

B.E. 401 - ENGINEERING MATHEMATICS III

Unit I

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 II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV

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).

Unit V

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

Reference:

- (i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
- (ii) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
- (iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
- (iv) Numerical Methods using Matlab by Yang,Wiley India
- (v) Pobability and Statistics by Ravichandran ,Wiley India
- (vi) Mathematical Statistics by George R., Springer

AU/IP/ME-402 Material Science and Metallurgy

Unit I

Crystal Atoms of Solid: Structure of atom binding in solids metallic, Vander walls, ionic and covalent, Space lattice and crystal system arrangement of atoms in BCC, FCC and HCP crystal. Manufacture of Refractory and Ferrous Metals: Properties uses and selection of acid, basic and natural refractory, metallurgical coke, Properties, types, uses and brief description of the manufacturing processes for iron and steel making.

Unit II

Plastic deformation of Metals: Point and line defects in crystals, their relation to mechanical properties, deformation of metal by slip and twinning stress strain curves of poly crystalline materials viz. mild steel cast iron and brass yield point phenomenon. Cold and hot working of metals and their effect on mechanical properties, annealing of cold worked metals, principles of re-crystallization and grain growth phenomenon, fracture in metal and alloys, ductile and brittle fracture, fatigue failure

Unit III

Alloy Formation and Binary Diagram: Phase in metal system solution and inter-metallic compounds. Hume-Rottery's rules, solidification of pure metals and alloy equilibrium diagrams of isomorphous, eutectic peritectic and eutectoid system, non-equilibrium cooling and coring iron, iron carbon equilibrium diagram.

Unit IV

Heat Treatment of Alloys Principles of Heat Treatment of Steel: TTT curves heat treating processes, normalizing, annealing spheroidizing, hardening, tempering, case hardening, austempering, mar-tempering, precipitation hardening process with reference to Al, Cu alloys

Unit V

Properties of Material: Creep Fatigue etc., Introduction to cast iron and steel, Non Ferrous metals base alloys, Bronze, Brasses, Duralumin, and Bearing Metals. Plastics, Composites and ceramics: Various types of plastics, their properties and selection. Plastic molding technology, FRP, GRP resins adhesive, elastomers and their application. Powder Metallurgy: Property and Applications of Powder Metallurgy, Various process and methods of making products by powder Metallurgy techniques.

References:

1. Narula GK, KS and GuptaVK; Material science; TMH
2. Raghavan V; Material Science and Engineering, PHI Publication.
3. Raghavan V; Physical Metallurgy Principles and Practice; PHI
4. Rajendran V and Marikani; Material science; TMH
5. Srinivasan R; Engineering materials and Metallurgy; TMH
6. Navneet Gupta, Material Science & Engineering, Dhanpat Rai.
7. B. K. Agrawal, Introduction to Engineering Materials, TMH.

AU/IP/ME-403 Theory of M/C and Mechanisms

Unit 1:

Mechanisms and Machines: Mechanism, machine, plane and space mechanisms, kinematic pairs, kinematic chains and their classification, degrees of freedom, Grubler's criterion, kinematic inversions of four bar mechanism and slider crank mechanism, equivalent linkages, pantograph, straight line motion mechanisms, Davis and Ackermann's steering mechanisms, Hooke's joint.

Unit 2:

Kinematic analysis of plane mechanisms using graphical and Cartesian vector notations: Planar kinematics of a rigid body, rigid body motion, translation, rotation about a fixed axis, absolute general plane motion. General case of plane motion, relative velocity method, velocity and acceleration analysis, instantaneous center and its application, Kennedy's theorem, relative motion, Coriolis component of acceleration; velocity and acceleration analysis using complex algebra (Raven's) method.

Unit 3 :

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 4: 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. 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

References:

1. Rattan SS; Theory of machines; TMH
2. Ambekar AG; Mechanism and Machine Theory; PHI.
3. Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
4. Thomas Bevan; Theory of Machines; CBS PUB Delhi.
5. Rao JS and Duggipati; Mechanism and Machine Theory; NewAge Delhi.
6. Dr.Jagdish Lal; Theory of Machines; Metropolitan Book Co; Delhi –
7. Ghosh,A,.Mallik,AK; Theory of Mechanisms & Machines, 2e,; Affiliated East West Press, Delhi.

List of experiments (expandable)

1. To study all inversions of four-bar mechanisms using models
2. Draw velocity and acceleration polygons of all moving link joints in slider crank mechanism
3. Determination of velocity and acceleration in above using method of graphical differentiation
4. To study working of differential gear mechanism.
5. To study working of sun and planet epicycle gear train mechanism using models
6. To plot fall and rise of the follower versus angular displacement of cam and vice versa.

7. Study of universal gyroscope

8. Analytical determination of velocity and acceleration in simple mechanism using Roven's M

AU -404 Automotive Engines

Unit I Historical: development of automobiles classification of Automobiles, type of automobile engines, principle of engine operation, classification of engines, fuels for modern automobile engines like LPG, CNG, bio-diesel, national and international pollution norms.

Unit II

Engine parts and their functions, types of cylinder head, piston, special features in pistons, piston rings, types of piston rings, piston pin, connecting rod, special features of connecting rods, crank shaft, flywheel, cam and follower, camshaft, valve and valve mechanism, crank case.

Unit III

Fuel system in petrol engine, carburetion principle and carburetors, petrol injection system, MPFI fuel system, diesel engine- diesel fuel pump principle, types of fuel pumps, types of fuel injector nozzles, simple and multiple unit pumps, C. A. V. Bosch pump, types of fuel systems for diesel engines, modern distributors; Air cleaners.

Unit IV

Cooling system in Automobiles; air and water cooled engines; Lubricants system; lubrication of piston rings, piston pin and crank pin; ignition system; super charging; silencers and control of combustion noise; Vehicle safety, safety features in modern automobiles like air bags, anti-lock braking system, crumple zones, introduction to power steering and power brakes.

Unit V

Dual Fuel & Multi Fuel Engine: Combustion in dual fuel engines, factors affecting combustion in dual fuel engines performance of dual fuel engines, advantages of dual fuel engines; multi-fuel engines, characteristics of Multi fuel engines, modification of fuel system, performance of multi-fuel engines, brief introduction to working of stratified charged engine, Sterling engine, Wankel engine, variable compression engine, Air cleaners & Silencers.

References:

1. Crouse , Automotive Mechanics TMH.
2. Srinivasan S; Automotive engines; TMH
3. Gupta HN; Internal Combustion Engines; PHI;
4. Joseph Heitner, Automotive Mechanics, Principles and Practices, CBS Pub.
5. Kripal Singh, Automotive Engineering Khanna Pub.
6. Newton & Steeds , Automotive Engineering
7. Emission standards from BIS and Euro –I and Euro-III
8. Mathur ML & Sharma RP; A Course in IC Engine by, Dhanpat Rai Publications

AU/IP/ME-405 Fluid Mechanics

Unit-I

Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, specific volume, specific gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and Tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit-II

Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streaklines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets- their utility & method of drawing flow nets.

Unit-III Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications. Fluid Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.); flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturimeter, weirs and notches).

Unit-IV

Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.)

Unit-V Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law, lubrication principles.

References: -

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechanics and machinery; TMH
3. Cengel; Fluid Mechanics; TMH
4. White ; Fluid Mechanics ; TMH
5. JNIA DAKE; Essential of Engg Hyd; African Network & Sc Instt. (ANSTI)
6. Francis JRD; A Text Book of fluid Mech. for Engg. Student
7. R Mohanty; Fluid Mechanics; PHI
8. Gupta; Fluid Mechanics; Pearson.

List of Experiment (Pl. expand it):

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.
11. Verification of Impulse momentum principle.

AU-406 Computer Programming

UNIT I

Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net.

UNIT II

Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. Advanced Features Of C# Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events.

UNIT III

Installing ASP.NET framework, overview of the ASP .net framework, overview of CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls. Windows Forms: All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls

UNIT IV

Understanding and handling controls events, ADO.NET- Component object model, ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader Data base controls: Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

UNIT V XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services

References:

1. C# for Programmers by [Harvey Deitel](#), [Paul Deitel](#), Pearson Education
2. Balagurusamy; Programming in C#; TMH
3. Web Commerce Technology Handbook by Daniel Minoli, Emma Minoli , TMH
4. Web Programming by Chris Bates, Wiley
5. XML Bible by Elliotte Rusty Harold ,
6. ASP .Net Complete Reference by McDonald, TMH.
7. ADO .Net Complete Reference by Odey, TMH

List of Experiments/ program (Pl. expand it):

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#
10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page using ASP .Net.
12. Working with Forms using ASP .Net
13. Data Sources access through ADO.Net,
14. Working with Data readers , Transactions
15. Creating Web Application.