

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 transform of 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 of Gradient, 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

CM-402
[MATERIAL SCIENCE & TECHNOLOGY]

Unit I

Introduction: Introduction to material science, Properties and behavior of materials useful in structure, machines and equipment, Structure- Property relationship in materials. Crystal Geometry and Structure Determination: Geometry of crystals- the Bravais lattices, Structure determination X – ray diffraction, Braggs Law, the powder method.

Unit II

Atomic Structure, Chemical Bonding & Structure of Solids: Atomic arrangements in material and imperfections. Structure of atom, Periodic table, Crystal Imperfections: Point Imperfections, Line imperfections- edge and screw dislocations, Surface imperfections.

Unit III

Phase Diagram And Phase Transformations: Phase rule, Single component systems, Binary Phase Diagrams, Lever rule, Typical Phase diagrams for Magnesia-Alumina, Copper-Zinc, Iron-carbon system, Nucleation and growth, Solidification, Allotropic transformation, Cooling curves for pure iron, Iron-carbon equilibrium diagram, Isothermal transformations (TTT curves). Deformation of Materials-Fracture: Elastic deformation, Plastic deformation, Creep, Visco-elastic deformation, Different types of fracture.

Unit IV

Heat Treatment: Annealing, Normalizing, Hardening, Martempering, Austempering, Hardenability, Quenching, Tempering, Carburising, Cyaniding, Nitriding, Flame hardening. Corrosion And Prevention: Direct Corrosion, electro-chemical corrosion, Galvanic cells, Hightemperature corrosion, Passivity, factor influencing corrosion rate, Control and of corrosion-modification of corrosive environment, Inhibitors, Cathodic protection, protective coatings. Corrosion charts.

Unit V

Typical Engineering Materials: Nonferrous metals – Copper, Aluminum, Lead, Chromium, Tin, Brass, and Zinc and its alloy, Non-metals – Glass, Enamels, Chemical stone wares, Graphite, Wood, Plastics, Rubber, Polymers and Ceramics.

References:

1. Van Vlack; MATERIAL SCIENCE
2. WOOLEF; <Title>; VOL. 1,2,3,4.
3. Perry RH & Don WG; PERRYS CHEMICAL Engineering HAND BOOK; McGraw Hill.
4. Murthy; Structures and properties of Engg Materials; TMH
5. Narula; Material science; TMH
6. Vijaya; Material Science; TMH
7. O.P. Khanna; MATERIAL SCIENCE & METALLURGY; DhanpatRai Publication.
8. S.K. HajraChoudhry; MATERIALS SCIENCE & PROCESSES; Indian Book DistribCo.

CM – 403

[ENERGY RESOURCES UTILIZATION & MANAGEMENT]

Unit I

Energy Scenario: Indian and global energy crisis, Classification of various energy sources, Renewable and Non-renewable energy sources, Remedial measures to some energy crisis. Energy Conservation: Biogas plants and their operation, Biomass and its conversion routes to gaseous and liquid fuels. Wind energy, its potential and generation by wind mills.

Unit II

Alternative Sources of Energy: Fuel cell, Solar Energy: Photo thermal and photovoltaic conversion and utilization methods, solar water heating, cooking, drying and its use for other industrial processes, solar cells their material and mode of operation. Direct and indirect methods solar energy storage, sensible heat and latent heat storage materials Solar ponds, Bio energy, biogas plants and their operation, biomass and its conversion roots to gaseous and liquid fuels, wind energy, its potential and generation by wind mills.

Unit III

Hydroelectric potential, its utilization & production, Geothermal energy its potential Status and production, Nuclear energy: Status, nuclear raw materials, nuclear reactors And other classification, Generation of Nuclear power, Nuclear installations in India and Their capacity of generation, Limitations of nuclear energy, Reprocessing of spent nuclear Fuel, Cogeneration of fuel and power, Energy from tidal and ocean thermal sources, MHD systems.

Unit IV

Fossil and Processed Fuel Coal its origin and formation, Coal analysis, Coal classification, Coal preparation, Coalwashing and coal blending, Coal carbonization, Treatment of coal gas and recovery of chemical from coal tar, Coal gasification, liquid fuel synthesis from coal, CBM.

Unit V

Petroleum crude, Types of crude, emergence of petroleum products as energy, Gaseous Fuels: Natural gas, Water gas, producer gas, L.P.G., bio- gas, coke oven gas, blast Furnace gas, LNG, CNG, Gas hydrates, GTL Technology (gas to liquid), Bio diesel.

References:

1. Brame J.S.S. and King J.G. ,Edward Arnold“Fuel Solid, Liquid and Gases” EdwardArnold (1967).
2. Sukhatme S.P, "Solar Energy-Principles of Thermal Collection & Storage", 2nd Ed., Tata McGraw-Hill.,(1996).
3. Gupta OP; Fuel and Combustion; Khana Publications
4. Gary ; Refining of Petroleum Technology

List of Experiments :

1. To carry on proximate analysis of the given coal sample.
2. To determine the calorific value of the coal by Bomb-Calorimeter method.
3. To determine the viscosity of the given oil sample by Redwood Viscometer.
4. To determine viscosity of a given coal tar with the help of tar viscometer.
5. To determine the flash and fire points of the given oil sample by Penskey Martin’s apparatus.
6. To determine the carbon residue of the given oil by Conradson method.
7. To determine cloud and pour point of given oil sample (coconut) by cloud and pour point apparatus.

CM-404
[MECHANICAL OPERATIONS]

Unit I

Particle Technology: Particle shape, particle size, different ways of expression of particle size, shape factor, sphericity, mixed particles size analysis, screens – ideal and actual screens, differential and cumulative size analysis, effectiveness of screen, specific surface of mixture of particles, number of particles in a mixture, standard screens and screen analysis of solids.

Unit II

Size Reduction: Introduction – types of forces used for comminution, criteria for comminution, characteristics of comminuted products, laws of size reduction, crushing, grinding, pulverizing and ultra-fining size reduction equipment, power requirement in communication.

Unit III

Flow of Fluid Past Immersed Bodies: Drag, drag coefficient, pressure drop, fluidization, conditions for fluidization, minimum fluidization velocity, types of fluidization, application of fluidization, slurry transport, pneumatic conveying. Motion of Particles Through Fluids: Mechanics of particle motion, equation for one dimensional motion of particles through a fluid in gravitational and centrifugal field, terminal velocity, drag coefficient, motion of spherical particles in Stoke's region, Newton's region and intermediate region, criterion for settling regime, hindered settling, modification of equation for hindered settling, centrifugal separators, cyclones and hydro cyclones.

Unit IV

Sedimentation: Principles of Sedimentation process for system involving solids, liquids & gases, classification, Separation and Filtration batch and continuous process.

Unit V

Agitation and Mixing: Application of agitation, Agitation equipment, Types of impellers – Propellers, Paddles and Turbines, Flow patterns in agitated vessels, Prevention of swirling, Standard turbine design, Power correlation and Power calculation, Mixing of solids, Types of mixers- change can mixers, Muller mixers, Mixing index, Ribbon blender, Internal screw mixer, Tumbling mixer. Sampling, Storage and Conveying of Solids: Sampling of solids, storage of solids, Open and closed storage, Bulk and bin storage, Conveyors – Belt conveyors, Chain conveyor, Apron conveyor, Bucket conveyor, Bucket elevators, Screw conveyor.

References:

1. Unit Operations of Chemical Engineering: McCabe and Smith, TMC
2. Chemical Engineering Vol. I: Coulson & Richardson, Pergamon, 1979
3. Perry RH & Don WG; PERRY'S CHEMICAL Engineering HAND BOOK; McGrawHill.
4. Nevers De; Fluid Mechanics for Chemical Engineers; TMH
5. Banchoor Badker; Introduction to chemical engg; TMH
6. Narayan CM, Bhattacharya BC; Mechanical operations for chemical eng.; PHI

List of Experiments :

1. To analyse the given sample by differential, cumulative methods using standard screen.
2. Determination of size & surface area of irregular particles using a Measuring gauge.
3. To study Crushing behavior & to determine the Rittinger's & Bond's Constant of the given solid in a Jaw crusher.
4. To determine the efficiency of a ball mill for grinding a material of known.
5. To determine the power consumption of the Hammer Mill.
6. To determine the specific cake resistance for the given slurry by Leaf Filter.
7. To determine the efficiency of a given cyclone separator.
8. To determine the efficiency of fluidized characteristic bed.
9. To study the Dorr type of thickener.
10. To study the Plate & Frame filter press.

CM-405
[Fluid Mechanics]

Unit I

Properties of fluids, fluid statics, Forces on fluids, pressure depth relationship for compressible and incompressible fluids, Forces on submerged bodies, Rigid body motion, pressure measurements, Euler's equation, Bernoulli's theorem.

Unit II

Kinematics of flow, Description of velocity field, Stream functions, Angular velocity, Fluids in circulation, Irrotational flow, Dimensional analysis, Buckingham Pi Theorem, Dimensionless numbers and their physical significance, Similitude Criteria.

Unit III

Fluid flow: Laminar and turbulent flows, Pressure drop in pipes, pipe fittings and pipe network, friction factor, Conservation of mass, momentum and energy, Mechanical engineering Bernoulli's equation .

Unit IV

Flow measuring devices for chemical plants, venturimeter, orifice meter, nozzle, Rota meter, pitot's tube and v-notch.

Unit V

Pumping and compressing of chemicals and gases, reciprocating pumps, rotary pumps, centrifugal pumps and blowers, NPSH and calibrations, mixing and agitation, types of mixers and their selection, power requirement, compressible fluid flow, introductory concepts of two-phase flow.

References: -

1. McCabe Smith; Unit Operation for Chemical Engg. TMH
2. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
3. Som and Biswas; Fluid Mechanics and machinery; TMH
4. White ; Fluid Mechanics ; TMH
5. Gupta; Fluid Mechanics; Pearson.
6. Rajpoot R. K. ; Fluid Mechanics and Hydraulic Machine.
7. Bansal R.K.; Fluid Mechanics and Hydraulic Machine.

List of Experiment:

1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Venturimeter
4. Determination of C_c , C_v , C_d of Orifices
5. Calibration of Orifice Meter
6. Calibration of Nozzle meter and Mouth Piece
7. Reynolds experiment for demonstration of stream lines & turbulent flow
8. Determination of metacentric height
9. Determination of Friction Factor of a pipe
10. To study the characteristics of a centrifugal pump.

CM-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 seekg(), seekp(), tellg() and tellp() 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 ub.
2. Lee "UML & C++ a practical guide to Object Oriented Development 2 ed, Pearson.
3. Schildt "C++ the complete reference 4ed, 2003.
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", Addison Wesley.