinometers, tape gauge, screw thread measurements limit gauging, Gauged design; fits and tolerance, Vernier Calliper scale, micrometer and vernier micrometer,

Unit II

Moulding & Casting Pattern Making : Pattern and pattern making, Difference between pattern casting, function of pattern, pattern material, pattern allowances; pattern design considerations, core, core boxes, types of patterns, pattern colors, storing of patterns.

Foundry: molding and core sands and their properties molding machines, centrifugal casting, die casting shell molding; cupola description and operation. Lost wax molding; continuous casting.

Unit III

Forging: forgeable materials, forging temperatures, merits of forging compare with machining and casting, Theory and application of forging processes description; principle of toleration of drop and horizontal forging machines; General principle of designs.

Unit IV

Press working: Description and operation of processes, process of shearing, punching, piercing, blanking, trimming, perfecting, notching, lancing, embossing, coining, bending, forging and drawing press, tool dies, auxiliary equipment, safety devices.

Unit V

Welding: Gas welding, Electric arc welding, A.C. and D.C. welding machines and their characteristics. Flux, Electrodes, Pressure welding, electric resistance welding spot, seam and built welding, submerged arc welding; thermit and TIG & MIG Welding, Brazing Gas cutting Spinning: Introduction of spinning.

References:

1. O.P. Khanna; Production technology Manufacturing process; Dhanpatrai publications.
2. Kaushik JP; Manufacturing Processes; PHI
3. Bawa; Manufacturing Processes; TMH
4. Rao PN; Manufacturing Tech- Foundry, forming welding; TMH
5. Rao PN; Manufacturing Tech- Metal cutting and machine tools; TMH
6. Chapman; Workshop Technology;
7. Begeman; Manufacturing Process: John Wiley
8. Raghuvanshi; Workshop Technology;; Dhanpat Rai.
9. Ravi B; Metal Casting- CAD analysis; PHI.
10. Hajra Choudhary; Workshop Technology; Vol II
11. Pandya & Singh; Production Engineering

AE/ME-303 Thermodynamics

Unit I

Fundamental Concepts and Definitions :

Thermodynamics, Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, statement and significance, concept of an Ideal gas, Gas laws, Avogadro's hypothesis,

Heat and work transfer. First law of thermodynamics - Statement of first law of thermodynamics, first law applied to closed system, first law applied to a closed system undergoing a cycle, processes analysis of closed system, flow process, flow energy, steady flow process, Relations for flow processes, limitations of first law of thermodynamics.

Unit II

Second law of thermodynamics : heat engine, heat reservoir, Refrigerator, heat pump, COP, EPR, Available energy, Carnot's theorem, Carnot's cycle, efficiency Carnot's cycle, statement of second law, Reversible and irreversible processes, consequence of second law, Entropy, Entropy change for ideal gas, T-S diagrams, Availability and Irreversibility. Gibbs and Helmholtz functions

Unit III

Real gas : Deviation with ideal gas, Vander-wall's equation, evaluation of its constants, limitations of the equation. The law of corresponding states Compressibility factor, Generalized compressibility chart, P-V-T surface of a Real gas, Thermodynamics relations, Maxwell relations and their applications.

Unit IV

Pure Substance : Phase, Phase-transformations, formation of steam, properties of steam, PVT surface, HS, TS, PV, PH, TV diagram, processes of vapor measurement of dryness fraction, Use of steam table and Mollier chart.

Unit V

Air standard cycles : Carnot, Otto, Diesel, Dual cycles and their comparison, two stroke and four stroke engines, Brayton cycle, non-reactive gas mixture, PVT relationship, mixture of ideal gases, properties of mixture of ideal gases, internal energy, Enthalpy and specific heat of gas mixtures, Enthalpy of gas-mixtures.

References:

1. P.K.Nag; Engineering Thermodynamics; TMH
2. Cengel Y; Thermodynamics; TMH
3. Arora CP; Thermodynamics; TMH
4. Thermal Engineering by RYadav
5. Engineering Thermodynamics by Omkar Singh New Age International.
6. Basic Engineering Thermodynamics, Joel, Pearson
7. Engineering Thermodynamics by M. Achuthan, PHI India.

List of Experiments (Pl. expand it):

1. To find mechanical equivalent of heat using Joules apparatus
2. To study working of impulse and reaction steam turbine.
3. To study working of Gas turbines.
4. To calculate COP of vapour compression refrigeration system and to plot on T-s, p-H diagrams.

ME-304 Machine Drawing

UNIT I:

Drawing conventions; drawing and dimensioning I Scodes, sectional views and sectioning, surface finish and tolerances, representation of machine parts such as external and internal threads, slotted heads, square ends, and flat radial ribs, slotted shaft, splined shafts, bearings, springs, gears. Rivet heads and Riveted joints, types of welded joints and representation.

UNIT II

Basic concept, plotting technique, assembly and blow up of parts, bill of materials, product data, Free Hand Sketching : Introduction, Need for free hand sketching. Types of free hand sketches, free hand sketching of Straight lines, Circle, Arcs and Curves Ellipse,

UNIT III

Assembly Machine Drawing : IC Engines parts- piston and connecting rods; lathe machine parts: Tool post, tail stock.

UNIT IV

Introduction to Computer Aided Drafting software for 2D and 3D Modeling, Basic design concepts, design process, stages/phases in design, flowchart, problem formulation, design considerations (strength, manufacturing, maintenance, environment, economics and safety); design for recycle and reuse, Design and safety factors for steady and variable loads, impact and fatigue considerations, reliability and optimization, standardization in design..

UNIT V

Drawing of components subject to static loads: riveted joints, welded joints threaded joints, pin, key knuckle, and cotter joints, pedestal and foot step bearings, crosshead, stuffing box

References:

1. Bhat, ND; Machine Drawing; Charotar
2. Singh A; Machine Drawing; TMH
3. Narayana and Reddy; Machine Drawing; New age, Delhi.
4. Agarwal and Agrawal; Engineering Drawing; TMH
5. Shigley J E et al; Mechanical Engineering Design, TMH
6. John K C; Text Book Of Machine Drawing; PHI Learning
7. Dr. K. K. Dwivedi & Dr. Mukesh Pandey, Machine Drawing Design Dhanpat Rai & co.
8. Er. R. K. Dhawan Machine Drawing. S. Chand
9. Basudev Bhattacharyya; Machine Drawing; oxford university press.

List of Experiments (Please expand it):

1. Computer Aided Drafting of simple machine parts
2. 2D & 3D modeling of simple solid shapes
3. Drawing of parts contained in the syllabus

AE/CE/ME-305 Strength of materials

UNIT I

Simple Stress and strain: stresses in members of a structure, axial loading, normal stress, shear stress, bearing stress, analysis of simple structures, stepped rods, members in series and parallel: stress-strain diagram, Hooke's law, modulus of elasticity, Poisson's ratio, Relation between the elastic moduli, Thermal stress and strain,

UNIT II

Compound stress and strain: principal stresses and principal planes, normal and shear stress, Graphical method-Mohr's circle, Mohr's circle construction for like stresses, unlike stresses, two perpendicular direct stresses as the state of simple shear, ductile and brittle failures,

UNIT III

Deflection of beam: pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, shear force and BM diagram, relationship among load, shear and BM, shear stresses in beams, strain energy in bending, deflection of beams, equation of elastic curve, Macaulay's method.

UNIT IV

Torsion in shafts: stresses in a shaft, deformation in circular shaft, angle of twist, stepped-hollow, thin walled-hollow transmission shafts, comparison of solid and hollow shaft, shafts in series, shaft in parallel, combined bending and torsion,

UNIT V

Theories of failures: maximum normal stress & shear stress theory; maximum normal and shear strain energy theory; maximum distortion energy theory; application of theories to different materials and loading conditions.

Columns: stability of structures, Euler's formula for columns with different end conditions, Rankin's formula.

References:

1. Er. R.K. Rajput; Strength of materials; S.Chand & Company PVT.LTD.
2. Rattan; Strength of materials; TMH
3. Nash William; Schaum's Outline Series; Strength of Materials; TMH.
4. Negi; strength of materials; TMH
5. Singh Arbind K; Mechanics of Solids; PHI
6. Sadhu Singh; Strength of Materials; Khanna Pub.
7. Kamal Kand Ghai RC; Advanced Mechanics of Materials; Khanna Pub.

List of experiments (Please expand it):

1. Standard tensile test on MS and CI test specimen
2. Direct/cross shear test on MS and CI specimen
3. Transverse bending test on wooden beam to obtain modulus of rupture
4. Fatigue test
5. Brinell Hardness test
6. Vicker hardness test
7. Rockwell hardness test
8. Izod/Charpy impact test