Third Semester

BTAM301 Engineering Mathematics-III

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

Unit II Laplace Transforms: Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

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.

Unit IV Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients.

Unit V Applications of PDEs: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation in Cartesian Coordinates, solution by the method of separation of variables.

Unit VI Functions of Complex Variable: Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. 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 (without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues.

Suggested Readings/ Books:

- Kreyszing, E., Advanced Engineering Mathematics, Eighth edition, John Wiley, New Delhi.
- Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, New Delhi.
- Ian N. Sneedon, Elements of Partial Differential Equations, McGraw- Hill, Singapore, 1957.
- Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth Publishing Company.
- Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, I. K. Publisher.
- Babu Ram, Advance Engineering Mathematics, Pearson Education.
- Bindra, J. S., Applied Mathematics, Volume-III, Kataria Publications.
- Advanced Engineering Mathematics, O'Neil, Cengage Learning.

BTCE301 Fluid Mechanics-I

Fluid and their properties : Concept of fluid, difference between solids, liquids and gases; ideal and real fluids; Continuum concept of fluid: density, specific weight and relative density; viscosity and its dependence on temperature; surface tension and capillarity, vapor pressure and cavitation, compressibility band bulk modulus; Newtonian and non-Newtonian fluids.

Fluid Statics : Concept of pressure, Pascal's law and its engineering hydrostatic paradox. Action of fluid pressure on plane (horizontal, vertical and inclined) submerged surface, resultant force and center of pressure , force on a curved surface due to hydrostatic pressure. Buoyancy and flotation, stability of floating and submerged bodies, Meta centric height and its determination.

Fluid Kinematics: Classification of fluid flows, velocity and acceleration of fluid particle, local and convective acceleration, normal & tangential acceleration streamline, pathline and streakline, flow rate and discharge mean velocity continuity equation in Cartesian co-ordinates. Rotational flows- Rotational velocity and circulation, stream & velocity potential functions.

Fluid Dynamics :- Euler's equation, Bernoulli's equation and steady flow energy equation;representation of energy changes in fluid system, impulse momentum equation, kinetic energy and momentum correction factors, flow along a curved streamline, free and forced vortex motions.

Dimensional Analysis and Similitude: Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh's and Buckingham's Pi method for dimensional analysis, dimension less number and their significance, geometric, kinematic and dynamic similarity, model studies.

Flow Past immersed bodies: Drag and lift deformation Drag and pressure drag. Drag on a sphere,cylinder and Airfoil: lift-Magnus Effect and circulation, lift on a circular cylinder.

Flow Measurement:- Manometers, Pitot tubes, venturimeter and orifice meters, orifices, mouth pieces, notches **(Rectangular and V-notches)** and weirs **(Sharp crested Weirs)**.

<u>**Suggested Readings / Books:**</u>

- Fluid Mechanics & Hydraulic Machines : Dr. R.K. Bansal
- Hydraulic and Fluid Mechanic by P.N.Modi & S.M.Seth
- Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker
- Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman
- Fluid Mechanics : Streetes VL & Wylie EB; Mcgraw Hill book company.
- Fluid Mechanics by White
- Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald
- Fluid Mechanics by Potter, Cengage Learning

BTCE302 Rock Mechanics & Engineering Geology

General Geology : Importance of Engg. Geology applied to Civil Engg. Practices. Weathering, definition, types and effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.

Rocks & Minerals : Minerals, their identification, igneous, sedimentary & metamorphic rocks. Classification of rocks for engineering purposes. Rock quality designation (RQD).

Structural Geology: Brief idea about stratification, apparent dip, true dip, strike and in conformities. Folds, faults & joints : definition, classification relation to engineering operations.

Engineering Geology: Geological considerations in the Engg. Projects like tunnels, highways, foundation, dams, reservoirs. Earthquake : Definition, terminology, earthquake waves, intensity, recording of earthquake.

Engineering properties of rocks and laboratory measurement : Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature

In-situ determination of Engg. Properties of Rock masses : Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses,bore hole test

Improvement in properties of Rock masses : Pressure grouting for dams and tunnels,

rock reinforcement rock bolting.

Suggested Readings / Books:

- Introduction to Rock Mechanics : Richard E. Goodman.
- Engg. Behaviour of rocks : Farmar, I.W.
- Rock Mechanics and Engg. : Jaager C.
- Fundamentals of Rock Mechanics : Jaager and Cook
- Engineering Geology : D.S.Arora
- Engineering Geology : Parbin Singh
- Rock Mechanics for Engineering : B.P. Verma.

BTCE 303 Strength of Material

Concept of Equilibrium: Load, reaction; General equilibrium equations; Equilibrium of a point in space; Equilibrium of a member; Concept of free body diagrams; Displacements; Concept of displacement-constraints/ supports; Statical-determinacy of a problem.

Simple Stress and Strains: Introduction; Concept of stress and strain; Stress-strain curves for ductile, brittle materials; Generalized Hooke's law, Stress-strain diagram of ductile and brittle material, statically determinate and indeterminate problems, compound and composite bars, thermal stresses. Elastic constants, relations between various elastic constants and its use;

Lateral strain, volumetric strain, poisons ratio; Stress and strains in thin cylinders, spherical shells; Thin vassals subjected to internal pressures.

Complex stress and strains: Introduction; Normal stress, tangential stress; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress; Concept of principal stress and its computation; Mohr circle; Principal strains, computation of principal stresses from the principal strains.

Shear force and Bending moment diagrams: Introduction to the concept of reaction diagrams—shear force and bending moment; Role of sign conventions; Types of load, beams, supports; Shear force and bending moment diagrams: simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed and varying load, and moment; Relationship between load, shear force and bending moment; Different methods for plotting a bending moment and shear force diagrams.

Bending and Shear Stresses: Introduction; Assumptions and derivation of flexural formula for straight beams; Centroid of simple and built up section, second moment of area; Bending stress calculation for beams of simple and built up section, composite sections (flitched sections); Shear stress; Variation of bending and shear stress along the depth of section.

Columns and Struts: Stability of Columns; Buckling load of an axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load.

Torsion of Circular shafts: Torsion, basic assumptions, derivation of torsion equation; Power transmitted by shafts; analysis and design of solid and Hollow shafts based on strength and stiffness; Sections under combined bending and torsion, equivalent bending and torsion.

Failure theories: Maximum principal stress theory, Maximum shear stress theory, Distortion Energy theory, Strain Energy theory, Constant   Analysis of Thin Cylinder

Suggested Readings / Books:
- Strength of Material by S. Ramamrutham
- Mechanics of Material : E .Popov
- Strength of Material : Rajput
- Strength of Materials : Sadhu Singh
- Strength of Materials by Gere, Cengage Learning

BTCE304 Surveying

Introduction: Definition, principles of surveying, different types of surveys, topographical map, scale of map.

Chain and Compass Surveying: Measurement of distances with chain and tape, direct & indirect ranging, offsets, bearing and its measurement with prismatic compass, calculation of angles from bearings.

Plane Table Surveying: Setting up the plane table and methods of plane tabling.

Levelling & Contouring: Setting up a dumpy level, booking and reducing the levels by rise & fall method and height of instrument method, correction due to curvature and refraction, characteristics of contours, methods of contouring, uses of contour maps.

Theodolite Traversing: Temporary and permanent adjustments, measurement of horizontal and vertical angles, adjustment of closing error by Bowditch & Transit rules.

Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations.

Triangulation: Selection of stations and base line, corrections for base line, satellite station and reduction to centre.

Curves: Elements of a simple curve, different methods of setting out of simple circular curve.

Suggested Readings / Books:

- Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill (2006)
- Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I and II, Laxmi Publications (2005)
- Agor, R., Surveying, Khanna Publishers (1982)
- Bhavikatti,S.S. Surveying & Levelling Volume I&II (2009)

BTCE305 Building Material & Construction

Building Stones & Bricks: General , Characteristics of a good building stone, Deterioration and preservation of stones, Artificial Stones , Composition of good brick earth, Qualities of good bricks, Classification of bricks, Tests on bricks, Varieties of fire bricks.

Cement: Composition of cement, Raw Materials, Manufacturing process, Varieties of cement, Hydration of cement, Properties , testing of cement.

Concrete : Introduction, Constituents of concrete, Batching of materials, Manufacturing process of cement concrete, workability and factors affecting it, Methods to determine workability, segregation and bleeding of concrete, Strength of concrete and factors affecting it.

Timber: Structure of a tree , classification of trees, Defects in timber, Qualities of good a timber, Seasoning of timber , Decay of timber, Preservation of timber

Miscellaneous materials: Paints, Distempering, Glass, Plastics.

Foundation and Walls : Definition, types of foundations, causes of failures of foundation and remedial measures ,Types of walls and thickness considerations.

Brick and stone masonry: Terms used, Types of bonds & their merits and demerits, rubble and ashlar joints in stone masonry, cement concrete hollow blocks and their advantages and disadvantage.

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

Roofs: Terms used, Classification of roofs and roof trusses, Different roof covering materials**.**

Plastering and pointing: Objects ,Methods of plastering , Materials and types, Defects in plastering, Special material for plastered surface, Distempering white washing and colour washing**.**

Floors: General ,Types of floors used in building & and their suitability, factors for selecting suitable floor for building**.**

Miscellaneous topics: Building Services – Plumbing service, Electrical services, Air conditioning, Accoustics and sound insulation, Fire protection measures, Lift

Suggested Readings / Books:

- Rangwala – Building materials
- Bindra SP, Arora KR Building construction
- Shetty MS , Concrete Technology
- Punmia BC, Building construction
- Singh, Parbin , Building materials
- Sushil Kumar , Building Construction

BTCE306 Fluid Mechanics Lab-I

1. To determine the meta-centric height of a floating vessel under loaded and unloaded conditions.

2. To study the flow through a variable area duct and verify Bernoulii's energy equation.

3. To determine the coefficient of discharge for an obstruction flow meter (venturimeter /orifice meter)

4. To determine the discharge coefficient for a Vee notch or rectangular notch.

5. To determine the coefficient of discharge for Broad crested weir**.**

6. To determine the hydraulic coefficients for flow through an orifice.

7. To determine the friction coefficient for pipes of different diameter.

8. To determine the head loss in a pipe line due to sudden expansion / sudden contraction/ bend.

9. To determine the velocity distribution for pipe line flow with a pitot static probe.

Suggested Readings / Books:

- Practical Fluid Mechanics for Engineering Applications (Mechanical Engineering (Marcell Dekker) By John J. Bloomer
- Fluid Mechanics Practical Manual by S.Sarabjit Singh.

BTCE-307 Strength of Material Lab

List of experiments:

1. Draw Stress Strain curve for Ductile and Brittle material in tension.

2. Draw Stress Strain curve for Ductile and Brittle material in compression.

3. Draw shear stress, shear strain curve for ductile and brittle material in torsion strength testing

4. Draw load deflection curve for spring in loading and unloading conditions.

5. To determine the hardness of the given material by Rockwell and Brinell hardness testing machine.

6. To determine the fatigue strength of the material.

7. To determine the impact strength by Izod and Charpy test.

8. To determine the load carrying capacity of the leaf spring.

9. To test a mild steel and cast iron specimen in double shear.

BTCE-305 Surveying Lab

1. Measurement of distance, ranging a line.

2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.

3. Different methods of leveling, height of instrument, rise & fall methods.

4. Measurement of horizontal and vertical angle by theodolite.

5. Determination of tachometric constants and determination of reduced levels by tachometric observations.

6. Plane table survey, different methods of plotting, two point & three point problem.

7. Determination of height of an inaccessible object.

8. Setting out a transition curve. Setting out of circular curves in the field using different methods.

BTCE-309 Workshop Training

This will be held after 2nd Semester during Summer in the Institute Workshop for four weeks daily for 4 hrs. The students will be trained in the area of Carpentary, Electrical, Plumbing, Masonary and CAD work.