

GLOBAL INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
COURSE CATALOGUE
REGULATIONS B.TECH – GR - 25
CIVIL ENGINEERING
II YEAR I SEMESTER

Course Code	Course Name	Subject Area	Category	Periods Per Week			Credits	Scheme of Examination Max Marks		
				L	T	P		CIA	SEE	Total
THEORY										
MA301BS	Probability and Statistics	BSC	Foundation	3	0	0	3	40	60	100
CE302PC	Building Materials and Concrete Technology	PCC	Core	3	0	0	3	40	60	100
CE303PC	Strength of Materials	PCC	Core	3	0	0	3	40	60	100
CE304PC	Surveying and Geomatics	PCC	Core	3	0	0	3	40	60	100
CE305PC	Fluid Mechanics	PCC	Core	3	0	0	3	40	60	100
MS306HS	Quantitative Aptitude and Logical Reasoning	HSMC	Foundation	2	0	0	2	40	60	100
PRACTICAL										
CE307PC	Material Testing Lab	PCC	Core	0	0	2	1	40	60	100
CE308PC	Strength of Materials Lab	PCC	Core	0	0	2	1	40	60	100
CE309PC	Surveying & Geomatics Lab	PCC	Core	0	0	2	1	40	60	100
CE310SD	Design Thinking and Tinkering Lab	SDC	Skill	0	0	2	1	40	60	100
Total Credits				17	0	8	21			

COURSE CONTENT

PROBABILITY & STATISTICS								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
MA301BS	Foundation	L	T	P	C	CIA	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 48		
Prerequisite: Mathematics courses of the first year of study.								

1. COURSE OVERVIEW

Probability and Statistics is a foundational course designed to equip Civil Engineering students with essential statistical and probabilistic tools used in engineering analysis, planning, and decision-making. The course emphasizes the practical application of these mathematical concepts to solve real-world problems encountered in civil engineering domains such as structural analysis, transportation engineering, geotechnical engineering, environmental systems, and construction management.

2. COURSE OBJECTIVE

The students will try to Learn:

- 1) The theory of Probability, and probability distributions of single and multiple random variables
- 2) The sampling theory and testing of hypotheses and making statistical inferences.
- 3) The curve fitting, correlation and regression for the given data.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Apply the concepts of Random variables and Discrete Probability distributions to some case studies.
CO 2	Correlate the concepts of one unit to the concepts in other units. Learn the concept of Continuous Probability and Fundamental Sampling Distribution.
CO 3	Understand sampling theory and apply hypothesis testing in real-world scenarios. Learn the concept of Estimating the means, variance & proportions of one & two samples.
CO 4	Test a hypothesis on large and small samples concerning means & variance of one & two samples, single & double proportions.
CO 5	Fit the curve, correlation and regression for the given data.

4. COURSE CONTENT

UNIT - I: Random Variables and Probability Distributions

8 L

Concept of a Random Variable – Discrete Probability Distributions – Continuous Probability Distributions – Mean of a Random Variable – Variance of a Random Variable

Discrete Probability Distributions: Binomial Distribution – Poisson distribution

UNIT - II: Continuous Distributions and Sampling

10 L

Uniform Distribution – Normal Distribution – Areas under the Normal Curve – Applications of the Normal Distribution – Normal Approximation to the Binomial Distributions. **Fundamental Sampling Distributions:** Random Sampling – Some Important Statistics – Sampling Distributions – Sampling Distribution of Means – Central Limit Theorem.

UNIT - III: Continuous Estimation**10 L**

Introduction – Statistical Inference – Classical Methods of Estimation – Single Sample: Estimating the mean – Standard error of a point Estimate. Two samples: Estimating the difference between two means– Single sample: Estimating a proportion – Two samples: Estimating the difference between two proportions– Two samples: Estimating the ratio of two variances.

UNIT - IV: Tests of Hypotheses (Large and Small Samples)**10 L**

Statistical Hypotheses: General Concepts – Testing a Statistical Hypothesis. Single sample: Tests concerning a single mean. Two samples: Tests on two means (Unknown for equal variance). One sample: Test on a single proportion. Two samples: Tests on two proportions. Two- sample tests concerning variances: F-distribution.

UNIT - V: Applied Statistics**10 L**

Curve fitting by the method of least squares, fitting of straight lines, second degree parabolas and more general curves, Correlation and regression, Rank correlation.

5. TEXT BOOKS

- 1) Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
- 2) S C Gupta & V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

6. REFERENCE BOOKS

- 1) T.T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, Ltd, 2004.
- 2) Sheldon M Ross, Probability and Statistics for Engineers and Scientists, academic press.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2										2	3	2
CO 2	2	3										2	2	3
CO 3	2	3											2	3
CO 4	3	-	1		2								3	-
CO 5	3	3			1							2	3	3

COURSE CONTENT

BUILDING MATERIALS AND CONCRETE TECHNOLOGY								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE302PC	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 48		
Prerequisite:								

1. COURSE OVERVIEW

This course introduces the fundamental properties, manufacturing processes, testing methods, and applications of building materials used in civil engineering construction. It covers traditional materials such as stones, bricks, timber, cement, aggregates, and concrete, along with modern materials and special concretes. The course emphasizes understanding material behavior in fresh and hardened states, concrete mix design as per Indian Standards, and quality control practices to ensure durable, safe, and sustainable construction.

2. COURSE OBJECTIVE

The students will try to Learn:

- 1) To introduce the classification, properties, and applications of traditional and modern building materials
- 2) To impart knowledge on the types and properties of cement, aggregates, water, and admixtures, including their standards and testing procedures
- 3) To enable students to understand the behavior of fresh and hardened concrete
- 4) To provide a comprehensive understanding of concrete mix design methodologies as per IS 10262:2019, including nominal and design mixes, quality control, and acceptance criteria as per IS 456:2000.
- 5) To familiarize students with the composition, properties, and applications of special concretes, such

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Explain how stones, bricks, tiles, and timber are classified, made, and used in building construction.	Understand
CO 2	Describe different types of paints, varnishes, glass, plastics, and modern materials, and explain their uses in buildings.	Understand
CO 3	Explain the properties of aggregates, water, and admixtures, and how they affect concrete quality.	Understand
CO 4	Explain how fresh and hardened concrete behaves and what factors affect its strength and durability.	Understand
CO 5	Design concrete mixes as per IS 10262:2019 and suggest suitable special concretes based on their properties and uses.	Understand

4. COURSE CONTENT

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 Admixtures:

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.

5. TEXT BOOKS

- 1) Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, “Building Construction”, Eleventh edition 2016 Laxmi Publications.
- 2) Concrete Technology by M. S. Shetty, S. Chand publishing & Company Pvt. Ltd.

6. REFERENCE BOOKS

- 1) Sushil Kumar “Building Materials and construction”, 20th edition, reprint 2015, Standard Publishers.
- 2) Properties of Concrete by A. M. Neville – 4th edition.
- 3) P C Varghese, “Building Materials”, PHI Learning Pvt. Ltd.
- 4) IS 10262: 2019 code for Concrete Mix Proportioning.
- 5) National Building Code (NBC) of India-2016.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3					1						1	2	2
CO 2	3					1						1	2	2
CO 3	3					1						1	2	2
CO 4	3					1						1	2	2
CO 5	3					1						1	2	2

COURSE CONTENT

STRENGTH OF MATERIALS								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE303PC	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisite: Engineering Mechanics								

1. COURSE OVERVIEW

This course focuses on the fundamental principles governing the behavior of materials under various loading conditions. It covers stress–strain relationships, elastic constants, strain energy, bending and shear behavior of beams, deflection analysis, and the behavior of thin and thick cylinders. The course emphasizes analytical methods for evaluating strength, stiffness, and deformation of structural members, enabling students to apply theoretical concepts to practical engineering problems in civil and mechanical engineering.

2. COURSE OBJECTIVE

The students will try to Learn:

- 1) Understand the nature of stresses developed in simple geometries such as bars, cantilevers and beams for various types of simple loads.
- 2) Calculate the elastic deformation occurring in simple members for different types of loading.
- 3) Show the plane stress transformation with a particular coordinate system for different orientation of the plane.
- 4) Know different failure theories adopted in designing of structural members

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Analyze simple and composite members subjected to axial loads, temperature effects, and impact loads by evaluating stresses, strains, and strain energy.	Analyze
CO 2	Construct and interpret shear force and bending moment diagrams for beams under various loading conditions.	Apply
CO 3	Determine flexural and shear stresses in beams of different cross-sections and design simple beam sections based on strength criteria.	Apply
CO 4	Calculate slopes and deflections of beams using analytical methods such as double integration, Macaulay's method, and moment area theorems.	Apply
CO 5	Evaluate stresses and strains in thin and thick cylinders using appropriate theories and apply them to pressure vessel design problems.	Analyze

4. COURSE CONTENT

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.

5. TEXT BOOKS

- 1) Strength of Materials by B. Raghu Kumar, BS Publications.
- 2) Strength of Materials by B.S. Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press
- 3) Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
- 4) Strength of Materials by R. Subramanian, Oxford University Press

6. REFERENCE BOOKS

- 1) Mechanics of Materials by R.C. Hibbeler, Prentice Hall publications
- 2) Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications
- 3) Strength of Materials by T.D. Gunneswara Rao and M. Andal, Cambridge Publishers
- 4) Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt.Ltd.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	1	2								2	2	2
CO 2	3	3	1	2								2	2	2
CO 3	3	3	1	2								2	2	2
CO 4	3	3	1	2								2	2	2
CO 5	3	3	1	2								2	2	2

COURSE CONTENT

SURVEYING AND GEOMATICS								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE304PC	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisite:								

1. COURSE OVERVIEW

This course introduces the fundamental principles and practices of surveying required for civil engineering applications. It covers conventional and modern surveying techniques for measurement of distances, directions, elevations, areas, and volumes. The course also includes levelling, contouring, theodolite and tachometric surveying, curve setting, and modern instruments such as Total Stations and GPS. Emphasis is placed on accuracy, field procedures, computations, and practical application of surveying methods in engineering projects.

2. COURSE OBJECTIVE

The students will try to Learn:

- 1) Understand the fundamentals of surveying including its objectives, classifications, principles, and accessories used.
- 2) Apply techniques for measurement of distances, directions, and angles using various conventional and modern instruments.
- 3) Perform levelling and contouring to determine elevations and prepare topographical maps.
- 4) Compute areas and volumes using different methods applicable in engineering projects like earthworks.
- 5) Handle theodolite and tachometric surveys and perform traversing and curve setting.
- 6) Use modern surveying instruments such as Total Station and GPS for accurate data collection and analysis.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Describe different types and phases of surveying, and explain conventional symbols and scales. Measure linear distances and directions using chains, tapes, compasses, and EDM methods, and apply corrections accurately.	Analyze
CO 2	Analyze differential levelling methods and contouring using various instruments and compute heights using HI and Rise & Fall methods.	Apply
CO 3	Calculate areas and volumes using MDM, DMD methods and Planimeter; compute earthwork quantities and reservoir capacities.	Apply
CO 4	Compute angle measurements, trigonometric levelling, and traverse computations including adjustments using theodolite.	Apply
CO 5	Understand the use of Total Station and GPS for advanced survey work and differentiate between modern and traditional surveying methods.	Analyze

4. COURSE CONTENT

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, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

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 and two-level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

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.

5. TEXT BOOKS

- 1) Surveying with Geomatics and R First Edition (2022) by Marcelo de Carvalho Alves, Luciana Sanches.
- 2) Surveying and leveling by R. Subramanian, Oxford university press, New Delhi.
- 3) Chandra A M, “Higher Surveying”, Newage International Pvt.Ltd. Publishers, New Delhi,2002.
- 4) Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.

6. REFERENCE BOOKS

- 1) Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw-Hill–2000.
- 2) Arora K R “Surveying Vol 1,2&3, Standard Book House, Delhi,2004.
- 3) Surveying (Vol–1,2&3), by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain-Laxmi Publications (P) ltd., New Delhi.
- 4) Chandra A M, “Plane Surveying”, New Age International Pvt.Ltd., NewDelhi,2002.
- 5) Surveying by Bhavikatti; Vikas publishing house ltd.
- 6) Duggal S K, “Surveying (Vol–1&2), Tata Mc Graw Hill Publishing Co. Ltd. New Delhi,2004.
- 7) Surveying and leveling by R. Agor Khanna Publishers 2015.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1				2			2			2	2	2
CO 2	3	1				2			2			2	2	2
CO 3	3	1				2			2			2	2	2
CO 4	3	1				2			2			2	2	2
CO 5	3	1				2			2			2	2	2

COURSE CONTENT

FLUID MECHANICS								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE305PC	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisite:								

1. COURSE OVERVIEW

Fluid Mechanics deals with the study of the behavior of fluids at rest and in motion and their interaction with solid boundaries. The course covers fundamental fluid properties, fluid statics, kinematics, and dynamics, including the laws governing fluid flow through pipes and open channels. Emphasis is placed on understanding fluid behavior, applying conservation laws, and solving practical engineering problems related to hydraulic systems and fluid flow.

2. COURSE OBJECTIVE

The students will try to Learn:

- 1) Introduce the concepts of fluid mechanics useful in Civil Engineering applications.
- 2) Provide a first level exposure to the students to fluid statics, kinematics and dynamics.
- 3) Learn about the application of mass, energy and momentum conservation laws for fluid flows.
- 4) Train and analyses engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students
- 5) To obtain the velocity and pressure variations in various types of simple flows.
- 6) To prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Evaluate the physical properties of fluids and principles of fluid statics.	Evaluate
CO 2	Analyze fluid kinematics and dynamics using continuity, energy, and momentum principles	Analyze
CO 3	Solve problems related to fluid flow through pipes and open channels, including losses and flow measurement.	Evaluate
CO 4	Apply dimensional analysis and similitude concepts to model and prototype studies.	Apply
CO 5	Analyze practical fluid flow systems and hydraulic machines using fundamental fluid mechanics principles.	Analyze

4. COURSE CONTENT

UNIT – I:

Properties of Fluid

Distinction between a fluid and a solid; Properties of fluids – 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, Pascals law, Hydrostatic law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. 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-Wiesbatch 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 EPA NET, 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.

5. TEXT BOOKS

- 1) Theory and Applications of Fluid Mechanics, K. Subramanian, TataMcGrawHill.
- 2) Fluid Mechanics by Modi and Seth, Standard Book House.
- 3) Fluid Mechanics by Streater.
- 4) Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

6. REFERENCE BOOKS

- 1) Fluid Mechanics–Frank M. White–8th Edition–McGraw-Hill Education.
- 2) Introduction to Fluid Mechanics and Fluid Machines by S K Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
- 3) Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
- 4) Fluid Mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai & Co
- 5) Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publication Pvt. Ltd.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	2	1								2	2	2
CO 2	3	3	2	1								2	2	2
CO 3	3	3	2	1								2	2	2
CO 4	3	3	2	1								2	2	2
CO 5	3	3	2	1								2	2	2

COURSE CONTENT

QUANTITATIVE APTITUDE AND LOGICAL REASONING								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
MS306HS	Foundation	L	T	P	C	CIA	SEE	Total
		2	-	-	2	40	60	100
Contact Classes: 32	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 32		
Prerequisite: Nil								

1. COURSE OVERVIEW

The **Quantitative Aptitude and Logical Reasoning** course is designed to strengthen numerical ability, analytical thinking, and problem-solving skills required for competitive examinations, campus placements, and professional aptitude tests. The course covers fundamental arithmetic, algebra, data interpretation, and logical reasoning techniques, enabling learners to analyze problems systematically, apply appropriate methods, and arrive at accurate solutions efficiently. Emphasis is placed on speed, accuracy, and logical thinking to enhance overall aptitude and decision-making skills.

2. COURSE OBJECTIVE

The students will try to Learn:

- 1) To answer general problems in his everyday life within in short time and to improves the certain skills of a student such as numerical and logical ability, mental capacity and also in sharpening minds.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Apply concepts of number systems, HCF and LCM, averages, ages, and ratio and proportion to solve quantitative problems.
CO 2	Solve problems related to various important topics of quantitative aptitude using appropriate mathematical techniques.
CO 3	Analyze and solve problems involving mensuration and data interpretation.
CO 4	Apply logical reasoning techniques to solve analytical and reasoning-based problems.
CO 5	Solve problems based on Venn diagrams, cubes and dice, and clock and calendar concepts.

4. COURSE CONTENT

UNIT – I

(6L)

Number System: Test for Divisibility, Test of prime number, Division and Remainders – HCF and LCM of Numbers–Fractions and Decimals -Average-Problems on Ages- Problems on Numbers- Ratio and Proportion.

UNIT -- II

(6L)

Percentage – Profit, Loss and Discount – Partnership and Share-Simple Interest – Compound Interest. Time and Work- Pipes and Cisterns-Time and Distance- Problems on Trains- Boats and Streams.

UNIT -- III**(6L)**

Allegation or Mixtures, Clocks & Calendar, Mensuration : Area of Plane Figures, Volume and Surface Area of Solid Figures.

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.

UNIT -- IV**(7L)**

Series Completion: Number Series, Alphabet Series, Alpha – Numeric Series.

Classification: Word Classification, Number Classification and Letter Classification.

Mathematical Operations-Arithmetical Reasoning. Puzzle Test: Classification Type Questions, Seating Arrangements, Comparison Type Questions, Sequential Order of Things, Selection Based on Given Conditions, Jumbled Problems.

UNIT -- V**(7L)**

Logical Venn Diagrams – Cubes and Dice – Analytical Reasoning-Assertions and Reason– Logical Deductions-Syllogism -Statement and Arguments-Statement and Conclusions- -Data Sufficiency.

5. TEXT BOOKS:

1. R. S. Agarwal, *Quantitative Aptitude*, Revised Edition, S. Chand Publishing, New Delhi.
2. R. S. Agarwal, *Verbal and Non-Verbal Reasoning*, Revised Edition, S. Chand Publishing, New Delhi.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2										2	3	1
CO 2	3	3	1									2	2	1
CO 3	2	3	2	1								1	3	1
CO 4	2	3	1						1			2	2	1
CO 5	2	2	1									1	2	1

COURSE CONTENT

MATERIAL TESTING LABORATORY								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE307PC	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				Total Classes: 32		
Prerequisite:								

1. COURSE OVERVIEW

The Material Testing Laboratory course provides hands-on experience in testing and evaluating the properties of construction materials used in civil engineering. Students perform laboratory tests on materials such as cement, aggregates, concrete, steel, and timber to understand their physical, mechanical, and durability characteristics. The course emphasizes standard testing procedures, interpretation of results as per relevant codes, and correlation of laboratory findings with practical engineering applications.

2. COURSE OBJECTIVE

The objectives of the course is to

- 1) Know the various procedures to determine the characteristics of cement
- 2) Understand the test procedures to evaluate the characteristics of aggregates
- 3) Know the test procedures to find the properties of fresh concrete
- 4) Understand the test procedures to find mechanical properties of hardened concrete

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Conduct standard laboratory tests on construction materials in accordance with relevant Indian and international codes.	Apply
CO 2	Evaluate the mechanical and physical properties of materials such as cement, aggregates, concrete.	Apply
CO 3	Analyze test results and assess the suitability of materials for various civil engineering applications.	Apply
CO 4	Prepare laboratory test reports with proper observations, calculations, and conclusions.	Apply
CO 5	Understand laboratory safety practices and demonstrate ethical and professional responsibility during material testing.	Apply

4. COURSE CONTENT

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.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	1		1					3	1		2	2	2
CO 2	2	1		1					3	1		2	2	2
CO 3	2	1		1					3	1		2	2	2
CO 4	2	1		1					3	1		2	2	2
CO 5	2	1		1					3	1		2	2	2

COURSE CONTENT

STRENGTH OF MATERIALS LABORATORY								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE308PC	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				Total Classes: 32		
Prerequisite:								

1. COURSE OVERVIEW

The Strength of Materials Laboratory provides practical exposure to the mechanical behaviour of materials under different types of loading. Through laboratory experiments on tension, compression, bending, torsion, and impact, students gain hands-on understanding of stress–strain relationships, elastic constants, and failure characteristics of engineering materials. The course bridges theoretical concepts with real-world material behaviour and testing practices.

2. COURSE OBJECTIVE

The objectives of the course is to

- 1) Conduct the Tension test, Compression test on various materials
- 2) Conduct the Shear test, Bending test on determinate beams
- 3) Conduct the Compression test on spring and Hardness test using various machines
- 4) Conduct the Torsion test, Impact test on various materials

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Determine the yield stress, ultimate tensile stress, percentage elongation of steel, compressive strength of brick and concrete	Apply
CO 2	Determine the ultimate shear stress, modulus of elasticity of steel	Apply
CO 3	Determine the stiffness of the close coiled helical spring and hardness number of mild steel, brass, copper and aluminium.	Apply
CO 4	Determine the modulus of rigidity and impact strength of steel	Apply
CO 5	Demonstrate safe laboratory practices and professional ethics while performing material testing experiments.	Apply

4. COURSE CONTENT

1. Tension test
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test

7. Compression test on concrete.
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam-deflection test.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1		1				1	3	1		2	2	2
CO 2	3	1		1				1	3	1		2	2	2
CO 3	3	1		1				1	3	1		2	2	2
CO 4	3	1		1				1	3	1		2	2	2
CO 5	3	1		1				1	3	1		2	2	2

COURSE CONTENT

SURVEYING & GEOMATICS LABORATORY								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE309PC	Core	L	T	P	C	CIA	SEE	Total
		-	-	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				Total Classes: 32		
Prerequisite: Nil								

1. COURSE OVERVIEW

The Surveying & Geomatics Laboratory provides practical training in the use of conventional and modern surveying instruments for field data collection and analysis. Students perform hands-on exercises in linear and angular measurements, levelling, traversing, contouring, curve setting, and the use of advanced technologies such as Total Stations and GPS. The course emphasizes accuracy, field procedures, data processing, and interpretation for civil engineering applications.

2. COURSE OBJECTIVE

The students will try to Learn:

- 1) Learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
- 2) Learn and understand about theodolite and total station in surveying.
- 3) Learn and understand how to calculate Area of plot and Ground.
- 4) Learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Interpret survey data and prepare field notes, drawings, laboratory reports, Map and Plan for required site with suitable scale.	Apply
CO 2	Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.	Apply
CO 3	Judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.	Evaluate
CO 4	Judge the profile of ground by observing the available existing contour map.	Evaluate
CO 5	Demonstrate teamwork, safety awareness, and professional ethics during field and laboratory surveying activities.	Apply

4. COURSE CONTENT

CYCLE-I

Theodolite surveying:

1. Measurement of horizontal angles and vertical angles.
2. Distance between two inaccessible points.

3. Measurement of area by theodolite traversing (Gales traverse table).
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

CYCLE-II

Total Station:

7. Area Measurement
8. Stake Out
9. Remote Elevation Measurement
10. Missing Line Measurement
11. Longitudinal & Cross Section Profile
12. Contouring
13. Setting of a Simple Circular Curve
14. Demonstration using DGPS

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1		1	1			1	2	1		2	2	2
CO 2	3	1		1	1			1	2	1		2	2	2
CO 3	3	1		1	1			1	2	1		2	2	2
CO 4	3	1		1	1			1	2	1		2	2	2
CO 5	3	1		1	1			1	2	1		2	2	2

COURSE CONTENT

DESIGN THINKING AND TINKERING LAB								
II Year - I Semester: CE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE310SD	Skill	L	T	P	C	CIA	SEE	Total
		-	-	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				Total Classes: 32		
Prerequisite:								

1. COURSE OVERVIEW

The Design Thinking and Tinkering Lab encourages students to apply creative problem-solving techniques to develop innovative solutions for real-world challenges. By focusing on iterative design processes, prototyping, and experimentation, students engage in hands-on projects that foster critical thinking, creativity, and technical skills. The lab provides a platform for students to explore emerging technologies, use various tools, and work collaboratively to prototype functional solutions using the principles of design thinking.

2. COURSE OBJECTIVE

The students will try to Learn:

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

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	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.	Apply
CO 2	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.	Evaluate
CO 3	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.	Create
CO 4	Analyze systems and complex problems using systems thinking tools to propose sustainable solutions.	Analyze
CO 5	Reflect critically on team-based design experiences and iterate solutions based on feedback and testing.	Evaluate

4. STUDENTS' 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.

5. 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)

6. 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

7. 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.

8. 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)

9. OTHER SUGGESTED READINGS:

- 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/>

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1	1	1		1		1	1	3		2	2	2
CO 2	3	1	1	1		1		1	1	3		2	2	2
CO 3	3	1	1	1		1		1	1	3		2	2	2
CO 4	3	1	1	1		1		1	1	3		2	2	2
CO 5	3	1	1	1		1		1	1	3		2	2	2