

Chhattisgarh Swami Vivekananda Technical University, Bhilai

**Name of program: Bachelor of
Technology Branch: All Branches
Subject: Mathematics – III
Total Theory Periods: 03
Class Tests: Two (Minimum)
ESE Duration: Three Hours
Marks: 35**

**Semester: III
Code: B000311(014)
Total Tutorial Periods: 01
Assignments: Two (Minimum)
Maximum Marks: 100 Minimum**

Course Objectives:

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n , Division by t , Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT- II Partial differential equation: Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT- III Random variable: Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

UNIT- IV Interpolation with equal and unequal intervals: Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

UNIT-V Numerical Solution of Ordinary Differential Equations: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

Text Books:

1. “Higher Engg. Mathematics”, Dr. B.S. Grewal– Khanna Publishers.
2. “Advanced Engg. Mathematics” , Erwin Kreyszig – John Wiley & Sons.
3. “Numerical Methods in Engineering and Science” , Dr. B.S. Grewal, Khanna Publishers.
4. “Numerical Methods for Scientific and Engineering Computation” , M .K. Jain, S. R. K

Reference Books:

1. “Applied Mathematics”, P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. “Applied Mathematics for Engineers & Physicists”, Louis A. Pipes- TMH.
3. “Numerical Methods for Scientists and Engineers” K. Shankar Rao, Prentice Hall of India.
4. “Numerical Methods” P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.

Course outcomes: After studying the contents of the syllabus in detail the students will be able to: Define (mathematically) unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**
Branch: **Civil Engineering**
Subject: **Introduction to Fluid Mechanics**
Class Tests: **Two (Minimum)**
ESE Duration: **Three Hours**

Semester: **III**
Code: **B020312(020)**
Assignments: **Two (Minimum)**
Maximum Marks: **100**
Minimum Marks: **35**

UNIT – I: Introduction - Fluid and continuum, physical properties of fluids ideal and real fluid, Newtonian and Non-Newtonian Fluid. Fluid Statics-Pressure density height relationship, pressure measurement by Manometers, Pressure on plan surface, centre of pressure, buoyancy, stability of immersed and floating bodies, metacentric height.

UNIT – II: Kinematics of fluid flow - Steady and unsteady flow, uniform and non- uniform flow, laminar and turbulent flow, one, two and three dimensional flow, streamlines, streak lines and path lines, circulation and vorticity, rotational and irrotational flow, velocity potential and stream function, continuity equation.

UNIT – III: Dynamics of fluid flow - Euler's equation of motion along a streamline and its integration, Bernoulli's equation and its applications – Pitot tube, Venturimeter, orificemeter, nozzles, momentum equation and its application to stationary and moving plates/vanes, pipe bends, problems related to combined application of energy and momentum equations

UNIT – IV: Flow in Pipes - Reynolds's experiment, experimental determination of critical velocity, transition from laminar to turbulent flow, Laminar flow through circular tubes, minor losses in pipe lines, loss due to sudden contraction, expansion, etc; Hot wire anemometer and LDA. Flow in open Channel Comparison between open channel and pipe flow, definition of uniform and non-uniform flow, uniform flow formulae, Chezy's and Manning's Formula, Hydraulically efficient channel section of rectangular and trapezoidal shape.

UNIT-V: Flow through mouthpiece and orifices - Hydraulic coefficients of orifice, bell method orifice, mouthpieces, Borda's mouthpiece, running free and submerged. Notches and Weirs-Rectangular, triangular and trapezoidal notches and weir, cippoletti and broad crested weir.

Text Books:

- 1 Fluid Mechanics and Machines – Dr. R.K. Bansal (Laxmi Publications)
2. Fluid Mechanics – Dr. P.N. Modi (Standard Book House)
3. Fluid Mechanics and Machines – Dr. A.K. Jain (Khanna Publications)

Reference Books:

1. Mechanics of Fluid – Irving H. Shames (McGraw Hill)
2. Introduction to Fluid Mechanics – James A. Fay (Prentice Hall India)
3. Fluid Mechanics – R.J. Garde (New Age International Publication)
4. Fluid Mechanics – Streeter V.L. & Wylie E.B. (Tata McGraw Hills)

Course Outcomes:

The students will be able to

1. Apply the concept of fluid statics in different engineering problem.
2. Apply the principle of fluid kinematics.
3. Apply the energy and momentum principle.
4. Analyse the pipe flow and open channel flow.
5. Analyse the flow through mouthpiece, orifice, notch and weir.



Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: : **Bachelor of Technology**

Branch: **Civil Engineering**

Subject: **Introduction to Solid Mechanics**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours**

Semester: **III**

Code: **B020313(020)**

Assignments: **Two (Minimum)**

Maximum Marks: **100**

Minimum Marks: **35**

UNIT – I: Stress-Strain Relations - Types of stresses and strains, Mechanical 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.

Text Books:

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

Reference Books:

1. Mechanics of Structures (Vol. – I) – Junarkar (Charotar Publications)
2. Strength of Materials – Timoshenko, S. & Gere (CBS Publishers)
3. Introductions to Solid Mechanics –Shames & Pitarresi (Prentice Hall of India)
4. Engineering Mechanics of Solid – Popov (Pearson Publication)
5. Strength of Materials – S. Ramamurtham (Dhanpat Rai Publications)
6. Strength of Materials (Part-I) – Timoshenko (CBS Publishers)

Course Outcome:

The students will be able to:

1. Define and explain the basic concepts of Mechanics of Solids and to be able apply the stress-strain equations to find out stress-strain in bars.
2. Analyse stresses and strains in a rectangular element and to find out the maximum stress in an inclined plane and its location.
3. Draw bending moment and shear force diagram for loaded beams and to be able to find out bending and shear stresses at the cross-section of the beam.
4. Calculate the critical load for columns and be capable of analysing dams and retaining walls.
5. Apply the concepts of unsymmetrical bending and torsion to solve the power transmission problems along with design of spring for shock-absorption.



Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: : **Bachelor of Technology**

Branch: **Civil Engineering**

Subject: **Plane Surveying – I**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours**

Semester: **III**

Code: B020314(020)

Assignments: **Two (Minimum)**

Maximum Marks: **100**

Minimum Marks: **35**

UNIT – I: 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 – II: Contouring - Direct and Indirect methods of contouring. Interpolation of contours, Uses of Contours. Application and Modern methods of depicting relief on a Map. Minor Instruments - Construction and field use of altimeter, Description and use of Hand level, Abney Level, Clinometers, Ceylon Ghat Tracer, Box Sextant, Pentagraph, Planimeter.

UNIT – III: Theodolite and Traversing - Vernier and microptic theodolites, Temporary and permanent adjustments, Measure of horizontal and vertical angles by different methods. Principle of traversing by theodolite, Field work and checks.

UNIT – IV: Traverse Computations and Plane Table Survey - Computation of coordinates, Source of errors, Precision of traversing, Checking and Balancing the traverses, Plane table equipment, Different methods of Plane Table Surveying, Resection-Two and Three point problems. Advantages and disadvantages of Plane Table Surveying.

UNIT – V: Curves - Classification of curves; Elements of Circular, compound, Transition and Vertical curves, Theory and method of setting out Simple, Transition, compound curves with field problems.

Text Books:

1. Surveying (Vol. I & II) – Punmia, B.C. (Laxmi Publications, New Delhi, 1996)
2. Surveying (Vol. II & III) – Agor, R (Khanna publications, Delhi, 1995)

Reference Books:

1. Surveying (Vol. II & III) – Arora, K.R. (Standard Book House, Delhi, 1993)
2. Fundamentals of Surveying – S.K. Roy (Prentice Hall of India)
3. Surveying (Vol. I & II) – S.K. Duggal (Tata McGraw Hill)
4. Surveying (Vol. I & II) – Kanetkar T.P. (Pune Vidyarthi Griha Prakashan, Pune)
5. Surveying (Vol. I & II) – C. Venkataramaih (Universities Press Hyderabad)

Course Outcomes:

1. Students will be able to: Determine elevations by applying different techniques.
2. Students will be able to: Deal with the minor instruments and will be familiar with their functioning.
3. Students will be able to: Do transverse computations, detect and rectify errors.
4. Students will be able to: Do the various methods of traversing with Plane table.
5. Students will be able to: Set out various curves with the field problems.



Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: : **Bachelor of Technology**

Branch: **Civil Engineering**

Subject: **Building Materials**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours**

Semester: **III**

Code: B020315(020)

Assignments: **Two (Minimum)**

Maximum Marks: **100**

Minimum Marks: **35**

UNIT – I: Cement and Aggregate - Ingredients of cement-manufacturing, Bouges compound, Hydration of cement, field and lab tests. Classification of Aggregates (Coarse and Fine), Ennore sand. Classification of Pozzolanas and applications.

UNIT – II: Concrete - Properties of concrete in fresh and hardened state, water cement ratio, Modulus of elasticity, factors affecting strength of concrete and durability, variables in proportioning concrete mixes, tests on concrete.

UNIT – III: Timber and Low cost materials - Characteristics of good timber, wood products plywood, veneers, hard boards, particle board, fibre board need for wood substitutes, form work. Low cost materials for construction – cost effective materials, industrial wastes, agricultural wastes and other materials for green buildings.

UNIT – IV: Paints and Varnishes, Bitumen and asphaltic materials - Composition of oil paint, PVC and PVCN of paint, Material for White washing, colour washing, varnishing and distempering, painting on wood and steel or metal, enamels. Bitumen and asphalt – types and uses.

UNIT – V: Other Engineering materials - Steel - structural steel properties, composition, use and grade of steels. Aluminium and its alloys: properties, uses and advantages. Glass and their uses, plastics with/without reinforcement- types and uses, Ceramics, types of tiles, Refractories, paver block, uses of PVC.

Text Books:

1. Building Materials – S.K. Duggal (New Age Publication)
2. Building Materials – S. C. Rangwala (Charotar Publication)
3. Building Materials – M.L. Gambhir, Neha Jamwal (Mc. Grawhill)

Reference Books:

1. Concrete Technology – A.M. Neville & J.J. Brooks (Pearson Education)
2. Concrete Technology – M.S. Shetty (S. Chand & Co.)
3. Engineering Materials – Surendra Singh (Laxmi Publication)
4. Construction Engineering and Management – S. Seetharaman (Umesh Publication)
5. Building Materials – Gurucharan Singh (Standard Publishers, Delhi)

Course Outcomes:

The students will be able to:

1. Identify properties of construction material.
2. Acquire fundamental knowledge of fresh and harden concrete
3. Describe characteristic of timber and use of eco friendly material in construction
4. Extend the knowledge about characteristic of paint, varnishes etc.
5. Extend the knowledge about steel, aluminium, glass etc.



Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program : **Bachelor of Technology** Branch: **Civil Engineering**

Semester: **III**

Subject: **Fluid Mechanics Laboratory**

Code: **B020321(020)**

Maximum Marks: **40**

Minimum Marks: **20**

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To determine the meta centric height of a ship model.
2. Verification of Bernoulli's equation.
3. Verification of momentum equation.
4. To calibrate a venturimeter and study the variation of the coefficient of discharge with the Reynolds number.
5. To calibrate orificemeter and study the variation of the coefficient of discharge with the Reynolds number.
6. Experimental determination of critical velocity in pipe.
7. Determination of head loss coefficient due to sudden expansion in pipe.
8. Determination of head loss coefficient due to sudden contraction in pipe.
9. Determination of head loss coefficient in pipe bends.
10. To determine the hydraulic coefficients (C_c , C_d and C_v) of an orifice.
11. To determine the coefficient of discharge of a mouth piece.
12. To calibrate a triangular notch.
13. To calibrate a rectangular notch.

Equipment/Machines/Instruments/Tools/Software Required:

- Ship Model
- Bernoulli's Apparatus
- Apparatus for momentum theorem
- Venturimeter
- Orificemeter
- Pipe Flow Apparatus
- Orifice Apparatus
- Mouth Piece Apparatus
- Notch Apparatus
- Vortex Flow Apparatus

Recommended Books:

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

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program : **Bachelor of Technology**

Branch: **Civil Engineering**

Semester: **III**

Subject: **Surveying Laboratory**

Code: **B020322(020)**

Maximum Marks: **40**

Minimum Marks: **20**

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To determine the elevation of a point with respect to reference elevation by Fly Leveling
2. To determine sensitivity of bubble tube of a dumpy level.
3. Contouring and its plotting.
4. Measurement of horizontal angle by repetition method.
5. Measurement of horizontal angle by reiteration method.
6. To determine the height of object when base is accessible.
7. To determine the height of tower when base is inaccessible and instrument stations are in same vertical plane.
8. To find out the position of points by the Plane Table Radiation and Intersection method.
9. Determination of location of a point with the help of Two point problem.
10. Determination of location of a point with the help of Three point problem.
11. Setting out of curve by ordinates or offsets from long chord.
12. Setting out of curve by successive bisection of arcs.
13. Setting out of curve by offsets from chords produced .
14. Setting out of curve by two theodolite method.
15. Setting out of curve by Rankine's method.

Equipment/Machines/Instruments/Tools/Software Required:

- Metric Chain (30 m)
- Tape (15m, 30 m)
- Ranging Rod (2 m, 3m)
- Plumb bob
- Arrows
- Theodolite
- Leveling Staff (Folding and Non-folding)
- Wooden Pegs
- Plain Table Accessories (Drawing Board – 70 x 60 x 1.5 cm, Spirit Level, Trough Compass, Tripod Stand, Alidade, Plumb bob for centering)
- Offset Rod
- Optical Square
- Cross Staff

Recommended 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)

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program : **Bachelor of Technology**
Semester: **III**
Subject: **Building Material Laboratory**
Maximum Marks: **40**

Branch: **Civil Engineering**
Code: **B000323(020)**
Minimum Marks: **20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. Determination of Compressive strength of cement.
2. Determination of Tensile strength of cement.
3. Determination of Fineness of cement by sieving method.
4. Determination of Fineness of cement by Blain Apparatus.
5. Determination of Soundness of cement.
6. Determination of Specific gravity of cement.
7. To determine Uniaxial Tensile Test of mild steel.
8. To determine IzodCharpy Value of given mild steel.
9. To determine Compressive Strength of Wood: (a) Along the fibre and (b) Across the fibre.
10. Determination of Specific gravity and water absorption of aggregate.
11. Abrasion Test on tiles.
12. Impact test on tiles.
13. Flexural Strength of Tiles.
14. To study the Cupping Test Machine and determine Erichser value of mild steel sheet.

Equipment/Machines/Instruments/Tools/Software Required:

- Cube mould 7.06 cm size
- IS Sieve 80, 40, 20, 10, 4.75, 2.36, 1.18 mm and 600, 300, 150, 90 Micron
- Sieve Shakers
- Tensile Strength Testing Machine
- Oven Wire Basket
- Spring Balance and Weighing Balance
- Air permeability blain apparatus
- Abrasion Testing Machine
- Flexural Strength Testing Machine for tiles
- Universal Testing Machine
- Hardness Testing Machine
- Impact Testing Machine

Recommended Books:

1. Lab Manual Concrete Lab – M.L. Gambhir (Tata McGraw Hill)
2. Concrete Technology – M.S. Shetty (S. Chand & Co.)

Chhattisgarh Swami Vivekanand Technical University, Bilai

Name of program : **Bachelor of Technology**

Branch: **Civil Engineering**

Semester: **III**

Subject: **Software Laboratory**

Code: **B0202324(020)**

Maximum Marks: **40**

Minimum Marks: **20**

List of Experiments: (At least Ten experiments are to be performed by each student)

1. Analysis of a cantilever beam with concentrated loadings using MDSolids 4.0.
2. Analysis of a cantilever beam with uniformly distributed loading using MDSolids 4.0.
3. Analysis of cantilever beam with combination of loading using MDSolids 4.0.
4. Analysis of simply supported beam using concentrated loadings using MDSolids 4.0.
5. Analysis of simply supported beam using uniformly distributed load loadings using MDSolids 4.0.
6. Analysis of simply supported beam with combination of loading using MDSolids 4.0.
7. To plot Mohr's Circle to determine Principal stresses and position of principal planes using MDSolids 4.0.
8. To plot Mohr's Circle to determine Maximum shear stress and its position using MDSolids 4.0.
9. To determine the Torque a shaft can safely transmit if shear stress is given using MDSolids 4.0.
10. To determine buckling load of column when the permissible stresses and material, dimensions of the column are given using MDSolids 4.0

Equipment/Machines/Instruments/Tools/Software Required:

- MDSolids 4.0

Recommended Books / Software Link:

- <https://web.mst.edu/~mdsolids/download.htm>