SARDAR PATEL UNIVERSITY, BALAGHAT (MP)
School of Engineering and Technology
Syllabus
Course: B. Tech.   Branch: Civil Engineering   Semester: IIIrd

Academic Session: 2024-25   w.e.f - Date-02-09-2024

BCE031 Mathematics-III

Course Contents

Course Objective:
1. To develop logical understanding of the subject.
2. To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from engineering fields.
3. To make aware students about the importance and symbiosis between Mathematics and Engineering.

Unit-I

Numerical Methods-I: Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Unit-II

Numerical Methods-II: Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss- Seidal, and Relaxation method.

Unit-III

Numerical Methods-III: Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Unit-IV

Transform Calculus: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Unit-V

Concept of Probability: Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Course Outcome

CO1 - To provide knowledge of Laplace transform and Fourier Transform of elementary functions including its properties and applications to solve ordinary differential equations.

CO2- To study about acquaint the student with mathematical tools available in Statistics needed in various field.

CO3- To provide a thorough understanding of effective mathematical tools for the Numerical Solutions algebraic and transcendental equations.

CO4- To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

References Books:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

BCE032 Strength of Material

Course Contents

Course Objectives:
1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.
2. To know the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements.
3. To analyse and understand different internal forces and stresses induced due to representative loads on structural elements.
4. To analyse and understand principal stresses due to the combination of two dimensional stresses on an element andfailure mechanisms in materials.
5. To evaluate the behavior of torsional members, columns and struts.

Unit-I
Stress-Strain Relations Types of stresses and strains, Mechanicals properties and testing of steel, Hooke's law, Uniaxial tensile test, stress – strain curve, hardness, impact, Poisson's ratio, Modulus of rigidity, Bulk modulus, Relation between the elastic constants, Thermal effects, Elongation of bars of constant and varying sections, Statically indeterminate problems in tension and compression, Thin cylindrical and spherical vessels.

Unit-II
Analysis of Stresses and Strains Two dimensional stress-system, Stress at a point on an inclined plane, Principal stresses and principal planes, Transformation equations, Mohr's circle for plane stress and their applications, Two dimensional Strain-system, Normal and shear strain, Strain components at a point on a plane, Transformation-equations, Principal strains.

Unit -III
Bending of Beams Theory of simple bending - limitations - bending stresses in beams of different cross sections, beams of two materials, shear stresses in symmetrical elastic beams transmitting both shear and bending moment. Shear force and bending moment diagrams for simply supported overhanging and cantilever beams, relation between shear force, bending moment and intensity of loading.

Unit-IV
Columns and Combined stresses Short columns, Eccentrically loaded short column, Kern of rectangular and circular sections, Middle third rule, Stable and unstable equilibrium, Euler's formula for long columns with different end conditions, Rankin's formula, stability of gravity dams and retaining walls.

Unit -V
Unsymmetrical Bending and Torsion Unsymmetrical bending - Location of neutral axis, Torsion of circular solid and hollow circular shafts - power transmission, Closed-coiled and Open-Coiled helical springs, Theory of Failure.

Course Outcome

CO-1: To understand properties of materials.

CO-2: Demonstrate the concept and laws applied to member under various loading condition.

CO-3: Analyze beams, bending moment, shear force, shear flow and shear stress distribution

CO-4: Analysis of Column using different end condition with stress.

CO-5: Apply the concepts of unsymmetrical bending and torsion to solve the power transmission problems along with design of spring for shock-absorption.

Reference books:

1. Punmia B.C., Mechanics of Materials, ,Laxmi Publications (P) Ltd.
2. Rajput R. K., Strength of Materials, S. Chand.
3. S. Ramamrutham, R. Narayanan, Strength of Materials, DhanpatRai Publications.
4. R. Subramaniam, Strength of Materials, Oxford University Press.
5. Sadhu Singh , Strength of Material , Khanna Publishers
6. Mubeen A , Mechanics of solids , Pearsons
7. D.S PrakashRao, Strength of Material , University Press , Hyderabad
8. Debrath Nag, Strength of Material , Wiley
9. Jindal , Strength of Material , Pearsons.
10. Bansal R.K, Strength of Materials, Laxmi Publisher, New Delhi.
11. Nash, W.A., Strength of Materials, Mcgraw hills, New Delhi.
12. Chandramouli, Strength of Materials, PHI learning
13. Dongre A.P., Strength of Materials, Scitech, Chennai
14. Negi L. S ,Strength of Materials, McGraw Hill Professional.
15. Raj Puroshattam, Strength of Material , Pearsons
16. J.M. Gere,.J. G. Barry Mechanics of Material, Cengage Learning

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BCE033 Surveying

Course Contents

Course Objectives:
1. To provide basic knowledge about principles of surveying for location, design and construction of engineering projects.
2. Students develop skills using surveying instruments including measuring tapes, automatic levels, theodolites, and electronic distance measurement equipment.
3. The ability to identify error sources and the procedures to minimize errors.
4. Use standard survey tools.
5. Understand and apply measurement error, accuracy, precision and techniques to improve accuracy of surveys

Unit-I
Theodolite Traversing: Theodolite : Introduction, Type of Theodolite ; Modern Theodolite Temporary adjustment, Principle Axes and relationship , permanent adjustment, Measurement of Horizontal & vertical angles, Magnetic Bearings, prolonging a line, lining in. b) Traverse Computation: Consecutive and independent coordinates, adjustment of closed traverse, Gales traverse table, area calculation by coordinates.

Unit-II
Leveling Spirit leveling-Definitions of terms, Principle, Construction, Temporary and permanent adjustment of levels. Sensitivity of bubble tube, Curvature and refraction, Reciprocal leveling Barometric leveling, Study of Automatic levels.

Unit-III
Tacheometery Definitions, Principles of stadia systems. Instrument constants, Subtense and Tangential Systems. Construction and use of Reduction Tacheometers, Range Finders, EDM instruments, Total Station and their uses. Study of Laser Distance Meter.

Unit–IV
Photographic and aerial surveying Photo theodolite, principle of the method of terrestrial photogrammetry, aerial surveying, scale and distortion of the vertical and tilted photograph, comparison between air photograph and map, Study of GPS, GIS and Remote Sensing.

Unit-V
Plane Table Surveying & Computation of Area & Volume Plane Table Surveying: Equipments, Advantages and Disadvantages, Orientation, methods of plane tabling, two point and three point problems in plane tabling. Telescopic Alidade. b) Computation of area and volume: Trapezoidal and Simpsons Rule. Digital Planimeter, construction and use.

Course Outcome
CO1- Understand the basics of surveying and apply the principles of chain surveying to make the survey plans.
CO2- Illustrate Classify of dumpy level and Profile, Reciprocal leveling and Contouring.
CO3- Illustrate Trignometrical leveling and Method of locating Contours
CO4- Explain magnetic bearing and permanent Adjustment Theodolite Traversing

CO5- Understand plan table surveying, Orientation Calculate of Area of Volume to method trapezoidal and Simpson's rule

Reference Books: -

1. B.C Punmia , Surveying Vol-II & III ,Laxmi Publication.
2. S.K. Duggal, Surveying Vol. II McGraw Hill Publishing Company Ltd.
3. Saikia MD, Das BM, Das MM, Surveying, McGraw hill
4. T.P. Kanetkar and S.V. Kulkarini Surveying and Leveling-Part-I & II , Pune VidyarthiGrihaPrakashan, Pune.
5. Gopi A, Satikumar R- Advance surveying, Pearson
6. Remote Sensing and image interpretation by Lillesand T.M. and Kiefer R.W.
7. R.Agor, Advance Surveying ,Khanna Publisher
8.   Chandra AM, Higher Surveying, New Age International, new Dwlhi
9. Bhavikatti SS, Surveying and Levelling Vol. II, I.K International
10. Venkatramaiah, Surveying, University Press, Mumbai
11. BhattaBasudeb, , Remote Sensing and GIS, Oxford, New Delhi.
12. Subramanaian, Surveying &levelling, Oxford, New Delhi.
13. Joseph George Fundamentals of Remote Sensing

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BCE034 Fluid Mechanics

Course Contents

Course Objectives:
1. Be familiar with different fluids.
2. Be familiar with different fluids flow condition.
3. Learning different flow & losses in pipes.
4. Be familiar with flow in open channel & different sections.

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, strea klines, 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
Laminar Flow: Introduction to laminar 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.

Unit-V
Dimensional Analysis and use of Buckingham-pi theorem, Introduction to Turblent flow-Prandtl mixing length hypothesis, Flow over smooth & rough surface. Darcy –weisbach resistance equation variation of friction factor, pipe flow problem.

Course Outcome

CO 1 - Understand the basic concepts and principles of fluid mechanics.

CO 2 - Analyze fluid flow problems with the application of momentum and energy equations.

CO 3 - Ability to distinguish between various types of fluid flow.

CO 4 - Ability to find solutions to typical pipe flow problems

CO 5 - Basic knowledge of hydraulic machines.

Reference Books: -

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. Engg fluid mech. – By Grade & Miraj gaonkar , Nem Chand & Bros. Prakashan
4. White ; Fluid Mechanics ; TMH
5. Essential of Engg Hyd. By JNIK DAKE; Afrikan Network & Sc Instt. (ANSTI)
6. A Text Book of fluid Mech. for Engg. Student by Franiss JRD
7. R Mohanty; Fluid Mechanics By; PHI
8. Fluid Mechanics and Machines – Dr. R.K. Bansal (Laxmi Publications)
9. Fluid Mechanics – Dr. P.N. Modi (Standard Book House)
10. Fluid Mechanics and Machines – Dr. A.K. Jain (Khanna Publications)

BCE035 Construction Material & Techniques
Course Contents

Course Objectives:
1. In recognizing the good materials to be used for the construction work.
2. In investigation of soil condition, Deciding and design of suitable foundation for different structures.
3. In supervision of different types of masonry.
4. In selection of materials, design and supervision of suitable type of floor and roof.
5. To gain knowledge about doors, windows, plastering, painting, damp proofing, scaffolding, shoring, underpinning and to take suitable engineering measures.

(A) Construction Materials:
Unit-I
Stones : Occurrence, varieties, Characteristics and their testing, uses, quarring and dressing of stones. Timber : Important timbers, their engineering properties and uses, defects in timber seasoning and treatment, need for wood substitutes, Alternate materials for shuttering doors/ windows, Partitions and structural members etc. Brick and Tiles: Manufacturing, characteristics, Classification and uses, Improved brick from inferior soils, Hand molding brick table, Clay-fly ash brick table, Flooring tiles and other tiles and their characteristics.

Unit-II
Advance Construction Materials : Use of fly ash in mortars, concrete, Fly ash bricks, stabilized mud blocks, non-erodible mud plinth, D.P.C. materials, Building materials made by Industrial & amp; agricultural waste, clay products P.V.C. materials, advance materials for flooring, doors & amp; windows, facia material, interiors materials for plumbing, sanitation & electrification.

(B) Construction Techniques:
Unit-III
Foundation: Type of soils, bearing capacity, soil stablization and improvement of bearing capacity, settlement and safe limits. Spread foundations, wall footings, grillage, foundations well foundation, causes of failure and remedial measures; under reamed piles, foundation on shrinkable soils, black cotton soil, timbering for trenches, dewatering of foundations. Hyperbolic parabolied footing, Brick arch foundation. Simple methods of foundation design, Damp proof courses, Repairs Techniques for foundations.

Unit-IV
Masonry and Walls : Brick masonry, Bonds, Jointing, Stone masonry, casting and laying, masonry construction, Brick cavity walls, code provisions regarding load bearing and non load bearing walls. Common defects in construction and their effect on strength and performance of walls, designed Brick masonry, precast stone masonry block, Hollow concrete block, plastering and pointing, white and color washing, distempering, dampness and its protection, Design of hollow block masonry walls. Doors, Windows and Ventilators: Types based on material etc., size location, fittings, construction sunshades, sills and jambs, RCC doors/windows frames. Stairs types, rule of proportionality etc., Repairs techniques for masonry, walls, doors & amp; windows.

Unit-V

Floors and Roofs : Types, minimum thickness, construction, floor finishes, Flat roofs, RCC jack arch, reinforced brick concrete, solid slab and timber roofs, pitched roofs, false ceiling, roof coverings, Channel unit, cored unit, Waffle unit, Plank and Joist, Brick panel, L-Panel, Ferro cement roofing units, water proofing .Services : Water supply & Drainage, Electrification, Fire protection, thermal insulation, Air Conditioning, Acoustics & Sound insulation, Repairs to damaged & cracked buildings, techniques and materials for low cost housing., Repairs techniques for floors & roofs.

Course Outcome

CO1- Describe important building materials used in Construction and their uses.

CO2- Describe timber, paints and other miscellaneous building materials used in construction.

CO3- Explain different types of structures and foundations.

CO4- To understand masonry works, doors, windows, stairs, floors and roofs.

CO5- Explain the procedure of surface finishes and concept of green building.

References Books:-

1. Mohan Rai & M.P. Jai Singh; Advance in Building Materials & Construction,.
2. S.C. Rangwala; Engineering Materials
3. Sushil Kumar; Building Construction,
4. B.C. Punmia; Building Construction ,.
5. Building Construction, Metchell
6. Construction Technology, Chudley R.
7. Civil Engineering Materials, N. Jackson.
8. Engineering Materials, Surendra Singh.

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BCE032P Strength of Materials Lab

List of Experiment

1. Study of Universal testing machine
2. To determine the compressive and tensile strength of materials.
3. To determine the Brinell hardness of materials.
4. To determine the Rockwell hardness of materials
5. To determine the toughness of the materials.
6. To determine the stiffness of the spring.
7. To determine the deflection of beam by the use of deflection-beam apparatus.

Reference books:

1. Strength of Materials – R.K. Rajput (S. Chand & Co.)
2. Mechanics of Materials – B.C. Punmia (Laxmi Publicatio

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BCE033P Surveying Lab

List of Experiment

1. Demonstration of metric chain.
2. Measurement of distance by ranging and tape.
3. Locating various objects by tape & cross staff survey.
4. Determination of area of given polygon by tape and cross staff survey.
5. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angles.
6. Locating given building by tape and compass traversing (One full size drawing sheet)
7. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall Method.
8. Fixing bench mark with respect to temporary bench mark with Auto level by fly levelling and check levelling.
9. L- Section and cross section of road (0ne full size drawing sheet each for L-section and cross section)
10. Measurement of horizontal angles using Theodolite by method of repetition
11. Measurement of vertical angles with Theodolite.
12. Locating given building by plane table traversing (One full size drawing sheet)

Reference Books: -

1. Surveying (Vol. I & II) – Punmia, B.C. (Laxmi Publications, New Delhi, 1996)
2. Surveying (Vol. I & II) - C Venkataramaih (Universities Press Hyderabad)
3. Surveying (Vol. I & II) – Kanetkar T.P. (Pune VidyarthiGrihaPrakashan, Pune)

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BCE034P Fluid Mechanics Lab

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 Cc, Cv, Cd 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 met centric height
9. Determination of Friction Factor of a pipe
10. To study the characteristics of a centrifugal pump.

Reference Books: -

1. Hydraulics Laboratory Manual – S.K. Likhi (New Age International Ltd.)
2. Fluid Mechanics – Jagdish Lal (Metropolitan Educational, NewDelh-

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BCE035P Construction Material & Techniques Lab

List of Experiments:

1. Determination of Water Absorption Test of bricks.
2. Determination of Compressive strength of bricks.
3. Determination of Effloresce Test of bricks.
4. Determination of Abrasion Test aggregate.
5. Determination of Normal consistency of cement.
6. Determination of Setting time test initial and final of cement.
7. Determination of Compressive strength of cubes test for concrete.
8. Determination of slump cone test test for concrete.
9. Determination of Compaction factor test test for concrete.

References Books:-

1. Lab Manual Concrete Lab – M.L. Gambhir (Tata McGraw Hill)
2. Building Materials – S.K. Duggal (New Age Publication)
3. Building Materials – S.C.Rangwala (Charotar Publication)
4. Building Materials – M.L. Gambhir, Neha Jamwal (Mc. Grawhill)

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BCE036P Software Lab (AutoCAD 2D & 3D)

Course Contents

Course Outcome

CO1: Analyze different types of commands and scale in AutoCAD

CO2: Draw Isometric Drawings and orthographic Drawings

CO3: Draw Scale setting and Drafting of Plotting

CO4: Drawing Plan of building or Section and Elevation of a building in AutoCAD

CO5: Analyze Building components like Door, Window, Roof Truss

Unit 1: CAD Software : Meaning, various CAD software available in the market AutoCAD, Felix Cad, Auto Civil, 2D Max ; etc.) Starting up of CAD, CAD Window, Tool bar, Drop down menu, Command window, Saving the drawing. Introduction of Graphic screen.

Unit 2: CAD Commands : WCS icon, UCS icon, co-ordinates, drawing limits, grid, snap, ortho features. Drawing commands, line, circle, polyline, multiline, ellipse, polygon etc. Editing commands – Copy, move, offset, fillet, chamfer, trim, lengthen, mirror, rotate, array etc. Working with hatches, fills, dimensioning, text etc.

Unit 3: Submission / Working Drawing : Generation of line plan, Detailed Plan, elevation, section, site plan, Area statement, Generation of 2D view and print commands, Introduction to Auto Civil.

Note: Above theoretical aspects should be covered in the practical periods.

Unit 4: Building Drawing: Following exercises shall be completed with CAD software and Print of all the drawings should be prepared on A3 / A4 size paper :

1) Preparation of line plan of a residential building.

2) Preparation of line plan of a Public building.

3) Preparation of detailed plan of a small residential building

4) Preparation of submission drawing of residential building – showing Plan, Elevation, Section, Schedule of openings, Site Plan and Area Statement.

List of Experiments:

1. To draw plan and section of footing and foundation for load bearing wall and framed structure.
2. To draw plan and section of load bearing and partition walls and its foundation.
3. To draw the single line plan of a primary school building.
4. To draw the line plan of a hostel building.
5. To draw the line plan of a hospital building.
6. To draw working drawing of single storey of 2BHK residential building
7. To draw elevation and section of single storey of 2BHK residential building
8. To draw working drawing of 3BHK double storey residential building

References Books:-

1. AutoCAD 2000 Complete – et. al. (BPB Publications)
2. An introduction to AutoCAD 2000 – A. Yarwood (Pearson Educations)