MATS UNIVERSITY
SEMESTER –III
BRANCH – MECHANICAL ENGINEERING
SUBJECT- MATHEMATICS - III
CODE-BT310

Unit-I

Fourier Series

Periodic functions, Euler's formula. Even and odd functions, half range expansions, Fourier series of different wave forms.

Unit-II

STATICS

Random variables , discrite and continuous probibilitydistribusions,expectations,mean and standard divisions,moments and moment generating function,distribution-binominal poisson and normal distribusion

Unit-III

Special Functions

Power series solution of differential equations, Frobenius method, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation, Error function and its properties.

Unit-IV

Partial Differential Equations

Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients Applications: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation, solution by the method of separation of variables. Laplacian in polar coordinates.

Unit-V

Functions of Complex Variable

Limits, continuity, derivative of complex functions, analytic function, Cauchy-Riemann equation, conjugate functions, harmonic functions; Conformal Mapping: Mapping of a complex function, conformal mapping, standard transforms, mapping of standard elementary transformations, complex potential, applications to fluid flow problems; Complex Integration : Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions, singular points, poles, residue, complex integration using the method of residues, evaluation of real integrals by contour integration.

Text Books

1. Advanced Engineering Mathematics by Kreyszing Erwin ; Wiley Eastern, New Delhi

2. Higher Engineering Mathematics by BS Grewal : Khanna Publishers, New Delhi.

3. Numerical Solutions of Differential Equations by NK Jain ; Prentice Hall, Delhi.

4. Differential Equations by Sharma and Gupta ; Krishna Prakashan Media (P) Ltd.,Meerut.

5. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.

6. Jain, Iyenger & Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi , 2003.

7. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.,2000

Reference Books :-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.

2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.

3. E. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.

4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.

5. Devi Prasad, An introduction to Numerical Analysis, Narosa Publication house, New Delhi 2006

MATS UNIVERSITY
SEMESTER –III
BRANCH – MECHANICAL ENGINEERING
SUBJECT- COMPUTER PROGRAMMING
CODE-BT311

UNIT - I

Algorithm / pseudo code, flowchart, program development steps, structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.

UNIT – II

Input-output statements, statements and blocks, if and switch statements, loops- while, do-while and for statements, break, continue, goto and labels, programming examples.

UNIT – III

Designing structured programs, Functions, basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, C preprocessor, example c programs.

UNIT – IV

Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays. pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory managements functions, command line arguments, c program examples.

UNIT – V

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bitfields, C program examples.
Input and output – concept of a file, text files and binary files, streams, standard I/o, Formatted I/o, file I/o operations, error handling, C program examples.

TEXT BOOKS :

1. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
2. DataStructures Using C – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.

REFERENCES :

1. C& Data structures – P. Padmanabham, B.S. Publications.
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie,
PHI/Pearson Education
3. C Programming with problem solving, J.A. Jones & K. Harrow,
dreamtech Press
4. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
5. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education

MATS UNIVERSITY
SEMESTER –III
BRANCH – MECHANICAL
SUBJECT - ENGINEERING THERMODYNAMICS
CODE- BT312

UNIT – I

First Law Of Thermodynamics (a) Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics, Work and Heat transfer, flow work, general numerical application. (b) First Law of thermodynamics, internal energy, proof of internal energy as a point function, general numerical application of first law to non-flow process and steady flow process.

UNIT II

a) Second law of thermodynamics: Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, PMM of Second kind, reversibility and irreversibility, causes of irreversibility, Carnot cycle, Carnot theorem, Absolute thermodynamic temperature scale. b) Entropy: Clasius theorem, the property of entropy, the inequality of Clausius, Entropy principle and its applications, Entropy change during different thermodynamic processes.

UNIT III

Properties of Pure substances: Thermodynamic properties of pure substances in solid,liquid and vapour phases, Phase Transformations, dryness fraction, Triple point, critical state, p-v, p-T, T-s, h-s diagrams, P-V-T surfaces,– Properties and processes in ideal vapour, use of steam tables and Mollier's diagram in determination of steam properties, energy interaction and entropy calculations.

UNIT IV

a) Availability and Irreversibility: Available energy, availability of a closed system, availability function of a closed system availability of steady flow system, availability function of open system , Helmholtz function , Gibbs functions, Irreversibility for closed and open system, Second law efficiency.

b) Thermodynamic Relationships: Maxwell's equations, T-ds equations, difference in heat capacities, coefficient of Volume expansion and isothermal compressibility, adiabatic compressibility, ratio of specific heat, energy equations, Joule-Kelvin effect, Clausius-Clapeyran equation.

UNIT V

Boilers:

Classification of boiler, difference between water tube and fire tube boiler, construction and working of Cochran fire tube boiler, construction and working of Babcock Wilcox water tube boiler, High pressure boiler- advantages, construction and working of Lamont boiler, function of

various boiler mounting and accessories, Draught-definition and classification. Performance of Boiler: Evaporation rate, equivalent evaporation, factor of evaporation, Boiler efficiency, Boiler trial, heat balance sheet of boiler.

Text Books:

1. Thermodynamics- An Engineering Approach – Cengal & Boles – McGraw Hill

2. Engineering Thermodynamics – P.K. Nag – TMH Publishers

Reference Books:

1. Fundamental of engineering thermodynamics- R.Yadav ,CPH, Allahabad

2. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria & Sons

3. Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag,Wiley,Delhi

4. An Introduction to Thermodynamics-Y.V.C.Rao University Prass, Hyderabad

5. Thermodynamics – C.P. Arora – TMH Pub.

MATS UNIVERSITY
SEMESTER –III
BRANCH – MECHANICAL ENGINEERING
SUBJECT - MECHANICS OF SOLID-I
CODE-BT313

UNIT – I

Introduction

Basic of Stress & Strain, elastic constants, stress – strain diagram, Hooke's law, stresses in the components subjected to multi-axial forces, temperature stresses, statically indeterminate systems.

UNIT – II

Bending of Beams

Bending of Beams with symmetric section, boundary conditions, pure bending, bending equations, Transverse shear stress distribution in circular / hollow circular / I & T section.

UNIT – III

Deflection of Beams

Relation between slope deflection & radius of curvature, solution of beam deflection, problems by Macaulay's Method, Direct integration method, Moment Area method, Method of Super position.

UNIT - IV

Torsion

Deformation in circular shaft due to torsion, basic assumptions, torsion equations, stresses in elastic range, angular deflection, hollow & stepped circular shaft.

Springs

Closed & Open Coil Helical Springs subjected to Axial Load, Springs in parallel & series.

UNIT – V

Principal Stress & Strain

Transformation of plane stress, principal stresses, maximum shear stress, Mohr's Circle for Plane Stress,

Plane Strain and its Mohr's circle representation, Principal Strains, Maximum Shear Strain.

Combined Loading

Components subjected to bending, torsion & axial load.

TEXT BOOKS

1. Strength of Material – Dr. Sadhu Singh – Khanna Publishers

2. Elements of Strength of Material – Timo Shenko & Young – EWP Press

3. Strength of Material – R.K. Rajput – Dhanpat Rai & Sons

REFERENCE BOOKS

1. Strength of Material – Rider – ELBS

2. Mechanics of Material – F.P. Bear & E.E. Johnston – McGraw Hill

3. Mechanics of Material – J.M. Gera & Time Shenko – CBS Publishers

4. Introduction to Solid Mechanics – I. H. Shames – PHI

5. Engineering Mechanics of Solids – E.P. Popov – PHI

6. Strength of Material – Shaums Outline Series – McGraw Hill

MATS UNIVERSITY
SEMESTER –III
BRANCH – MECHANICAL
SUBJECT - MATERIAL SCIENCE & METALLURGY
CODE- BT314

UNIT I

Solidification of Metals and Alloys: Mechanism of solidification, nucleus formation and crystal growth, Homogeneous and Heterogeneous nucleation, Metal ingot structure-dendrite and columnar grains, grain boundaries, grain growth, solidification process, effect of grain size on properties of metals.

UNIT II

Mechanical Properties of Materials: Elastic and Plastic behavior of solids, Material properties – Elasticity, Plasticity, Ductility, Malleability, Brittleness, Toughness, Stiffness, Yield strength, Resilience, Hardness, Hardenability, fatigue, creep, and Tensile strength. Deformation of Metals: Elastic deformation: Elastic after effect, Plastic deformation: Deformation by Slip (shear deformation)- Critical Resolved Shear Stress, Deformation by twinning, Differences between slip and twinning. Dislocation theory-Edge dislocation, Screw dislocation. Imperfection in crystal structure: Point defects – Interstitial Defect, Frankel Defect and Schottky defect; Line defects- Edge dislocations, Screw dislocation; Surface defects – Tilt boundary, Twin boundary and Stacking fault; Volume defects. Strain hardening, Seasons cracking, Baushinger effect, Cold and Hot working processes, effect on properties like recovery, recrystallization, grain growth and grain size.

UNIT III

Phase Diagrams: Phase and phase equilibrium: solidification of pure metals and alloys, Gibb's phase rule, Hume-Rothery's rule, Types of Phase Equilibrium diagrams: Isomorphous- Lever rule, Monotectic, Eutectic-Hyper, hypoeutectic, EutectoidHyper, hypoeutectoid, Peritectic and Peritectoid system. Allotrophy of iron and Fe-C diagram.

UNIT IV

Heat Treatment of carbon and alloy steels: Introduction, purpose and advantages of heat treatment, defects due to faulty heat treatment, T-T-T curve and micro constituents in steel heat treatment processes like Annealing-stress relief, spheroidising, Process and Full annealing; Normalising, Hardening, Tempering- Austempering, Martempering, Surface hardening-Flame, Induction and Case hardening: Carbuising- Pack and Gas carburizing, Nitriding, Cyaniding, Carbo-Nitriding.

UNIT V

Engineering Materials: Composition, Properties and Application of the following Engg. Materials:- Ferrous Metals: Cast Iron & Steel, Cast Iron-Grey Cast Iron, White Cast Iron, Malleable Cast Iron, Nodular Cast Iron, Chilled CI, Alloy CI, Mechanite CI, Steels- Unalloyed steels or Plain carbon steels- Low, Medium, High carbon steels. Alloy steelsStainless steel, Martensitic stainless steel, Ferritic stainless steel, High Speed Steel, Heat resisting alloys; spring steel. NonFerrous Metals & Alloys - Copper Alloys: Brasses – Muntz metal, Cartridge brass, Admiralty brass, Naval Brass, Bronzes – Gun Metal, Phospher Bronze, Aluminium Bronze, Copper-Nickels alloys. Bearing metals- Babbit, Copper lead alloys, Bronze bearing alloys. Light metal alloys: Aluminium alloys- Duralumin, Cast Aluminium alloys, Aluminium Silicon Alloys. Sintered Carbide.

TEXT BOOKS

1. Engineering Physical Metallurgy – Lakhtin – CBS Publishers & Distributors
2. Materials Science- Narang – CBS Publishers & Distributors

REFERENCES

1. Physical Metallurgy - Clark & Varney, East West Edn., New Delhi
2. Engineering Materials - Woulf series.
3. Material Science & Engg. – A first course – V. Raghavan – PHI (P) Ltd., Delhi, 2003
4. A Text Book of Material Science & Metallurgy – O.P. Khanna – Dhanpat Rai & Sons – New Delhi

MATS UNIVERSITY
SEMESTER –III
SUBJECT- MACHINE DRAWING
CODE- BT315

UNIT- I Machine Drawing Conventions

a) Conventional representation of machine components-leaf spring, leaf spring with eyes, coil spring (tension and compression),disc spring, spiral spring, splined shaft, serrated shaft, square end of shaft, ball and roller bearing, spur gearing, bevel gearing ,worm and worm wheel, straight knurling, diamond knurling, internal and external thread, method of designating and dimensioning metric thread. b) Representation of geometrical and dimensional tolerance-Straightness, flatness, circularity, cylindricity, parallelism, perpendicularity, angularity, concentricity and coaxiality, symmetry, radial run out and axial run out. Representation of dimensional tolerance of hole, shaft and fits. c) Representation of surface roughness and direction of lay of machining. d) Representation of welded joints- representation of form, location and size of welds

UNIT-II PROJECTION AND SECTIONAL VIEW

a) Conversion of pictorial views into orthographic views-First angle projection and third angle projection. b) Sectional view Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, sectioning conventions-spokes, web, rib, shaft, pipes, different types of holes, hatching or section lines, conventions of section lines for different metals and materials.

UNIT- III SCREWED FASTENERS

a) Screwed Fasteners Drawing hexagonal nut and square nut, hexagonal headed bolt, square headed bolt and washer. b) Riveted Joint Form and properties of snap or cup head rivet, dimensions of rivet joint, Type of riveted joints, single riveted lap joint, double riveted (chain) lap joint ,double riveted (zigzag) lap joint, single riveted (single strap) butt joint, single riveted (double straps) butt joint.

UNIT-IV

Assembly Drawing Preparation of assembly drawing and bill of materials of following assemblies from its disassembled views: (i) Cotter joint- Sleeve & Cotter Joint, Spigot and Cotter joint (ii) Pin Joint or Knuckle joint (iii) Bearing-Bushed bearing, Plummer block (iv) Coupling-Flange coupling ,Flexible coupling (v) Pulley-Fast and loose pulley (vi) Valves-Steam stop valve, Blow-off cock, Lever safety valve

UNIT-V

Gear Drawing, Gear terminology such as pitch, pitch circle diameter, module, addendum, root circle diameter, hole depth, blank diameter etc., Construction of cycloidal, involutes teeth-profiles, Pinion and rack meshing, spur gear meshing.

Marks allotted to UNIT I to UNIT III is 16 each whereas for UNIT IV it is 32

Text Books:

1. Machine Drawing, N.D. Bhatt, Charotar Book Stall, Anand 2. A Text Book of Machine Drawing, P.S.Gill, S.K.Kataria, Delhi
2. Machine Drawing, R.K.Dhawan,S,Chand,Delhi

Reference Books:

1. Textbook of Machine Drawing, K.C. John,PHI,Delhi
2. Machine Drawing, N.Sidheswar,P. Kannaiah, &V.V.S. Sastry, TMH,Delhi
3. Machine Drawing With Autocad,, Pohit, Goutam & Ghosh, Goutam,Pearson,Delhi

MATS UNIVERSITY
SEMESTER –III
BRANCH – MECHANICAL ENGINEERING
SUBJECT- COMPUTER PROGRAMMING LAB
CODE - BT316

EXPERIMENTS TO BE PERFORMED

1. Write a program to calculate the area & perimeter of the rectangle and the area & circumference of the circle. The length and breadth of a rectangle and radius of a circle are input through keyboard.
2. Write a program to determine whether the character entered through a keyboard is a capital letter, a small case letter, a digit or a special symbol.
3. Write a program to add first seven terms of the following series using looping statements series is

$$s = \frac{1}{1!} + \frac{2}{2!} + \frac{3}{3!} + \cdots$$

4. Write a program which has the following options:
    a. Factorial of a number
    b. Prime or not
    c. Odd or even
5. Write a program to implement Bubble sort on a set of 10 numbers.
6. Write a program to store every character typed at the keyboard into a file. The procedure should come to an end as soon as the 'Esc' key is pressed.
7. Write a program to find the roots of an equation using Newton Raphson Method.
8. Write a program to practice one of the Numerical Integration Method.
9. Write a program to find the solution of Differential Equation by Modified Euler's Equation.
10. Write a program to find the solution of Differential Equation by Runge Kutta Equation.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. P-IV, 2.6 G. Hz., 128/256 MB SDRAM, 40 GB HDD, 1.44 MB FDD, 14" Colour Monitor, 52 X CD RW,
Laser Scroll Mouse
2. Software Required – C & C++

MATS UNIVERSITY
SEMESTER –III
BRANCH – MECHANICAL ENGINEERING
SUBJECT- Thermodynamics Laboratory
CODE - BT317

EXPERIMENTS TO BE PERFORMED

1. To study Mountings & Accessories of a Boiler.
2. To study the Cochran Boiler and it's Accessories and Mountings.
3. To study the Lancashire and it's Accessories and Mountings.
4. To study the Babcock Wilcox and it's Accessories and Mountings.
5. To study a Simple Steam Engine.
6. To study a Simple Steam Engine With D-Slide Valve.
7. To study a Compound Steam Engine.
8. To study Meyer's Expansion Valve of Steam Engine.
9. To study Drop Valve of Steam Engine.
10. To study Two Stroke Petrol Engine.
11. To study Four Stroke Petrol Engine.
12. Determination of vacuum efficiency and condenser efficiency of a surface steam condenser.
13. Performance and testing of steam jet condenser.
14. Study of Steam Turbines
15. Study of Reciprocating Compressor

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Cornish Boiler or its model with mountings and accessories.
2. Cochran Boiler or its model with mountings and accessories.
3. Lancashire Boiler or its model with mountings and accessories.
4. Babcock Wilcox Boiler or its model with mountings and accessories.
5. Reducing Valve
6. Expansion Steam Trap
7. Steam Injector
8. Green Economizer
9. Super Heater
10. Steam Engine with D-Slide Valve
11. Spring Loaded Safety Valve
12. Throttle Valve
13. Stop Valve Hopkins's Type
14. Blow off Cock
15. Feed Check Valve
16. Lever Safety Valve
17. Dead Weight Safety Valve
18. Pressure Gauge
19. Fusible Plug
20. High Steam Low Water Safety Valve
21. Antipriming Pipe

22. Model of Two Stroke Petrol Engine
23. Model of Four Stroke Petrol Engine
24. Surface Steam Condenser experimental setup
25. Jet Condenser experimental setup
26. Reciprocating Compressor
27. Steam Turbine

MATS UNIVERSITY
SEMESTER –III
SUBJECT-MACHINE DRAWING LAB
CODE- BT318

MATS UNIVERSITY
SEMESTER –III
BRANCH – MECHANICAL ENGINEERING
SUBJECT- MACHINE SHOP LAB
CODE BT319

EXPERIMENTS TO BE PERFORMED

LATHE OPERATIONS

1. To Perform Plain turning in lathe machine

2 .To Perform Taper turning in lathe machine

3 .To Perform Step turning in lathe machine

4 .To Perform Thread cutting in lathe machine

5 .To Perform Facing in lathe machine

6 .To Perform Knurling in lathe machine

7. To Perform Drilling in lathe machine

8. To Perform Boring in lathe machine

DRILLING OPERATIONS

1. Preparation of model with two or three different sizes holes for different materials.

2. Preparation models of different holes by maintain minimum distance between them.

SHAPING OPERATIONS

1. Hexagon on a round bar, key ways, grooves splines.

2. Shaping step block cut dovetail to angles 60, 90, 120 degrees.

GRINDING OPERATIONS

1. Grinding flat surface on a surface grinder.

2. Grinding Cutting tools to the required angles.

LIST OF MACHINES REQUIRED

1. LATHE MACHINE

2. SHAPER MACHINE

3. DRILLING MACHINE

4. GRINDING MACHINE