DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC REGULATIONS & SYLLABI (R-25)

B. Tech II Year

(Civil Engineering)

w.e.f. the Academic Year 2026-2027

Vidya Jyothi Institute of Technology

(An Autonomous Institution)

(Accredited by NAAC A+ Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

Aziz Nagar Gate, C.B. Post, Hyderabad-500 075

DEPARTMENT OF CIVIL ENGINEERING
B. TECH II YEAR COURSE STRUCTURE 2026-27
(Civil Engineering)
Semester – I

S. No	Course Code	Course Title	L	T	P	Credits
1	A253001	Probability and Statistics	3	0	0	3
2	A253101	Building Materials and Concrete Technology	3	0	0	3
3	A253102	Strength of Materials	3	0	0	3
4	A253103	Surveying and Geomatics	3	0	0	3
5	A253104	Fluid Mechanics	3	0	0	3
6	A253081	Computational Mathematics Laboratory	0	0	2	1
7	A253181	Concrete Technology Laboratory	0	0	2	1
8	A253182	Strength of Materials Laboratory	0	0	2	1
9	A253183	Surveying & Geomatics Laboratory	0	0	2	1
10.	A253184	Design Thinking and Tinkering Laboratory	0	0	2	1
Total			**15**	**0**	**10**	**20**

Semester – II

S. No	Course Code	Course Title	L	T	P	Credits
1	A254101	Structural Mechanics	3	0	0	3
2	A254102	Water Resources and Irrigation Engineering	3	0	0	3
3	A254103	Hydraulics & Hydraulic Machinery	3	0	0	3
4	A254104	Theory of Structures	3	0	0	3
5	A254105	Engineering Geology	2	0	0	2
6	A254005	Innovation and Entrepreneurship	2	0	0	2
7	A254181	Engineering Geology Laboratory	0	0	2	1
8	A254182	Hydraulics & Hydraulic Machinery Laboratory	0	0	2	1
9	A254183	Computer Aided Building Drafting Laboratory	0	0	2	1
10	A254184	Digital Surveying Laboratory	0	0	2	1
11	A254001	Indian Knowledge System	1	0	0	1
Total			**15**	**0**	**12**	**21**

BUILDING MATERIALS AND CONCRETE TECHNOLOGY

Department of Civil Engineering					II B. Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A253101	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Objectives: To learn

- Introduce the classification and properties of traditional and modern building materials.
- Impart knowledge of cement, aggregates, water, admixtures, and their testing standards.
- Understand the behavior of fresh and hardened concrete.
- Provide comprehensive knowledge of concrete mix design and quality control as per IS 10262:2019 and IS 456:2000.
- Familiarize with special concretes, including their composition, properties, and applications.

Course outcomes: After learning the contents of this paper, the student must be able to

- Explain the classification and use of stones, bricks, tiles, and timber.
- Describe paints, glass, plastics, and modern materials used in buildings.
- Analyze properties of aggregates, water, and admixtures in concrete.
- Understand factors affecting fresh and hardened concrete.
- Design concrete mixes as per IS 10262:2019 and suggest special concretes.

UNIT-I:

Building Materials -I: Stones, Bricks, and Tiles: Classification and properties of building stones, Quarrying, dressing, and testing of stones, Manufacturing, classification, and properties of bricks, Tests on bricks, Types and properties of clay tiles – manufacturing process, Uses of tiles in buildings.

Timber and Wood Products: Classification and structure of timber, Defects in timber, seasoning, and preservation, Types of engineered wood – plywood, particle board.

UNIT-II:

Building Materials - II:

Paints, Varnishes, and Miscellaneous Materials: Types of paints, constituents, and applications, Varnishes, distempers – composition and uses, Glass – types and uses, Plastics, asphalt, bitumen, adhesives, and sealants – properties and applications, Modern building materials: GFRP, geo synthetics, AAC blocks.

Cement: Types as per IS codes (OPC, PPC, PSC), Composition and hydration of cement compounds, Tests on cement (consistency, setting time, strength)

UNIT-III:

Aggregates and Admixture:

Aggregates: Classification of fine and coarse aggregate, Properties like specific gravity, bulk density, grading, shape, surface texture. Tests on aggregates like sieve analysis, impact value, crushing value, flakiness index.
Water: Requirements for mixing and curing, Effect of impurities
Admixtures Types: plasticizers, super plasticizers, retarders, accelerators, air-entraining agents, pozzolanic admixtures and the effects admixtures on concrete properties

UNIT-IV:

Fresh and Hardened Concrete

Fresh Concrete: Workability, factors affecting, Measurement of workability using slump cone, compaction factor, Vee-Bee test, flow table, Segregation and bleeding, setting time of concrete, Batching, mixing (hand and machine), transporting, placing, compacting, finishing, Curing methods and significance
Hardened Concrete: Strength gain with age, Compressive, tensile, and flexural strength, Factors affecting strength, Water–cement ratio: Abram's law, Maturity concept. Shrinkage and creep

UNIT-V:

Mix Design and special concretes

Concept of mix design – nominal mix and design mix, Factors influencing mix design, Indian Standard method (IS 10262:2019), Target strength, water-cement ratio, workability, air content, Mix design examples using IS method, Acceptance criteria for concrete (as per IS 456:2000), Quality control and quality assurance in concrete works**.**
Special Concretes (Ingredients and Properties only): Self-compacting concrete (SCC), Lightweight concrete, High performance concrete (HPC), Fiber-reinforced concrete, Roller Compacted concrete.

TEXT BOOKS:

1. Shetty, M. S. Concrete Technology. S. Chand Publishing & Company Pvt. Ltd., Revised Edition, 2019.
2. Gambhir, M. L. Concrete Technology. Tata McGraw-Hill Publishers. 6th Edition, 2019.
3. Neville, A. M., & Brooks, J. J., Concrete Technology, Pearson Education Limited. 2nd Edition, 2019.
4. Punmia, B. C., Jain, A. K., & Jain, A. K. Building Construction. Laxmi Publications. 12th Edition, 2021.

REFERENCE BOOKS:

1. Sushil Kumar. Building Materials and Construction. Standard Publishers. 20th Edition, Reprint 2015.
2. Neville, A. M. Properties of Concrete. Pearson Education Limited,4th Edition, 2011.
3. Varghese, P. C. Building Materials. PHI Learning Pvt. Ltd. 2nd Edition, 2018.
4. Santhakumar, A. R. Concrete Technology. Oxford University Press, New Delhi. 2nd Edition, 2018.
5. National Building Code (NBC) of India, Bureau of Indian Standards (BIS), 2016.

CODE BOOKS:

1. IS 4031:1988 - Methods of Physical tests for Hydraulic Cement, BIS Publication
2. IS 12269:2013 - Ordinary Portland Cement, 53 Grade — Specification, BIS Publication
3. IS 383 : 2016 –Coarse and Fine aggregate for concrete, BIS Publication
4. IS 2386:1963 – Methods of Test for aggregate for concrete, BIS Publication
5. IS 516 (updated as IS 516 Part 1/Sec 1):2021 – Hardened Concrete – Methods of Test
6. IS 10262-2019 - Guidelines for concrete mix design proportioning, BIS Publication
7. IS 456:2000 –(Reaffirmed 2021)- Plain and Reinforced Concrete – Code of Practice

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/102/105102012/
   https://nptel.ac.in/courses/105/104/105104030/

STRENGTH OF MATERIALS

Department of Civil Engineering					II B. Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A253102	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Pre-Requisites: Engineering Mechanics

Objectives: To learn

- Understand and analyze stresses and strains in simple and composite members under various loads.
- Analyze and draw shear force and bending moment diagrams for different beams and loadings.
- Calculate flexural and shear stresses in various beam sections using bending theory.
- Determine slope and deflection in beams using analytical methods.
- Analyze stress distribution and design thin and thick cylindrical shells.

Course outcomes: After learning the contents of this paper, the student must be able to

- Determine the stresses and strains in the members.
- Draw shear force and bending moment diagram for determinate beams.
- Identify the flexural and shear stresses for various sections.
- Evaluate the slope and deflection of determinate beams
- Identify stresses and strains in thin and thick cylindrical and spherical shells

UNIT-I:

Simple Stresses and Strains: Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram-Elasticity and plasticity –Types of stresses and Strains-Hooke's law–stress–strain diagram for mild steel–Working stress–Factor of safety–Lateral strain, Poisson's ratio and volumetric strain –Pure shear and Complementary Shear-Elastic moduli, Elastic constants and the relationship between them–Bars of varying section–composite bars–Temperature stresses.
Strain Energy–Resilience–Gradual, sudden, and impact loadings–simple applications.

UNIT-II:

Shear Force and Bending Moment: Types of beams–Concept of shear force and bending moment –

S. F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contra flexure–Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-III:

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections–Design of simple beam sections.
Shear Stresses: Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle and channel sections.

UNIT-IV:

Deflection of Beams: Slope, deflection and radius of curvature–Differential equation for the elastic line of a beam–Double integration and Macaulay's methods–Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load and Couple-Mohr's theorems –Moment area method –Application to simple cases.

UNIT-V:

Thin Cylinders: Thin seamless cylindrical shells–Derivation of formula for longitudinal and circumferential stresses–hoop, longitudinal and Volumetric strains–changes in diameter, and volume of thin cylinders – Thin spherical shells.
Thick Cylinders: Introduction-Lame's theory for thick cylinders–Derivation of Lame's formulae–distribution of hoop and radial stresses across thickness–design of thick cylinders–compound cylinders–Necessary difference of radii for shrinkage.

TEXT BOOKS:

1. Bansal, R. K., Strength of Materials, Laxmi Publications, 5th Edition, 2014.
2. Timoshenko, S., & Gere, J. M., Mechanics of Materials, PWS Publishing Company, Boston. 5th Edition, 2017.
3. Rajput, R. K., Strength of Materials, S. Chand & Company Ltd., 6th Edition, 2020.
4. Punmia, B. C., Jain, A. K., & Jain, A. K., Mechanics of Materials, Laxmi Publications. 11th Edition, 2023.

REFERENCE BOOKS

1. Hibbeler, R. C., Mechanics of Materials, Pearson Education, 9th Edition, 2018.
2. Popov, Egor P., Engineering Mechanics of Solids, Pearson Education. 2nd Edition, 1998.
3. Vazirani, V.N., and Ratwani, M.M. Strength of Materials., Khanna Publishers, 11th Edition. 2010.
4. Subramanian, R. Strength of Materials, Oxford University Press, 4th Edition, 2015.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/112/101/112101095/
2. https://nptel.ac.in/courses/105/105/105105108/

SURVEYING AND GEOMATICS

Department of Civil Engineering					II B. Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A253103	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Objectives: This course is expected to enable the students to:

- Understand surveying principles and measurement techniques.
- Perform levelling and contouring for elevation and mapping.
- Calculate areas and volumes for engineering works.
- Conduct theodolite and tachometric surveys, including traversing and curves.
- Use Total Station and GPS for accurate data collection.

Course Outcomes: By the end of this course, students will be able to:

- Explain fundamental surveying concepts and recognize basic instruments.
- Apply levelling and contouring methods to assess elevation and terrain.
- Perform and analyze theodolite and traverse surveys.
- Apply tachometric techniques and curve setting in fieldwork.
- Demonstrate the use of Total Station and GPS for modern surveying tasks.

UNIT-I :

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances – Approximate methods, Direct Methods- Chains-Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.
Prismatic Compass - Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT-II:

Levelling and Contouring Leveling- Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method
Contouring- Characteristics and uses of Contours, Direct& Indirect methods of contour surveying

Computation of Areas and Volumes

Areas -Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes - Computation of areas for level section with and without transverse slopes, determination of volume of earth work in cutting and embankments.

UNIT-III:

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.
Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT-IV :

Tachometric Surveying: Principles of Tachometry, stadia and tangential methods of Tachometry.

Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves,

UNIT–V:

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory – electromagnetic distance measuring system-principle of working and EDM instruments, Components of GPS–space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

TEXT BOOKS:

1. Punmia, B. C., Jain, A. K., & Jain, A. K., Surveying (Vol. 1, 2 & 3), Laxmi Publications (P) Ltd., 17th Edition, 2018.
2. Bhavikatti, B., Surveying, Vikas Publishing House Ltd., 3rd Edition, 2019.
3. Duggal, S. K., Surveying (Vol. 1 & 2), McGraw-Hill Publishing Co. Ltd., 5th Edition, 2019.
4. Subramanian, R. Surveying and Levelling, Oxford University Press, 2nd Edition 2012.

REFERENCE BOOKS:

1. Benton, A. R., & Taetz, P. J., Elements of Plane Surveying, McGraw-Hill,4th Edition, 1991.
2. Alves, M. de C., & Sanches, L. Surveying with Geomatics and R., CRC Press (Taylor & Francis Group). Illustrated Edition, 2024.
3. Chandra,A.M.,Higher Surveying,New Age, International Pvt. Ltd., 4th Edition, 2024.
4. Hofmann-Wellenhof, B., Lichtenegger, H., & Collins, J., Global Positioning System – Theory and Practice, Springer-Verlag (Springer Vienna), 5th Edition, 2001.
5. Agor, R., Surveying and Levelling, Khanna Publishers, 12th Edition, 2015

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105104101
2. https://nptel.ac.in/courses/105107158
3. https://nptel.ac.in/courses/105103176

FLUID MECHANICS

Department of Civil Engineering					II B. Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A253104	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Objectives: This course is expected to enable the students to:

- To understand the fundamentals of fluid properties, statics, kinematics, and dynamics relevant to civil engineering.
- To apply conservation laws of mass, momentum, and energy to analyze fluid flow problems.
- To develop problem-solving skills for practical fluid flow applications in pipes, open channels, and hydraulic systems

Course Outcomes: At the end of the course, student will be able to:

- Understand fluid properties and fluid statics, including pressure measurement and hydrostatic forces.
- Apply continuity, momentum, and energy principles to analyze fluid flow.
- Analyze flow measurement devices, notches, and weirs.
- Evaluate pipe flow systems, including losses and pipe networks.
- Analyze boundary layer concepts and their effect on flow behavior.

UNIT-I

Properties of Fluid

Distinction between a fluid and a solid; Properties of fluids – Density, Specific weight, Specific gravity, Viscosity, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics**
Fluid Pressure: Pressure at a point, Pascal's law, Hydrostatic law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

UNIT-II

Fluid Kinematics

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; One, two- and three-dimensional flows; Streamline, path line, streak line and stream tube; stream function, velocity potential function, flow net, One, two- and three-dimensional, Continuity equations in Cartesian coordinates applications.

Fluid Dynamics

Surface and Body forces -Euler's and Bernoulli's equation; Momentum equation. Correction factors. Bernoulli's equation to real fluid flows.

UNIT-III

Flow Measurement in Pipes

Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube, applications of Momentum equations; Forces exerted by fluid flow on pipe bend, sudden enlargement in pipes.

Flow Over Notches & Weirs

Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

UNIT-IV

Flow through Pipes

Reynolds experiment, Reynolds number**,** Loss of head through pipes, Darcy- Wies batch equation, minor losses, total energy line, hydraulic grade line, Pipes in series, equivalent pipes, pipes in parallel, siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis of pipe networks: Hardy Cross method and EPANET, water hammer in pipes and control measures.

UNIT-V

Laminar & Turbulent Flow

Laminar flow through circular pipes, and fixed parallel plates.

Boundary Layer Concepts

Prandtl contribution, Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness concepts of laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Drag and Lift and types of drag, magnus effect.

TEXT BOOKS:

1. Subramanian, K., Theory and Applications of Fluid Mechanics. Tata McGraw-Hill, Revised Edition, 2019.
2. Modi, P. N., & Seth, S. M., Fluid Mechanics, Standard Book House, Revised Edition, 2017.
3. Bansal, R. K., Fluid Mechanics and Hydraulic Machines, Laxmi Publications Pvt. Ltd., 10th Edition, 2018.
4. Hibbeler, R. C. Fluid Mechanics, Pearson India Education Services Pvt. Ltd., 15th Edition, 2015.

REFERENCE BOOKS:

1. White, Frank M., Fluid Mechanics, McGraw-Hill Education, 8th Edition, 2017
2. Som, S. K., Biswas, G., & Chakraborty, S., Introduction to Fluid Mechanics and Fluid Machines. 3rd Edition, Tata McGraw-Hill Education, 2012.
3. Ojha, C. S. P., Berndtsson, R., & Chandramouli, P. N., Fluid Mechanics and Machinery, 1st Edition, Oxford University Press, 2010.
4. Domkundwar, S. & Domkundwar, A., Fluid Mechanics and Hydraulic Machines. Dhanpat Rai & Co., Revised Edition, 2014
5. Streeter, V. L., Wylie, E. B., & Bedford, K. W., Fluid Mechanics. McGraw-Hill, 9th Edition, 2012.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104118/
2. https://nptel.ac.in/courses/112/105/112105171/

CONCRETE TECHNOLOGY LABORATORY

Department of Civil Engineering					II B. Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A253181	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Objectives: This course is expected to enable the students to:

- Understand the test procedures to evaluate the characteristics of cement and aggregates
- Know the test procedures to find the properties of fresh concrete
- Understand the test procedures to find mechanical properties of hardened concrete
- Know the various nondestructive testing methods to determine the characteristics of concrete

Course Outcomes: At the end of the course, student will be able to:

- Acquire knowledge on the properties of cement and aggregate
- Evaluate the workability of fresh Concrete
- Determine the strength characteristics of hardened concrete
- Gain knowledge of Non-destructive test on concrete

List Of Exercises

1. **Tests on Cement:**
   a) Soundness.
   b) Compressive strength.
2. **Tests on Aggregates:**
   a) Specific gravity of fine aggregate.
   b) Specific gravity of coarse aggregate.
   c) Bulking of fine aggregate.
   d) Grading of fine aggregate
3. **IS method of mix design of normal concrete as per IS:10262**
4. **Tests on Fresh Concrete:**
   a) Slump cone test.
   b) Compacting factor test.
   c) Vee-Bee consistometer test.
5. **Tests on Hardened Concrete:**
   a) Compressive &Tensile strength tests.
   b) Modulus of elasticity of concrete.
   c) Non-destructive testing of concrete.

REFERENCE BOOKS:

1. A.M.Neville, Properties of Concrete– Pearson Education Limited, 5th Edition, 2012
2. M.S.Shetty, Concrete Technology, S.Chand & Co., 8th Edition, 2019
3. A.R. Santha Kumar, Concrete Technology, Oxford university Press, 2nd Edition, 2018

IS CODES:

1. IS: 4031 (All parts) - Methods of Physical tests for Cement.
2. IS: 383:2016 - Specifications for Coarse and Fine aggregate.
4. IS: 2386:1963 (Reaffirmed 2021) - Methods of Tests for Aggregates for Concrete.
5. IS: 1199:1959 (Reaffirmed 2018)- Methods of Sampling and Analyses of Concrete.
6. IS 516 (updated as IS 516 Part 1/Sec 1):2021 – Hardened Concrete – Methods of Test
7. IS 10262-2019 - Guidelines for concrete mix design proportioning, BIS Publication
8. IS 456:2000 (Reaffirmed 2021) – Plain and Reinforced Concrete – Code of Practice
9. IS 13311:1992 – (Part-1 & 2) Non Destructive testing of Concrete – Methods of Tests.

ONLINE RESOURCES

1. https://cs-iitd.vlabs.ac.in/List%20of%20experiments.html

STRENGTH OF MATERIALS LABORATORY

Department of Civil Engineering					II B. Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A253182	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Course Objectives:

- Understand the mechanical properties of materials through experimental testing.
- Perform standard tests such as tension, compression, bending, torsion, and impact.
- Analyze and interpret test data to evaluate material behavior under various loads.
- Apply testing knowledge to real-world engineering design and material selection.

Course Outcomes: By the end of the course, the student will be able to:

- Identify the bending behavior of beams using bending test.
- Determine the behavior of material under torsion.
- Determine the hardness of materials using different tests.
- Find out the characteristic of material under compression, impact and shear test.

List of Experiments:

1. Tension test
2. Bending test on Cantilever beam.
3. Bending test on simple support beam.
4. Bending test on Continuous beam.
5. Torsion test
6. Hardness test – Aluminium, Steel and Copper
7. Compression Test on Spring
8. Compression test on concrete.
9. Impact test
10. Shear test
11. Verification of Maxwell's Reciprocal theorem on beams.
12. Use of electrical resistance strain gauges.

REFERENCE BOOKS:

1. Rajput.R.K. ,Strength of Materials‖, S.Chand and Co, New Delhi, 4th Edition, 2018
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS – I Strength of materials, Laxmi Publications, New Delhi, 10th Edition, 2018
3. Bansal. R.K.,Strength of Materials‖, Laxmi Publications Pvt. Ltd., New Delhi, 6th Edition, 2018

ONLINE RESOURCES:

1. http://sm-nitk.vlabs.ac.in/List%20of%20experiments.html
2. https://eerc01-iiith.vlabs.ac.in/List%20of%20experiments.html

SURVEYING & GEOMATICS LABORATORY

Department of Civil Engineering					II B. Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A253183	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Course Objectives:

- Understand the principles and methods of Theodolite surveying.
- Operate and apply Total Station for various surveying tasks.
- Analyze and compute field data for distance, area, and elevation.
- Apply surveying techniques in real-world engineering projects

Course Outcomes: By the end of the course, the student will be able to:

- Calculate area of given plot/points using theodolite survey.
- Determine the angle/distance of given points using theodolite survey.
- Apply Total Station techniques to compute area, distance, and elevation of given points. CO 4: Determine the height and plot curve using Total station

List of Experiments:

Theodolite surveying:

1. Measurement of horizontal angles and vertical angles.
2. Distance between two inaccessible points.
3. Measurement of area by theodolite traversing.
4. Determination of tachometer constants.
5. Distance between two inaccessible points using the principles of tachometer surveying.
6. Distance between two inaccessible points using the principles of trigonometric surveying

Total Station:

7. Setting up and calibration of the Total Station.
8. Stake Out
9. Remote Elevation Measurement
10. Missing Line Measurement
11. Contouring
12. Providing a Simple Circular Curve

REFERENCE BOOKS:

1. Dr. K.R. Arora, ―Surveying Volume I and II‖, Standard Book House, 15th Edition, 2015.
2. R. Subramanian, ―Surveying and Leveling‖, Oxford University Press, New Delhi, 2nd Edition, 2007.
3. B.C. Punmia & Ashok kumar Jain, ―Surveying Volume I and II‖, Laxmi Publications, 16th Edition., 2011.

ONLINE RESOURCES:

1. http://sl-iitr.vlabs.ac.in/List%20of%20experiments.html

DESIGN THINKING AND TINKERING LABORATORY

Department of Civil Engineering					II B. Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
A253184	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Course Objectives:

- Introduce students to the principles and stages of design thinking, creativity, and user-centered innovation.
- Develop students' ability to frame problems and create solutions using iterative and collaborative methods.
- Enhance empathy-driven approaches to design and engineering challenges.
- Cultivate skills in rapid prototyping, brainstorming, ideation, and effective team collaboration.
- Build communication and presentation skills through real-world pitch and innovation exercises.
- Promote critical reflection and systems thinking in addressing complex design problems

Course Outcomes: By the end of the course, the student will be able to:

- Apply design thinking methodology (Empathize, Define, Ideate, Prototype, Test) to solve real- world problems.
- Use empathy-based research techniques to understand user needs and perspectives.
- Generate innovative ideas using ideation tools like "Yes, and", "Five/Nine Whys", and "Six Thinking Hats".
- Demonstrate the ability to collaborate in multidisciplinary teams and engage in constructive feedback.
- Rapidly prototype and test design concepts within constrained timeframes (e.g., 48-hour challenges).
- Present and pitch design solutions effectively to a target audience or jury.
- Analyze systems and complex problems using systems thinking tools to propose sustainable solutions.
- Reflect critically on team-based design experiences and iterate solutions based on feedback and testing.

STUDENT'S RESPONSIBILITIES

1. Forming diverse teams of 3–5 members each to work collaboratively throughout the semester.
2. Proactively engaging to observe the objects and interactions in their daily life and society from a design perspective.
3. Identifying general societal and social problems that may be effectively addressed using design thinking principles
4. Presenting and reporting the tasks to the concerned faculty members using their creative communication and people skills.

ACTIVITIES

1. Introduction and briefing (15 minutes)
2. Ice-breaker activity (20 minutes)
3. Introduction to Design Thinking (20 minutes)
4. Building empathy for the user (1 hour)
5. Define a problem statement (1 hour)
6. Ideation part 1: Generate ideas and potential solutions (1 hour) Presentation (5 minutes): What is ideation? Activity—worst possible idea (10 minutes) Activity—coming up with solutions (10 minutes) Activity—sharing ideas and getting feedback (10 minutes) Activity—refining your solution (10 minutes) Reflection and discussion (5 minutes)
7. Ideation part 2: User journey mapping (1 hour) Presentation (10 minutes): What is a user journey map? Activity—define the activities and steps in the customer's experience (15 minutes) Activity—group the steps into phases (10 minutes) Activity—adding goals and pain-points (15 minutes) Sharing user journey maps, reflection and discussion (10 minutes)
8. Prototype and test ideas (1 hour) Presentation (5 minutes): Activity—create mobile screens (15 minutes) Activity—add functionality to mobile screens (15 minutes) Activity—user testing (15 minutes) Activity—decide on a winning approach (10 minutes):
9. Debrief and outline next steps (15 minutes)

EXERCISES

1. The Pin-Up Exercise
2. The Systems Thinking Exercise
3. The 48-Hour Crash Course Exercise
4. The Design with Empathy Exercise
5. The Tinker Toy Exercise
6. The Wallet Exercise
7. The Pitch Competition Exercise
8. "Yes, but" vs. "Yes, and" exercise
9. "Five whys" or "Nine Whys" exercise
10. The "Six Thinking Hats" exercise

TEXT BOOKS

1. Kumandari Ranga Chari (2024) Applied Design Thinking for Problem Solving - A Tool Kit for Business Practitioners and Managers, BS Publications
2. Tim Brown, "Change by Design", Harper Business, 2012 (ISBN: 978-0062337382)
3. Donald A. Norman, "The Design of Everyday Things", MIT Press, 2013 (ISBN: 978- 0262525671)
4. Daniel Ling, "Complete Design Thinking Guide for Successful Professionals", Create Space Independent Publishing, 2015 (ISBN: 978-1514202739)
5. Design Thinking: A guide to creative problem solving for everyone, Andrew Pressman, Routledge Taylor and Francis group, 2019, 1st edition.
6. Engineering Design, George E. Dieter, Linda C. Schmidt, McGraw-Hill Education,

2019, 5th edition.
7. Product design and development, Ulrich, K., Eppinger, S. and Yang, M., 2020, 7th edition.

REFERENCE BOOKS:

1. Bruno Munari, “Design as Art”, Penguin UK, 2009 (ISBN: 978-0141035819)
2. Tom Kelly, Jonathan Littman, “The Art of Innovation”, HarperCollins Business, 2002 (ISBN: 978- 0007102938)
3. Thomas Lockwood, “Design Thinking: Integrating Innovation, Customer Experience, and Brand Value”, Allworth Press, 2009 (ISBN: 978-1581156683)
4. Joost Groot Kromelink, “Responsible Innovation: Ethics, Safety and Technology”,2nd ed., TU Delft, Faculty of Technology, Policy and Management, 2019 (e-Book ISBN: 978-9463662024)
5. Jimmy Jain, “Design Thinking for Startups: A Handbook for Readers and Workbook for Practitioners”, Notion Press, 2018 (ISBN: 978-1642495034)

ONLINE RESOURCES:

1. https://www.arvindguptatoys.com/
2. https://honeybee.org/
3. https://dschool.stanford.edu/resources/getting-started-with-design-thinking
4. https://designthinking.ideo.com/

STRUCTURAL MECHANICS

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254101	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Objectives: This course is expected to enable the students to:

- Understand the nature of stresses developed in shafts, springs, columns, and cylindrical and spherical shells under various loads.
- Calculate elastic deformation and assess stability of simple geometries under different loading conditions.
- Analyze unsymmetrical bending in structural members with multiple axes of symmetry.
- Understand the significance of the shear center for equilibrium in asymmetrical structural members.

Course Outcomes: By the end of this course, students will be able to:

- Identify the concept of principal stresses and theory of failures
- Understand the concept of torsion of circular shafts and springs
- Determine the critical load of columns
- Evaluate the direct and bending stresses of different structures
- Analyze the unsymmetrical bending of beams and shear centre for different section

UNIT-I :

Principal Stresses: Introduction–Stresses on an oblique plane of a bar under axial loading– compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses –Two perpendicular normal stresses accompanied by a state of simple shear–Principal stresses–Mohr's circle of stresses–ellipse of Stress-Analytical and graphical solutions.

Theories of Failure: Introduction–Various theories of Failure-Maximum Principal Stress theory, Maximum Principal Strain Theory, Maximum shear stress Theory-Strain Energy and Shear Strain Energy Theory (VonMises Theory).

UNIT-II:

Torsion of Circular Shafts: Theory of pure torsion– Derivation of Torsion Equation-Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion–Design of shafts according to theories of failure.

Springs: Introduction–Types of springs –deflection of close and open coiled helical springs under axial pull and axial couple–springs in series and parallel.

UNIT-III:

Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment, core of a section–determination of stresses in the case of retaining walls, chimneys and dams–conditions for stability- Overturning and sliding–stresses due to direct loading and bending moment about both axes.

UNIT-IV :

Columns and Struts: Introduction–Types of columns–Short, medium and long columns–Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio–Euler's critical stress–Limitations of Euler's theory–Long columns subjected to eccentric loading – Secant formula–Empirical formulae — Rankine– Gordon formula- Straight line formula– Prof. Perry's formula.

UNIT–V:

Unsymmetrical Bending:

Introduction – Centroidal principal axes of section –Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid–Location of neutral axis.
Shear Centre: Introduction - Shear center for symmetrical and unsymmetrical (channel, I, T and L) sections.

TEXT BOOKS:

1. Timoshenko, S., & Gere, J. M., Mechanics of Materials, PWS Publishing Company, Boston. 5th Edition, 2017.
2. Rajput, R. K., Strength of Materials, S. Chand & Company Ltd., 6th Edition, 2020.
3. Punmia, B. C., Jain, A. K., & Jain, A. K., Mechanics of Materials, Laxmi Publications. 11th Edition, 2023.
4. Subramanian, R. Strength of Materials, Oxford University Press, 4th Edition, 2015.

REFERENCE BOOKS:

1. Hibbeler, R. C., Mechanics of Materials, Pearson Education, 9th Edition, 2018.
2. Popov, Egor P., Engineering Mechanics of Solids, Pearson Education. 2nd Edition, 1998.
3. Vazirani, V.N., and Ratwani, M.M. Strength of Materials., Khanna Publishers, 11th Edition. 2010.
4. Bansal, R. K., Strength of Materials, Laxmi Publications, 5th Edition, 2014.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/112/101/112101095/
2. https://nptel.ac.in/courses/105/105/105105108/

WATER RESOURCES AND IRRIGATION ENGINEERING

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254102	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Prerequisites: Probability & Statistics, Fluid Mechanics and Hydraulic Machines

Objectives: This course is expected to enable the students to:

- Understand the fundamentals concepts of Engineering Hydrology.
- Derive various formulae used in estimation of abstractions and runoff.
- Solve problems in hydrograph analysis and groundwater.
- Estimate the water requirement of crops and also design the dams.
- Study types of spillways and design procedures for distribution systems.

Course Outcomes: By the end of this course, students will be able to:

- Describe different concepts of engineering hydrology.
- Apply appropriate formula to estimate runoff.
- Apply fundamental principles of hydrograph analysis and estimate ground water Resources.
- Estimate water requirement for crops and design hydraulic structures. CO5: Apply a suitable design methodology for distribution systems.

UNIT-I :

Precipitation

Introduction-Concepts of Hydrologic Cycle, Global Water Budget, Applications in Engineering. Precipitation-Forms of Precipitation, Measurement of Precipitation: Recording and Non-Recording Types, Mass Rainfall Curves, Characteristics Mean Rainfall on A Basin – Arithmetic, Theissen and Isohyetal Methods, Intensity – Duration Analysis, PMP, Missing Rainfall Data – Estimation, Consistency of Rainfall Records, Double Mass Curve, Rain Gauge Network Analysis.

UNIT-II:

Abstractions from Precipitation and Runoff

Abstractions from Precipitation-Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for Its Reduction, Evapo transpiration, Measurement of Evapo transpiration, Evapo transpiration Equations, Potential Evapo transpiration Over India, Actual Evapo transpiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Modeling Infiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices.

Runoff-Components of Runoff, Factors affecting Runoff, Basin Yield, SCS-CN Method of Estimating Runoff, Flow Duration Curves, Mass Curve of Runoff – Analysis.

UNIT-III:

Hydrographs and Groundwater Hydrology

Hydrographs-Hydrograph – Components, Separation of Hydrograph into Base Flow and Effective Rainfall – Methods, Unit Hydrograph – Principles, Derivation of UH of Isolated Unit Storms.
Groundwater Hydrology - Occurrence, Movement and Distribution of Groundwater, Aquifers – Types, Specific Yield, Permeability, Storage Coefficient, Transmissibility, Darcy's Law. Well Hydraulics-Steady Radial Flow into Well for Confined and Unconfined Aquifers, Recuperation Tests.

UNIT-IV :

Water Withdrawals, Dams and Reservoirs

Water Withdrawals- Water Requirement of Crops -Crops And Crop Seasons In India, Cropping Pattern, Duty and Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive Use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to the Fields: Surface, Sub-Surface, Sprinkler and Trickle /Drip Irrigation.
Dams and Reservoirs-Classification of Dams, Gravity Dams: Forces on Gravity Dams, Causes of Failure, Stress Analysis, Elementary and Practical Profile. Arch and Buttress Dams, Economic Height of Dam, Selection of Suitable Site. Reservoirs- Types, Capacity of Reservoirs, Yield of Reservoir, Sedimentation.

UNIT–V:

Spillways and Distribution Systems

Spillways- Components of Spillways, Types of Gates for Spillway Crests.
Distribution Ssystems- Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels-Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime Channels. Canal Outlets: Non-Modular, Semi-Modular and Modular Outlets. Water Logging: Causes, Effects and Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods.

TEXT BOOKS:

1. Reddy, P. Jaya Rami., A Textbook of Hydrology, University Science Press (Laxmi Publications), 3rd Edition, 2019.
2. Asawa, G. L., Irrigation and Water Resources Engineering, New Age International Publishers, 2nd Edition, 2025.
3. Garg, Santosh Kumar., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 38th Revised Edition, 2024.
4. Subramanya.K. "Engineering Hydrology"- Tata McGraw Hill,4th Edition 2017

REFERENCE BOOKS:

1. Singh, V. P. Elements of Engineering Hydrology, Tata McGraw-Hill, Latest Edition, 2017.
2. Todd, David Keith. Groundwater Hydrology, John Wiley & Sons, 3rd Edition, 2015.
3. Sharma, R. K. Textbook of Irrigation Engineering & Hydraulic Structures, Oxford & IBH Publishing Company, 38th Revised Edition, 2023.
4. Raghunath .H.M., "Hydrology", New Age International publishers, 3rd Edition, 2015.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/104/105104103/
2. https://nptel.ac.in/courses/105/107/105107129/

HYDRAULICS AND HYDRAULIC MACHINERY

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254103	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Objectives: This course is expected to enable the students to:

The objective of the course is to

- Define the fundamental principles of water conveyance in open channels.
- Discuss and analyze the open channels in uniform and Non-uniform flow conditions.
- Study the characteristics of hydroelectric power plant and its components.
- Analyze and design of hydraulic machinery and its modeling.

Course Outcomes: By the end of this course, students will be able to:

- Apply their knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
- Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
- Apply dimensional analysis and to differentiate the model, proto type and similitude conditions for practical problems.
- Get the knowledge on different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages.

UNIT-I :

Open Channel Flow–I: Introduction to Open channel flow - Comparison between open channel flow and pipe flow, Classification of open channel flows, Velocity distribution. Uniform flow– Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient. Most economical sections. Computation of Uniform flow, Normal depth.

Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical Flows-Channel transitions (Theory only).

UNIT-II:

Open Channel Flow–II: Non-uniform flow–Gradually Varied Flow-Dynamic equation for G.V.F; Classification of channel bottom slopes–Classification and characteristics of Surface profiles– Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.

Rapidly varied flow: Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses.

UNIT-III:

Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity – Rayleigh's method and Buckingham's π methods–Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems.
Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency.

UNIT-IV :

Hydraulic Turbines – I: Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines–Pelton wheel–Francis turbine–Kaplan turbine–working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.
Hydraulic Turbines–II: Governing of turbines–Surge tanks–Unit and specific turbines–Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

UNIT–V:

Centrifugal Pumps: Pump installation details–classification–work done–Manometric head– minimum starting speed–losses and efficiencies–specific speed. Multistage pumps –pumps in series, parallel – performance of pumps – characteristic curves – NPSH – Cavitation.

TEXT BOOKS:

1. Modi, P. N., & Seth, S. M., Hydraulics and Fluid Mechanics Including Hydraulic Machines, Standard Book House, 22nd Edition, 2019.
2. Goyal, Manish Kumar, Fluid Mechanics and Hydraulic Machines, PHI Learning Private Limited, Revised Edition, 2015.
3. Subramanya, K., Flow in Open Channels, McGraw-Hill Education, 5th Edition, 2019

REFERENCE BOOKS:

1. Hibbeler, R. C., Fluid Mechanics, Pearson India (SI Units), 2nd Edition, 2025
2. Kumar, D. S., Fluid Mechanics & Fluid Power Engineering, Kataria & Sons Publications Pvt. Ltd., 9th Edition, 2018
3. Som, S. K., Biswas, G., & Chakraborty, S., Introduction to Fluid Mechanics and Fluid Machines, McGraw Hill Education (India), 3rd Edition, 2012
4. Banga, T. R., & Sharma, S. C., Hydraulic Machines, Khanna Publishers, 7th Edition, 1998

ONLINE RESOURCES:

- https://nptel.ac.in/courses/105/103/105103096/
- https://nptel.ac.in/courses/112/104/112104117/

THEORY OF STRUCTURES

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254104	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Prerequisites: Strength of Materials**.**

Objectives: This course is expected to enable the students to:

- Differentiate the statically determinate and indeterminate structures.
- To understand the nature of stresses developed in perfect frames and three hinged arches for various types of simple loads
- Analyse the statically indeterminate members such as fixed bars, continuous beams and for various types of loading.
- Understand the energy methods used to derive the equations to solve engineering problems
- Evaluate the Influence on a beam for different static & moving loading positions

Course Outcomes: By the end of this course, students will be able to:

- Analyze pin-jointed plane frames by different methods.
- Analyze three hinged arches and understand the concept of energy theorems.
- Understand the Indeterminate beams with rotation of a support.
- Analyze the beams using three moments and slope deflection method.
- Understand the concept of moving loads and influence lines.

UNIT-I :

Analysis of Perfect Frames: Types of frames- Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT-II:

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's Theorem-Unit Load Method – Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.

Three Hinged Arches – Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem - Analysis of Three hinged arches - Normal Thrust and radial shear and bending moment - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels.

UNIT-III:

Propped Cantilever and Fixed Beams: Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - Shear force, Bending moment diagrams and elastic curve for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams - effect of sinking of support, effect of rotation of a support.

UNIT-IV :

Continuous Beams: Introduction-Continuous beams - Clapeyron's theorem of three moments-Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - effect of sinking of supports.

Slope Deflection Method: Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports -Determination of static and kinematic indeterminacies for frames - Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway - Shear force and bending moment diagrams and Elastic curve.

UNIT–V:

Moving Loads and Influence Lines: Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load ,uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length - Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span.

TEXT BOOKS:

1. Rao, Meesala Chakradhara, Introduction to Structural Analysis: Indeterminate Structures, CRC Press (Taylor & Francis Group), 1st Edition, 2026
2. Khurmi, R. S., Theory of Structures, S. Chand & Company Pvt. Ltd., Latest Edition, 2020.
3. Pandit, G. S., & Gupta, S. P. Theory of Structures, Tata McGraw Hill Education Pvt. Ltd., Latest Edition, 2017.
4. Shah, H. J. & Junnarkar, S. B., Mechanics of Structures, Vol. I (Strength of Materials), Charotar Publishing House, 32nd Edition, 2016.

REFERENCE BOOKS:

1. V.N. Vazirani and M.M. Ratwani, Structural Analysis Vol –I & II, Khanna Publishers, 16th edition, 2015.
2. Punmia, B. C. Strength of Materials and Mechanics of Solids, Vol. 2, Laxmi Publications, New Delhi, Latest Edition, 2015.
3. Bhavikatti, S. S. Structural Analysis Vol. I & II, Vikas Publishing House Pvt. Ltd., Latest Edition, 2021.
4. T. S Thandavamoorthy, Structural analysis, Oxford university Press, Revised Edition, 2011
5. Chu Kia Wang, Intermediate Structural Analysis, McGraw Hill Education, Indian Edition,201

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/105/105105166/
2. https://nptel.ac.in/courses/105/101/105101085/

ENGINEERING GEOLOGY

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254105	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

Objectives: This course is expected to enable the students to:

- Give the basics knowledge of Geology that is required for constructing various Civil Engineering Structures, basic Geology, Geological Hazardous and Environmental Geology.
- Focus on the core activities of engineering geologists–site characterization and geologic hazard identification and mitigation. Planning and construction of major Civil Engineering projects.

Course Outcomes: By the end of this course, students will be able to:

- Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice.
- The fundamentals of the engineering properties of Earth materials and fluids.
- Rock mass characterization and the mechanics of plan arrock slides and topples.

UNIT-I :

Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological drawbacks. Importance of Physical geology, Petrology and Structural geology.

Weathering of Rocks: Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like "Granite"

UNIT-II:

Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT-III:

Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints-their important types and case studies. Their

importance Insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilization of soils. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

UNIT-IV :

Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence.

Importance of Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of Competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

UNIT–V:

Geology of Dams, Reservoirs, and Tunnels: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Lithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXT BOOKS:

1. Chennakesavulu, N. Textbook of Engineering Geology, Laxmi Publications (MacMillan India Ltd.), 3rd Edition, 2018.
2. Varghese, P. C. Engineering Geology for Civil Engineers, PHI Learning Pvt. Ltd., 5th Edition, 2011.
3. Duggal, S. K. & Pandey, H. K. Engineering Geology, McGraw Hill Education (India) Pvt. Ltd., 5th Edition, 2014.
4. Gokhale, K. V. G. K. Principles of Engineering Geology, B. S. Publications, 3rd Edition, 2006.

REFERENCE BOOKS:

1. Bell, F. G. Fundamentals of Engineering Geology, B. S. Publications, 2nd Edition, 2005.
2. Krynine & Judd. Principles of Engineering Geology & Geotechnics, CBS Publishers & Distributors, Revised Edition, 2005.
3. Gangopadhyay, Subinoy. Engineering Geology, Oxford University Press, 3rd Edition, 2013.
4. Venkat Reddy, D. Engineering Geology, Vikas Publishing House, 2nd Edition, 2017.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/105/105105106/
2. https://nptel.ac.in/courses/105/104/105104191/
3.

ENGINEERING GEOLOGY LABORATORY

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254181	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Pre-Requisites: Engineering Geology Theory

Objectives: This course is expected to enable the students to:

- Develop practical skills in identifying minerals and rocks
- Classify minerals and rocks into appropriate geological groups.
- Apply techniques for identification of igneous, sedimentary, and metamorphic rocks.
- Solve basic structural geology problems related to folds, faults, and unconformities.

Course Outcomes: By the end of this course, students will be able to:

- Identify and classify minerals based on their physical properties and groups.
- Identify igneous, sedimentary, and metamorphic rocks through hand specimen analysis.
- Interpret geological and topographical maps using standard symbols.
- Solve basic structural geology problems related to folds, faults, and unconformities.

List of Experiments:

1. Study of physical properties of minerals.
2. Megascopic identification of Rock forming minerals.
   Silica group: Quartz, Feldspar, Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Hornblende, Magnetite, Hematite, Kyanite, Garnet, Galena.
3. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Pegmatite. Basic rock: Gabbro, Basalt and its varieties,
4. Identification of rocks (Sedimentary Petrology): Conglomerate, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
5. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite.
6. Study of Geological structures using models and their features in Engineering field
7. Simple structural Geology Problems (Folds & Faults)
8. Simple structural Geology Problems (Tilted Beds & Unconformities)
9. Study of microscopic identification of Rocks samples
10. Study of Topographical features from geological maps.

REFERENCE BOOKS:

1. Bell, F. G. Fundamentals of Engineering Geology, B. S. Publications, 2nd Edition, 2016.
2. Krynine & Judd. Principles of Engineering Geology & Geotechnics, CBS Publishers & Distributors, Revised Edition, 2005.
3. Gangopadhyay, Subinoy. Engineering Geology, Oxford University Press, 3rd Edition, 2013.
4. Varghese, P. C. Engineering Geology for Civil Engineers, PHI Learning Pvt. Ltd., 5th Edition, 2012.

ONLINE REFERENCES

1. https://nptel.ac.in/courses/105/105/105105106/

HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254182	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Objectives: This course is expected to enable the students to:

- Identify differences between analytical fluid flow models and real fluid behavior.
- Explain standard measurement techniques in fluid mechanics and its practical applications.
- Describe components and working principles of hydraulic machines
- Analyze laboratory measurements and prepare detailed reports of findings.

Course Outcomes: By the end of this course, students will be able to:

- Verify fundamental fluid flow principles through experimental methods.
- Calibrate flow measuring devices such as Venturimeter, orifice meter, and notches.
- Evaluate head losses in pipe systems and open channels.
- Analyze performance characteristics of turbines and pumps under varying conditions..

List of Experiments:

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter/ Orifice Meter
4. Calibration of Triangular/Rectangular/ Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipeline
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance characteristics of Kaplan Turbine
12. Performance Characteristics of a single stage/multistage Centrifugal Pump

REFERENCE BOOKS:

1. D.S. Kumar, Fluid Mechanics & Fluid Power Engineering‖, Kataria & Sons, 9th Edition, 2018
2. K, Subramanya, Fluid Mechanics and Hydraulic Machines‖, Tata McGraw Hill Education Pvt. Ltd, 2nd Edition, 2019
3. Rajput.R.K. Fluid Mechanics and Hydraulic Machines‖, S.Chand and Co, New Delhi, 6th Edition, 2016

ONLINE REFERENCES

1. http://fm-nitk.vlabs.ac.in/List%20of%20experiments.html

COMPUTER AIDED BUILDING DRAFTING LABORATORY

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254183	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Objectives: This course is expected to enable the students to:

- Plan buildings as per NBC**.**
- Understand various types of conventional signs and brick bonds.
- Draw the plan section and elevation for doors, trusses and staircases.
- Use AutoCAD tools to draw building plans, sections and elevations from a given line diagram and specifications.
- Develop working drawings of residential buildings.

Course Outcomes: By the end of this course, students will be able to:

- Plan buildings as per NBC.
- Use different Commands of selected drafting software to draw Conventional signs and brick bonds, Plan, Section and Elevation of buildings.
- Draw section and elevation of paneled doors and trusses& detail the different components of Staircases..
- Develop and draw single/ two storey residential building and public building as per the building by-laws.
- Draw Electrical layout, Plumbing layout for residential buildings.

List of Experiments:

1. Planning Aspects of Building systems as per National Building Code (NBC).
2. Brick bonds: English bond & Flemish bond– Odd and Even courses.
3. Developing plan and section of dog-legged staircase.
4. Developing plan of single storied residential building.
5. Developing section and elevation of single storied residential building.
6. Developing plan of single/ two storied Residential building as per Building by-laws.
7. Developing plan of public building as per building by-laws.
8. Developing section and elevation of public building.
9. Development of working drawing of building–Electrical Layout.
10. Development of working drawing of building–Plumbing Layout.

Software/Tools to be Used : AutoCAD (Open Source)

REFERENCE BOOKS:

1. Dr. M. N. Sesha Praksh & Dr. G. S. Suresh, Reference Book on Computer Aided Design Laboratory, Laxmi Publications, 1st Edition, 2006.
2. P. J. Shah, Engineering Graphics, S. Chand & Co., Revised Edition, 2021.

3. N. Sreenivasulu & S. Rama Rao, Civil Engineering Drawing – I, Radiant Publishing House, 1st Edition, 2017.
4. M. G. Shah, Building Drawing, Tata McGraw-Hill Education, 6th Edition, 2012.
5. National Building Code (NBC) of India, Bureau of Indian Standards (BIS), 2016.

ONLINE REFERENCES

1. https://www.autodesk.in/campaigns/autocad-tutorials

DIGITAL SURVEYING LABORATORY

Department of Civil Engineering					II B. Tech II Semester		
Course Code	Hours/Week			Credits	Marks		
A254184	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

Objectives: This course is expected to enable the students to:

- To familiarize students with advanced surveying instruments such as Total Station and GPS.
- To provide hands-on training in digital data collection using modern surveying tools.
- To develop skills in interpreting and analyzing digital survey data accurately.
- To enhance the application of modern surveying techniques in civil engineering practices.

Course Outcomes: After completion of the course, the student will be able to: Handle and operate Total Station, handheld GPS effectively.

- Demonstrate operation of digital surveying instruments like Total Station and GPS.
- Perform distance, angle, and coordinate measurements for traversing and leveling.
- Conduct GPS-based surveys and apply route tracking and waypoint marking techniques.
- Analyze survey data and present project outputs through maps and reports.

List of Experiments:

1. Introduction and demonstration of digital surveying instruments.
2. Measurement of distances, angles, and coordinates using a Total Station.
3. Traversing and plotting with Total Station.
4. Area and volume computations using Total Station.
5. Profile and cross-section levelling using Total Station.
6. Introduction to GPS surveying – types and working principles.
7. Static and dynamic GPS survey using handheld devices.
8. Route tracking and waypoint marking with GPS.
9. Data extraction and plotting in AutoCAD
10. Group mini-project: topographical survey of a given area.
11. Project data processing and map/report preparation.
12. Project presentation and viva-voce.

SOFTWARE/TOOLS TO BE USED:

- Total Station
- GPS Devices (Handheld)
- Surveying Software: AutoCAD (Open Source)

REFERENCE BOOKS:

1. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Surveying Vol. 1 & 2, Laxmi Publications Pvt. Ltd., 18th Edition, 2020.
2. Satheesh Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2nd Edition, 2017.
3. R. Subramanian, Surveying and Levelling, Oxford University Press, 2nd Edition, 2014.

ONLINE REFERENCES

1. http://sl-iitr.vlabs.ac.in/List%20of%20experiments.html