

MTH – 301
COMPUTATIONAL TECHNIQUES

UNIT I MATRICES

Eigenvalues and Eigenvectors of a real matrix , Characteristic equation , Properties of Eigenvalues and eigenvectors , Cayley-Hamilton Theorem , Diagonalization of matrices , Reduction of a quadratic form to canonical form by orthogonal transformation

UNIT II INFINITE SERIES

Sequences , Convergence of series , General properties , Series of positive terms , Tests of convergence (Comparison test, Integral test, Comparison of ratios and D’Alembert’s ratio test) , Alternating series , Series of positive and negative terms , Absolute and conditional convergence , Power Series , Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES

Limits and Continuity , Partial derivatives , Homogeneous functions and Euler’s theorem , Total derivative , Differentiation of implicit functions , Change of variables , Partial differentiation of implicit functions , Taylor’s series for functions of two variables .

Errors and approximations , Maxima and minima of functions of two variables

UNIT IV IMPROPER INTEGRALS

Improper integrals of the first and second kind and their convergence , Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions , Properties , Evaluation of integrals using Beta and Gamma functions , Error functions.

UNIT V MULTIPLE INTEGRALS

Double integrals , Change of order of integration , Area enclosed by plane curves , Triple integrals , Volume of Solids , Change of variables in double and triple integrals , Area of a curved surface.

TEXT BOOKS :

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw Hill Co. Ltd.,

MEC-302 Thermodynamics

UNIT I

Basic concepts: Thermodynamics, Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, 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, 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 of Carnot's cycle, statement of second law Reversible and irreversible processes.

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 there 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 there comparison, two stroke and four stroke engines, Brayton cycle, non reactive gas mixture. Internal energy, Enthalpy and specific heat of gas mixtures, Enthalpy of gas mixtures.

References:

1. P.K.Nag; Engineering Thermodynamics; TMH
2. Van GJ; Thermodynamics; John Wylen
3. Cengel Y; Thermodynamics; TMH
4. Arora CP; Thermodynamics; TMH
5. Thermal Engineering by R Yadav
6. Engineering Thermodynamics by Omkar Singh New Age International.
7. Engineering Thermodynamics by Ratha Krishanan PHI India Pvt. Ltd.
8. Engineering Thermodynamics by M. Achuthan, PHI India.

List of Experiments :

1. To find mechanical equivalent of heat using Joules apparatus
2. To study working of impulse and reaction steam turbine by models.\
3. To study working of Gas turbines by models and to identify various processes of Brayton Cycle.
4. To calculate COP of vapour compression refrigeration system and to plot on T-s, p-H diagrams.
5. To plot specific fuel consumption versus rpm diagrams for diesel and petrol engines

Theory classes must be supplemented with laboratory classes.

MEC-303 Machine Drawing & design

UNIT I:

Drawing and dimensioning IS codes, 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

Machine Drawing: Basic concept, plotting technique, assembly and blow up of parts, bill of materials, product data; Cotter and Knuckle joints, pedestal and footstep bearings, crosshead, stuffing box, IC engines parts - piston and connecting rods; lathe machine parts.

UNIT III

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

UNIT IV

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 IV

Design of components subject to static loads: riveted joints, welded joints threaded joints, pin, key knuckle, and cotter joints

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 JE et al; Mechanical Engineering Design, TMH
6. John KC; Text Book Of Machine Drawing; PHI Learning
7. Kulkarni SG; Machine Design; TMH
8. Mubeen and Mubeen; Machine Design.
9. Bhandari VB; Design of Machine elements; TMH
10. Sharma PC, Agarwal DK; Machine Design; Katson
11. Luzzader WJ, Duff JM; Fundamental of Engg Drawing Interactive Graphics; PHI.
12. PSG Design data book
13. Mahadevan and Reddy's Mechanical design data book

List of Experiments:

1. Computer Aided Drafting of simple machine parts
- 2 3D modeling of simple solid shapes
- 3 Design and drawing of parts contained in the syllabus

MEC-304 Strength & Mechanics of materials

UNIT I

Mechanical properties of materials: Ductility, malleability, hardness, toughness, fatigue, creep; behavior of materials under tension, compression, bending, shear; ductile and brittle materials, failure of MS and CI in tension and torsion

UNIT II

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, elastic and plastic behavior of materials, deformation under axial loading, statically indeterminate problems, stress due to temperature, Poisson's ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, Mohr's circle and its application to two and three dimensional analysis

UNIT III

Bending: pure bending, deformation and stress, bending of composite sections, eccentric axial loading, shear force and BM diagram, shear stresses in beams, strain energy in bending, deflection of beams, equation of elastic curve, Macaulay's method and Area moment method for deflection of beams.

UNIT IV

Torsion in shafts: stresses in a shaft, deformation in shaft, angle of twist, stepped-hollow, thin walled-hollow transmission shafts Leaf springs; helical springs, open and closed coil, stress in spring wire, deflection of helical spring.

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.

References:

1. Beer FP, Johnson ER, Dewolf JT : Mechanics of Materials; TMH
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 K and Ghai RC; Advanced Mechanics of Materials; Khanna Pub.

List of Experiments:

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 beams to obtain modulus of rupture
4. Fatigue test
5. Brinell Hardness tests
6. Vicker hardness test
7. Izod/ Charpy impact test

MEC-305 Production Technology

Unit I

Standards of Measurements, Linear and angular instruments; Gauges comparators, sine bar, angle gauges, clinometers, tape gauge, screw thread measurements limit gauging, Gauge design; fits and tolerance. Rolling: General description of machines and process; construction of mills; hot and cold rolling techniques

Unit II

Metal cutting : Principles of metal cutting, tool geometry ,Tool life plots , Mach inability, Tool wear , Cutting force analysis ,Cutting tool materials & Cutting fluids ,Economics of metal machining .

Unit III

Pattern Making: Pattern and pattern making, pattern allowances; types of patterns. Foundry: molding and core sands and their properties molding machines, dye casting shell molding; cupola description and operation. Lost wax molding; continuous casting.

Unit IV

Forging: Theory and application of forging processes description: 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, stock feeders, scrap cutters, forces, pressure and power requirements, requirements of stock material.

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 and TIG & MIG Welding, Brazing Gas cutting

References:

1. Anderson and Tetro; Shop Theory;TMH
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 I
11. Pandya & Singh;Production Engineering Science:

List of Experiments

1. PATTERN DESIGN AND MAKING (CONNECTING ROD)
2. MELTING AND CASTING PRACTICE
3. PREPARATION OF LAP JOINT USING SPOT WELDING
4. HYDRAULIC PRESS WORKS-ROD BENDING
5. PROCESSING OF PLASTICS-INJECTION MOULDING

MEC- 306 –Programming Language in C

UNIT I

Fundamentals of C Programming: History of C; Structure of a C Program; Data types; Constant & Variable, naming variables; Operators & expressions; Control Constructs – if-else, for, while, do-while; Case switch statement.

UNIT II

Functions; Arguments; Return value; Parameter passing – call by value, call by reference; Return statement; Scope, visibility and life-time rules for various types of variable. static variable; Calling a function; Recursion – basics, comparison with iteration, types of recursion- direct, indirect, tree and tail recursion, when to avoid recursion, examples.

UNIT III

Arrays: Arrays: Introduction to Arrays, Array Declaration, Single and Multidimensional Array, Memory Representation, Strings, String handling functions.

Pointers: Introduction to Pointers, Address operator and pointers, Declaring and Initializing pointers, Assignment through pointers. Pointer v/s array; Pointer to pointer; Array of pointer & its limitation; Function returning pointers; Pointer to function, Function as parameter.

UNIT IV

Structure and Union: Declaration of structure, Accessing structure members, Structure Initialization, Union.

Advanced Programming Techniques: Special constructs – Break, continue, exit(), goto & labels; Pointers - & and * operators, pointer expression, pointer arithmetic, dynamic memory management functions like malloc(), calloc(), free();

UNIT V

Miscellaneous Features: File handling and related functions; printf & scanf family; C preprocessor – basics, #Include, #define, #undef, conditional compilation directive like #if, #else, #elif, #endif, #ifdef and #ifndef; Variable argument list functions.

References:

1. Kerninghan & Ritchie “The C programming language”, PHI
2. Schildt “C: The Complete reference” 4th ed TMH.
3. Cooper Mullish “The Spirit of C”, Jaico Publishing House, Delhi
4. Kanetkar Y. “Let us C”, BPB.

List of Experiments

1. WAP to perform arithmetic operations (Addition, Subtraction, Multiplication, Division) on two numbers.
2. WAP to calculate gross salary of an employee [using formula: gross_sal = basic_sal+hra+da].
3. WAP to calculate area of circle.
4. WAP to evaluate marks of student for 3 subjects, calculate percentage and display their grades.

	Marks	grades
CASE -1:	90-100	A
CASE -2:	80-89	B
CASE -3:	65-79	C
CASE -4:	Otherwise	D
5. WAP to determine sum of odd series from 1 to N
6. WAP to calculate factorial of a number.
7. WAP to print Fibonacci series up to N. [E.g. - 0 1 1 2 3 5.....]
8. WAP to identify whether given number is prime or not.
9. WADF to identify whether given number is even or odd.
10. WADF to print whether given year is leap year or not.
11. WADF to check whether the 5 digit number is palindrome or not [A palindrome number or numeral palindrome is a number that remains the same when its digits are reversed. Like 16461, for example, it is "symmetrical".].
12. WADF to check whether 5 number entered is Armstrong number or not.[An Armstrong number is an n-digit number that is equal to the sum of the nth powers of its digits. Like 153]
13. WAP to find the sum of the digits of a number.
14. WAP to input 3 sides of triangle and identify the type of triangle.
15. WAP to input 5 digit numbers and find the sum of the first and last digit.
16. WAP to check whether the number is power of 2 or not.
17. WAP to find out GCD of two numbers.
18. WAP to check whether given number is perfect power of any natural number.