BE-401

ENGINEERING MATHEMATICS – II

Unit I

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution,Testing of Hypothesis |:Students t-test, Fisher's z-test, Chi-Square Method.

Unit II

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals.

Unit III

Introduction of Fourier series: Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier. Fourier transform, Sine and Cosine transform.

Unit IV

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions,properties of Laplace Transform, Change of scale property, second shifting property, Laplace transformof the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations.

Unit V

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning ofGradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem.

References:

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

ME- 402
MATERIAL SCIENCE

Unit 1 Ferrous and Non-Ferrous Metals and Alloys: -Properties and application of various steels and cast iron. Effect of impurities in ferrous metals. Effect of common alloying elements on the steels, High speed steels, Stainless steel. Corrosion and its prevention. Composition, microstructure, properties and applications of Aluminium and its principle alloys, Copper and its principle alloys, Nickel and its principle alloys.

UIT-II Mechanical Properties & Equilibrium Diagram: Various mechanical properties like strength, stiffness, elasticity, plasticity, ductility, hardness, impact strength, malleability, brittleness, toughness, resilience, etc Allotropy structure of alloys, lever rule, phase rule, Various types of phase diagrams. Cooling curves, Iron carbon equilibrium diagram . TTT diagrams.

UIT-III Heat Treatment of Metals and Alloys and Powder metallurgy: Heat treatment procedure for steel hardening, hardenability, Surface hardening of steel, Defects in heat treated parts. Strengthening mechanisms. Property and applications of powder metallurgy, Manufacturing of metal powders, Various process and methods of making products by powder metallurgy techniques. Composite materials

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UIT-IV Destructive and Non-Destructive Testings: Tensile, compression, shear, torsion fatigue, impact, hardness tests. Ultrasonic, magnetic, eddy current, radiography tests etc. Metallography. Introduction to instrumental methods of analysis.

UIT-V Discription of Crystal Structure and Dislocation: Seven Crystal System. Bravais lattice. Symmetry and properties of simple crystal structure Millers indices. Direction and planes indices. Edge Dislocation, Screw dislocations slip planes. Stress fields of dislocation. Grain Boundaries. Dislocation Densities. Strength of alloys. Dislocations and crystal growth.

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BOOKS RECOMMEDED

[1] Khanna,O.,P., *Material Science and Metallurgy,* Dhanpat Rai Publications,2005
[2]Nayak, S.,P., *Engineering Metallurgy & Material Science*, Charotara Publications,2000
[3]Narang., *Material Science*, Khanna Publisher-2000
[4] Singh,I. P., *Material Science and Engineering* , Jain Brothers-2003

ME- 403
THORY OF M/C AND MECHANISM

Unit 1 Basics of theory of machines: Degree of Freedom (Grubler's criterion) ,Inversions of Quadric cycle chain, single and double slider crank mechanism. Grashof's criterion, Types of kinematic synthesis, Chebychev spacing method for 3- positions, Synthesis of four bar function generator, Study Pantograph, Straight line mechanisms, Steering Mechanisms (Ackerman's mechanism, Delay's Steering Gear mechanism).

Unit 2 :Gears: Classification of gears, nomenclature, involutes and cycloidal tooth profile properties, synthesis of tooth profile for spur gears, tooth system, conjugate action, velocity of sliding, arc of contact, path of contact, contact ratio, interference and undercutting, helical, spiral, bevel and worm gears.

Unit 3 Cams: Classification of followers and cams, radial cam nomenclature, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours.

Unit 4 Gear Trains: Simple, compound, epicyclic gear trains; determination of gear speeds using vector, analytical and tabular method; torque calculations in simple, compound and epicyclic gear trains.

Unit 5 Gyroscopic: Action in Machines: angular velocity and acceleration, gyroscopic torque/ couple; gyroscopic effect on naval ships; stability of two and four wheel vehicles, rigid disc at an angle fixed to a rotating shaft

REOMME DED BOOKS :

- T. Bevan, Theory of Machines, CBS Publications & Distributions,2000
- J. Shigley, Theory of Machines and mechanisms, Oxford University,2006.
- Ambekar AG; Mechanism and Machine Theory; PHI.
- Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
- Thomas Bevan; Theory of Machines; Pearson/ CBS PUB Delhi.
- Rao JS and Dukkipati; Mechanism and Machine Theory; NewAge Delhi.
- Dr.Jagdish Lal; Theory of Machines; Metropolitan Book Co; Delhi –
- Ghosh,A,.Mallik,AK; Theory of Mechanisms & Machines, 2e,; Affiliated East West Press,

List of experiments (expandable)

1. Study of cam and follower and finding velocity and acceleration of follower
2. Study of slider crank mechanism
3. Study of diffrent kinematic pairs
4. Generation of involute teeth profile for diffrent gears
5. Performance of interference and undercutting of tooth (by ploting)
6. Study of gyroscopic effect using gyroscope
7. To study working of differential gear mechanism.
8. To study working of sun and planet epicycle gear train mechanism using models

ME-404
THERMAL ENGG AND GAS DYNAMICS

Unit I Steam generators: classification, conventional boilers, water tube boiler and Fire tube boiler. Low pressure boiler. Babcock and Wilcox boiler Cochran boiler locomotive boiler. Lancashire boiler high-pressure boilers-Lamont, Benson, Loffler and velox steam generators,

Unit II Heat balance sheet, performance and rating of boilers, equivalent evaporation, boiler efficiency, combustion in boilers, super critical boilers, fuel and ash handling, boiler draught, natural draught Artificial draught overview of boiler codes.

Unit III Gas dynamics: speed of sound, in a fluid Mach number, Mach cone, stagnation properties, one-dimensional isentropic flow of ideal gases through variable area duct-Mach number variation, area ratio as a function of Mach number, mass flow rate and critical pressure ratio, effect of friction, velocity coefficient, coefficient of discharge, diffusers, normal shock.

Unit IV Air compressors: classification and working of reciprocating compressor, and rotary compressor , work input for single stage compression , compression processes, volumetric efficiency isentropic & isothermal and mechanical efficiency, multi stage compression, inter - cooling, condition for minimum work done.

Unit V Steam nozzles: nozzle convergent. Divergent nozzle isentropic flow of vapors, flow of steam through nozzles, condition for maximum discharge, effect of friction, super-saturated flow Types of steam condensers,

References:

- R.k.Rajpuat
- R.Yadav Thermal Engg.
- Ganesan; Gas turbines; TMH
- P.K.Nag; Basic and applied Thermodynamics; TMH
- Thermodynamics by Gordon J. Van Wylen
- R. Yadav Steam and Gas Turbines
- Kadambi & Manohar; An Introduction to Energy Conversion – Vol II. Energy conversion cycles

List of Experiments (Please Expand it) (Thermal Engg and gas dynamics):

1. Study and working of Babcock and Wilcox boilers.
2. Study and working of Cochran boilers.
3. Study and working of high pressure boiler Lamont.
4. Study and working of high pressure boiler Benson.
5. Study of Induced draft/forced and balanced draft by chimney.
6. Study of different types of steam turbines.
7. Study of multistage Compressor.
8. Determination of Calorific value of a fuel
9. Determination of thermal efficiency of steam power plant

ME- 405
Fluid Mechanics

UNIT I- PROPERTIES OF FLUID

Fluid and continuum, Physical properties of fluids. Newtonian and non-Newtonian fluids. Pressure transducers, Pascal's law, pressure variation in a fluid at rest, Hydrostatic law, Manometer, Hydrostatic force on submerged body, Buoyancy and Flotation.

UNIT II- FLUID KINEMATICS

Langragian and Eulerian approach, Type of fluid flow. Continuity equation, acceleration of a fluid particle, motion of fluid particle along curved path, Normal and tangential acceleration, Rotation and Vorticity, circulation, stream and potential function, flow net. Liquid in relative equilibrium.

UNIT III- FLUID DYNAMICS

Euler's equation of motion along a streamline, Impulse momentum equation, Momentum of Momentum equation, Kinetic energy and momentum correction factor, forces on fixed and moving vanes and applications. Fluid Measurements, Velocity measurement, flow measurement.

UNIT IV- LAMINAR FLOW

Reynolds's experiment, Hagen-Poiseuille Equation, flow of viscous fluids between two parallel plates, Drop of pressure head. Effect of turbulence, Expression for loss of head due to friction in pipes**.** Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipe power transmission through pipe, water hammer in pipes.

UNIT V-DIMENSIONAL ANALYSIS

Methods of dimensional analysis, Rayleigh's method, Buckingham's theorem. Model analysis: Dimensionless number and their significance, model laws, Type of models, scale effect in model, limitation of hydraulic similitude.

Reference Books:

1. Fluid Mechanics- Yunush A. Cengel, John M. Cimbala- TMH,Delhi
2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria & Sons – New Delhi
3. A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd., Delhi\
4. Fluid Mechanics & Hydraulics Machines-R.K.Bansal-Laxmi Publications, Delhi
5. Engineering Fluid Mechanics –K.L. Kumar, Eurasia Publication House, Delhi
6. Mechanics of Fluid – B.S. Massey – English Language Book Society (U.K.)
7. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas- TMH, Delhi
8. Hydraulics and Fluid Mechanics Including Hydraulic Machine- PN Modi,& SM Seth-Standard, Delhi

List of Experiments:

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the meta-centric height of a ship model.
2. To verify Impulse Momentum Principle.
3. To calibrate a Venturimeter and study the variation of coefficient of discharge.
4. To calibrate an orifice-meter.
5. Flow measurement using Pitot tube.
6. To determine the hydraulic coefficients (C_c, C_d and C_v) of an orifice.
7. To determine the coefficient of discharge of a mouth piece.

8. To study the variation of friction factor for pipe flow.
9. To determine the head loss for a sudden enlargement
10. To determine the head loss for a sudden Contraction.
11. To determine of head loss in various pipe fittings.
12. To study of Reynolds experiment for demonstration of stream lines & turbulent flow.
13. To study the characteristics of a centrifugal pump.

ME – 406
Programming in C++

Unit – I
C++ basics, loops and decisions, structures and functions, object and classes, object arrays, constructor and destructor functions.

Unit – II
Operator and function overloading, pointers, pointers to base and derived classes inheritance, public and Private inheritance, multiple inheritance.

Unit – III
Polymorphism, virtual functions, abstract base classes and pure virtual function, friend function, early and late binding.

Unit – IV
C++ I/O system, formatted I/O, creating insertors and extractors, file I/O basis, creating disk files and file manipulations using seekg0, seekp0, tellg0 and tellp0 functions, exception handling: try, catch and throw.

Unit – V
UML concepts, object-oriented paradigm and visual modeling, UML diagrams, UML specifications, object model, object oriented design, identifying classes and object, object diagrams.

Books

1. Lafore R. "Object Oriented Programming in C++", Galgotia Pub.
2. Lee "UML & C ++ a practical guide to object oriented Development 2 ed, pearson
3. Schildt "C++ the complete reference 4ed.
4. Hans Erit Eriksson "UML 2 toolkit" Wiley.
5. Balagurusawmy "Object Orienter Programming with C ++
6. B.G., Boach "Object Oriented Analysis & Design with Applications", Addision Wesly.

ME-407
Self Study (Internal Assessment)

Objective of Self Study : is to induce the student to explore and read technical aspects of his area of interest/ho boar new topics suggested by faculty.

Evaluation will be done by assigned faculty based on report/seminar presentation endive.

ME-408
Seminar/Group Discussion (Internal Assessment)

ObjectiveofGDandseminar-istoimprovetheMASSCOMMUNICATIONandCONVINCING/ under standing skills of students and it is to give student anopportunityto exercise their rights to expressthemselves.
Evaluation will be done by assigned faculty base don group discussion and power point presentation.