BRILLIANT INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
UGC AUTONOMOUS INSTITUTION
B.Tech. in CIVIL ENGINEERING
COURSE STRUCTURE & SYLLABUS (B25 Regulations)
Applicable from AY 2025-26 Batch

I Year I Semester (25 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1.	25QAMA101	Matrices and Calculus	3	1	0	4
2.	25QAPH102	Advanced Engineering Physics	3	0	0	3
3.	25QAME103	C Programming and Data Structures	3	0	0	3
4.	25QAEN104	English for Skill Enhancement	3	0	0	3
5.	25QAME105	Engineering Drawing and Computer Aided Drafting	2	0	2	3
6.	25QAPH106	Advanced Engineering Physics Lab	0	0	2	1
7.	25QACS107	C Programming and Data Structures Lab	0	0	2	1
8.	25QAME108	Engineering Workshop	0	0	2	1
9.	25QAEN109	English Language and Communication Skills Lab	0	0	2	1
		Induction Program				
		Total Credits	**14**	**01**	**10**	**20**

I Year II Semester (24 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1.	25QAMA201	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2.	25QACH202	Applied Chemistry	3	0	0	3
3.	25QACS203	Python Programming	3	0	0	3
4.	25QAEE204	Elements of Electrical and Electronics Engineering	3	0	0	3
5.	25QACE205	Building Planning and Construction	3	0	0	3
6.	25QACE206	Engineering Mechanics for Civil Engineers	3	0	0	3
7.	25QACH207	Chemistry Lab for Engineers	0	0	2	1
8.	25QACS208	Python Programming Lab	0	0	2	1
9.	25QAEE209	Elements of Electrical and Electronics Engineering Lab	0	0	2	1
		Total Credits	**18**	**0**	**06**	**21**

II YEAR I SEMESTER (25 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1.	25QAMA301	Probability and Statistics	3	0	0	3
2.	25QACE302	Building Materials and Concrete Technology	3	0	0	3
3.	25QACE303	Strength of Materials	3	0	0	3
4.	25QACE304	Surveying and Geomatics	3	0	0	3
5.	25QACE305	Fluid Mechanics	3	0	0	3
6.	25QAMA306	Computational Mathematics Lab	0	0	2	1
7.	25QACE307	Concrete Technology Lab	0	0	2	1
8.	25QACE308	Strength of Materials Lab	0	0	2	1
9.	25QACE309	Surveying & Geomatics Lab	0	0	2	1
10.	25QACE310	Design Thinking and Tinkering Lab	0	0	2	1
		Total Credits	**15**	**0**	**10**	**20**

II YEAR II SEMESTER (25 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	25QACE401	Advanced Strength of Materials	3	0	0	3
2.	25QACE402	Water Resources and Irrigation Engineering	3	0	0	3
3.	25QACE403	Hydraulics & Hydraulic Machinery	3	0	0	3
4.	25QACE404	Basic Structure Analysis	3	0	0	3
5.	25QACE405	Engineering Geology	2	0	0	2
6.	25QAMS406	Innovation and Entrepreneurship	2	0	0	2
7.	25QACE407	Engineering Geology Lab	0	0	2	1
8.	25QACE408	Hydraulics & Hydraulic Machinery Lab	0	0	2	1
9.	25QACE409	Computer Aided Building Drafting Lab	0	0	2	1
10.	25QACE410	Digital Surveying Lab	0	0	2	1
11.	25QAVA400	Indian Knowledge System	1	0	0	1
		Total Credits	**17**	**0**	**08**	**21**

III YEAR I SEMESTER (25 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	25QACE501	Environmental Engineering	3	0	0	3
2.	25QACE502	Design of Reinforced Concrete Members	3	0	0	3
3.	25QACE503	Transportation Engineering	3	0	0	3
4.		Professional Elective-I	3	0	0	3
5.		Open Elective-I	2	0	0	2
6.	25QACE504	Environmental Engineering Lab	0	0	2	1
7.	25QACE505	Computer Aided Design Lab	0	0	2	1
8.	25QACE506	Highway Materials Lab	0	0	2	1
9.	25QACE507	Field Based Project/ Internship	0	0	4	2
10.	25QACE508	Building Information Modelling Lab	0	0	2	1
11.	25QAVA500/ 25QAVS501	Gender Sensitization Lab*/ Human Values and Professional Ethics*	1	0	0	1
12.		**Total Credits**	**15**	**0**	**10**	**21**

***Note: For the courses Gender Sensitization Lab and Human Values and Professional Ethics-** one hour of instruction will be conducted on alternate weeks. For example, if a one-hour class for Gender Sensitization Lab is conducted this week, then a one-hour class for Constitution of India will be conducted in the following week.

III YEAR II SEMESTER (25 Hours)

S.No	Course Code	Course Title	L	T	P	Credits
1.	25QACE601	Geotechnical Engineering	3	0	0	3
2.	25QACE602	Design of Steel Structures	3	0	0	3
3.	25QACE603	Business Economics and Financial Analysis	3	0	0	3
4.		Professional Elective-II	3	0	0	3
5.		Open Elective – II	2	0	0	2
6.	25QACE604	Geotechnical Engineering Lab	0	0	2	1
7.	25QACE605	GIS Lab	0	0	2	1
8.	25QACE606	Civil Engineering Software Lab	0	0	2	1
9.	25QAEN607	Advanced English Communication Skills Lab	0	0	2	1
10.	25QACE608	Project Management Software Lab	0	0	2	1

11.	25QAVS600	Environmental Science	1	0	0	1
		Total Credits	**15**	**0**	**10**	**20**

IV YEAR I SEMESTER (25 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1	25QACE701	Estimation Quantity Surveying & Valuation	3	0	0	3
2	25QACE702	Foundation Engineering	3	0	0	3
3	25QAMS703	Fundamentals of Management	3	0	0	3
4		Professional Elective-III	3	0	0	3
5		Professional Elective – IV	3	0	0	3
6		Open Elective – III	2	0	0	2
7	25QACE704	Quantity Surveying Laboratory	0	0	2	1
8	25QACE705	Computational Lab / IOT Lab	0	0	2	1
9	25QACE706	Industry Oriented Mini Project/ Summer Internship	0	0	4	2
		Total Credits	**17**	**0**	**08**	**21**

IV YEAR II SEMESTER (34 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1		Professional Elective – V	3	0	0	3
2		Professional Elective – VI	3	0	0	3
3	25QACE801	Project Work	0	0	28	14
		Total Credits	**6**	**0**	**28**	**20**

PROFESSIONAL ELECTIVES

Professional Elective - I

25QACE511	Advanced Structural Analysis
25QACE512	Fuzzy Logic and ANN Applications in Civil Engineering
25QACE513	Remote Sensing & GIS
25QACE514	Green Building Technologies
25QACE515	Advanced Concrete Technology

Professional Elective – II

25QACE621	Prestressed Concrete
25QACE622	AI Applications in Civil Engineering
25QACE623	Hydraulic Structures
25QACE624	Industrial Waste Water Treatment
25QACE625	Railways, Airports &Water ways

Professional Elective-III

25QACE731	Smart Cities
25QACE732	Machine Learning and Data Analytics in Civil Engineering
25QACE733	Air pollution & Control
25QACE734	Ground water Hydrology
25QACE735	Pre-Engineered Buildings

Professional Elective-IV

25QACE741	Solid & Hazardous Waste Management

25QACE742PE	IoT Applications in Civil Engineering
25QACE743PE	Intelligent Transportation Systems
25QACE744PE	Structural Dynamics & Earth Quake Engineering
25QACE745PE	Construction Planning & Management

Professional Elective-V

25QACE851	Pavement Analysis & Design
25QACE852	Digital Image Processing in Civil Engineering
25QACE853	Urban Hydrology
25QACE854	Ground Improvement Techniques
25QACE855	Finite Element Methods

Professional Elective-VI

25QACE861	Repair and Rehabilitation of Structures
25QACE862	Quantum Computing Applications in Civil Engineering
25QACE863	Sustainable Engineering Technologies
25QACE864	Climate Change Adaptation & Mitigation
25QACE865	Rock Mechanics

OPEN ELECTIVES

Open Elective-I:

25QACE511OE	Disaster Management
25QACE512OE	Low Cost Materials and Green Buildings

Open Elective-II:

25QACE621OE	Building Science and Technology
25QACE622OE	Environmental Impact Assessment

Open Elective-III:

25QACE731OE	Road Safety Engineering
25QACE732OE	Building Services Engineering

25QACE205: BUILDING PLANNING AND CONSTRUCTION

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: This course is expected to enable the student to:

- Provide fundamental knowledge about buildings and the influence of climate, orientation, and landscaping on building planning and design.
- Impart understanding of planning principles
- Familiarize students with the National Building Code (NBC), its structure and guidelines for residential buildings,
- Develop knowledge of key building components
- Introduce various finishing works and temporary structures

Course Outcomes: Upon completion of this course, student should be able to

- Understand the classification of buildings, criteria for site selection, the impact of climate on building design, and the role of orientation and landscaping in planning.
- Apply the principles of planning and interpret building bye-laws to design functionally efficient, economical, and regulation-compliant buildings.
- Interpret and implement provisions of the National Building Code (NBC) related to residential buildings and understand basic construction techniques including foundations and masonry.
- Identify and analyze various types of floors, roofs, staircases, doors, windows, and lintels used in building construction and their suitability for different design conditions.
- Demonstrate knowledge of finishing works such as plastering, pointing, and floor finishes, and explain the types, design, and safety aspects of scaffolding, formwork, and centering.

UNIT - I

Fundamentals of Buildings: Building, Classification of buildings, Site selection for Residential buildings, Climate and its influence on building planning; Elements of Climate, Climatic Zone of India, Climate and comfort, Earth and its motion, Directions and their characteristics, Landscaping.
Orientation of buildings; orientation, Factors affecting orientation, Sun, Wind, Rain, CBRT suggestions orientation criteria for Indian conditions.

UNIT - II

Principles of planning and Bye Laws of buildings: Aspects, prospect, Privacy, Furniture Requirements, Roominess, Grouping, Circulation, Elegance, Economy, Practical consideration.
Buildings bye Laws; Introduction, Objective, Principles, Applicability of building bye Laws. Introduction to National building code, Objectives, Scope, Structure of NBC. General Building Requirements, Guidelines for Residential Buildings. Building Heights, Setbacks, FAR/FSI. Open Spaces, room sizes, Lighting and Ventilation, Means of Access and service ducts. Classification of buildings for fire safety.

UNIT - III

Introduction to building construction and site preparation; components of Building, **Foundations: Functions & Requirements, Types of Shallow Foundations:** isolated footings, combined footings, strap footings, wall footings, raft foundations, **Types of Deep Foundations:** driven piles (timber, precast concrete, steel), bored cast-in-situ piles. Brick masonry – types – bonds; Stone masonry – types

UNIT - IV

Floors, Roofs, Stairs, Doors, Windows:

Types of floors – Ground and upper floors – Brick flooring, Cement concrete flooring, Stone flooring, Tiled flooring, Types of roofs – Flat, Pitched, Sloped, Curved roofs Components and classification of staircases – Straight flight, Dog-legged, Open well, Spiral staircases –Types of doors – Panelled, Flush,

Glass, PVC, Aluminum, Steel, Sliding, Revolving, Collapsible, and Rolling shutter doors – Door frame materials and fittings. Types of windows

UNIT - V

Finishing Works:

Plastering – Purpose, types, tools and techniques – Defects in plastering. Pointing – Types and application areas – Differences between plastering and pointing.

Scaffolding, Formwork, and Centering:

Scaffolding – Definition, purpose, components – Types: Single, Double, Cantilever, Suspended, Trestle, Steel and patented scaffolds – Safety considerations. Formwork – Functions, materials (timber, steel, aluminum, plastic), formwork for slabs, beams, columns, and walls – Centering: Definition and role in arches and domes.

TEXT BOOKS:

1. Benny Raphael (2022) Building Automation from Concepts to Implementation Routledge Publications.
2. Kumara Swamy N. and Kaneswaran Rao A., *Building Planning and Drawing*, Charotar Publishing House, Revised Edition, 2020.
3. B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, *Building Construction*, Laxmi Publications, 11th Edition, 2022.
4. S.S. Bhavikatti, *Building Materials and Construction*, Vikas Publishing House, 4th Edition, 2020.

REFERENCE BOOKS:

1. Sushil Kumar, *Building Construction*, Standard Publishers Distributors, 21st Edition, 2022.
2. Bindu Balan and R. Sathish Kumar, *Climatology and Building Design*, McGraw Hill Education, 1st Edition, 2020.
3. Gurcharan Singh, *Building Planning, Designing and Scheduling*, Standard Book House, 6th Edition, 2019.
4. Rangwala S.C., *Building Construction*, Charotar Publishing House, 33rd Edition, 2021.
5. M. Chakraborti, *Building Planning and Drawing*, Chakraborti Publications, 9th Edition, 2021.
6. Bureau of Indian Standards, *National Building Code of India (NBC) – 2016*, SP 7, Part 1 & 2, Reprint 2021.

25QACE206: ENGINEERING MECHANICS FOR CIVIL ENGINEERS

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: This course is expected to enable the student to:

- Provide Knowledge of force systems and free body diagram to analyze rigid body equilibrium
- Comprehend the principles of Friction and solve engineering mechanics problems associated with frictional force
- Compute the centroid, first moment and second moment of an area
- Impart the concept of motion of particles and rigid bodies.
- Familiarize the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

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

- Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
- Interpret and implement work-energy principle and its applications.

UNIT - I

Introduction to Engineering Mechanics– Force Systems: Basic concepts, Particleequilibriumin2-D &3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space –Resultant-Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

UNIT - II

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, Ladder friction

Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. –Theorem of Pappus.

UNIT - III

Area moment of inertia - Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem.

Mass Moment of Inertia: Moment of Inertia of Masses-Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT - IV

Kinematics of Particles: Kinematics of particles – Rectilinear motion – Curvilinear motion – Projectiles. Kinetics of Particles: Kinetics of particles– Newton's Second Law– Differential equations of rectilinear and curvilinear motion–Dynamic equilibrium–Inertia force–D. Alembert's Principle applied for rectilinear and curvilinear motion.

UNIT - V

Work-Energy Principle: Equation of translation, principle of conservation of energy, work-energy principle applied to particle motion and connected systems, fixed axis rotation. Impulse– Momentum Principle: Introduction, linear impulse momentum, principle of conservation of linear momentum, elastic

impact and types of impact, loss of kinetic energy, co efficient of restitution.

TEXTBOOKS:

1. G. Lakshmi Narasaiah (2023) Engineering Mechanics, B.S. Publications
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2024), Singer's Engineering Mechanics– Statics & Dynamics, B.S. Publications
3. Shames and Rao (2006), Engineering Mechanics, Pearson Education
4. S.S. Bhavikatti (2021) Engineering Mechanics, New age International Publishers.

REFERENCE BOOKS:

1. Timoshenko S. P and Young D.H, "Engineering Mechanics", McGraw-Hill International Edition, 2017.
2. Andrew Pytel, Jaan Kiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
3. Bee r F. P & Johnston E. R Jr. Vector, "Mechanics for Engineers", TMH, 2004.
4. Hibbeler R.C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
5. Tayal D.H.," Engineering Mechanics–Statics & Dynamics", Umesh Publications, 2011.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
7. Meriam.J.L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.
8. P.C Dumiretal. "Engineering Mechanics", University press

25QACE302: BUILDING MATERIALS AND CONCRETE TECHNOLOGY

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives: This course is expected to enable the student to:

- To introduce the classification, properties, and applications of traditional and modern building materials
- To impart knowledge on the types and properties of cement, aggregates, water, and admixtures, including their standards and testing procedures
- To enable students to understand the behavior of fresh and hardened concrete
- 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.
- To familiarize students with the composition, properties, and applications of special concretes, such

Course Outcomes: Upon completion of this course, students should be able to

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

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. 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.

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.

25QACE303: STRENGTH OF MATERIALS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: Engineering Mechanics

Course Objectives: The objective of this Course is to

- understand the nature of stresses developed in simple geometries such as bars, cantilevers and beams for various types of simple loads.
- calculate the elastic deformation occurring in simple members for different types of loading.
- show the plane stress transformation with a particular coordinate system for different orientation of the plane.
- know different failure theories adopted in designing of structural members.

Course Outcome: On completion of the course, the student will be able to:

- Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, related to the strength of structured and mechanical components.
- Recognize various types loads applied on structural components of simple framing geometries and understand the nature of internal stresses that will develop within the components.
- To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
- Analyze various situations involving structural members subjected to plane stresses by application of Mohr's circle of stress.

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. 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

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 byT.D. Gunneswara Rao and M. Andal, Cambridge Publishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt.Ltd.

25QACE304: SURVEYING AND GEOMATICS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objective of this Course is to

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

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

- Classify and 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.
- Perform differential levelling and contouring using various instruments and compute heights using HI and Rise & Fall methods.
- Calculate areas and volumes using MDM, DMD methods and Planimeter; compute earthwork quantities and reservoir capacities.
- Use theodolite for angle measurements, trigonometric levelling, and traverse computations including adjustments.
- Apply principles of tachometry and set out horizontal curves in the field.
- Utilize Total Station and GPS for advanced survey work and differentiate between modern and traditional surveying methods.

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.

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.

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.

25QACE305: FLUID MECHANICS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to

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

Course Outcomes: Upon completion of this course, students should be able to:

- Understand the broad principles of fluid statics, kinematics and dynamics.
- Understand definitions of the basic terms used in fluid mechanics and characteristics of fluids and its flow.
- Understand classifications of fluid flow.
- Be able to apply the continuity, momentum and energy principles.

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, 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.

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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.

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.

25QACE307: CONCRETE TECHNOLOGY LABORATORY

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to

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

Course Outcomes: After completion of the course, the student should be able to

- Perform various tests required to assess the characteristics of cement
- Test and evaluate the properties of fine and coarse aggregates and determine its suitability for construction
- Evaluate the fresh and hardened properties of concrete
- Design the concrete mix for required strength and test its performance characteristics

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.

25QACE308: STRENGTH OF MATERIALS LABORATORY

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to

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

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

- Determine the yield stress, ultimate tensile stress, percentage elongation of steel, compressive strength of brick and concrete
- Determine the ultimate shear stress, modulus of elasticity of steel
- Determine the stiffness of the close coiled helical spring and hardness number of mild steel, brass, copper and aluminum.
- Determine the modulus of rigidity and impact strength of steel**.**

List of Experiments:

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.

25QACE309: SURVEYING & GEOMATICS LABORATORY

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to

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

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

- Prepare Map and Plan for required site with suitable scale.
- Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
- Judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
- Judge the profile of ground by observing the available existing contour map.

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. Providing a Simple Circular Curve
14. Demonstration using DGPS

25QACE310: DESIGN THINKING AND TINKERING LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to

- 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: At the end of the course 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.

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.

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)

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/

25QACE401: ADVANCED STRENGTH OF MATERIALS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: Strength of Materials

Course Objectives: The objective of this Course is

- To understand the nature of stresses developed in simple geometries shafts, springs, columns & cylindrical and spherical shells for various types of simple loads.
- To calculate the stability and elastic deformation occurring in various simple geometries for different types of loading.
- To understand the unsymmetrical bending and shear center importance for equilibrium conditions in a structural member of having different axis of symmetry.

Course Outcome: On completion of the course, the student will be able to:

- Describe the concepts and principles, understand the theory of elasticity, and perform calculations, relative to the strength of structures and mechanical components in particular to torsion and direct compression.
- To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
- Analyze strength and stability of structural members subjected to Direct, and Direct and Bending stresses.
- Understand and evaluate the shear center and unsymmetrical bending.

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'sformula.

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. Mechanics of Materials by Dr.B.C. Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
2. Strength of Materials by R. Subramanian, Oxford University Press.

REFERENCE BOOKS:

1. Mechanics of Materials by R.C. Hibbeler, Pearson Education
2. Engineering Mechanics of Solids by Popov E.P. Prentice-Hall Ltd
3. Strength of Materials by T.D. GunneswaraRao and M. Andal, Cambridge Publishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt.Ltd.
5. Fundamentals of Solid Mechanics by M.L. Gambhir, PHI Learning Pvt. Ltd

25QACE402: WATER RESOURCES AND IRRIGATION ENGINEERING

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites: Probability & Statistics, Fluid Mechanics and Hydraulic Machines

Course Objectives: The objective of this Course is 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: At the end of the 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.
- 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. Hydrology, P. Jaya Rami Reddy, 3rd edition, Laxmi Publications, 2018.
2. Irrigation and Water Resources Engineering, G L Asawa, New Age Publishers, 2008.
3. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna Publishers

REFERENCES:

1. Elements of Engineering Hydrology, V.P. Singh, Tata McGraw-Hill, 2017.
2. Ground water Hydrology, David Keith Todd, John Wiley & Son, 2015.
3. Textbook of irrigation Engineering & Hydraulic Structures, R.K. Sharma, Oxford & IBH Publishing Company, 2023.

25QACE403: HYDRAULICS AND HYDRAULIC MACHINERY

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: 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: At the end of the course the student will 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. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015
3. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt. Ltd.).

REFERENCE BOOKS:

1. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt.Ltd
2. Introduction to Fluid Mechanics and Fluid Machines by S K Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
3. Hydraulic Machines by Banga & Sharma (Khanna Publishers).
4. Open channel flow by V.T. Chow (McGraw Hill Book Company).

25QACE404: BASIC STRUCTURE ANALYSIS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites: Strength of Materials**.**

Course Objectives:

- 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: Upon completion of this course, students should be able to

- An ability to apply knowledge of mathematics, science, and engineering.
- Analyse the statically indeterminate bars and continuous beams.
- Draw strength behavior of members for static and dynamic loading.
- Calculate the stiffness parameters in beams and pin jointed trusses.
- Understand the indeterminacy aspects to consider for a total structural system.

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. Basic Structural Analysis by K.U. Muthu et al., I.K. International Publishing House Pvt. Ltd
2. Structural Analysis Vol I & II by G. S. Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt.Ltd.
3. Introduction to Structural Analysis First Edition Indeterminate Structures First Edition (2026) by Meesala Chakradhara Rao, CRC Press.
4. Theory of Structures by R S Khurmi, S Chand & Company Pvt. Ltd, 2020

REFERENCE BOOKS:

1. Structural Analysis Vol –I & II by Vazarani and Ratwani, Khanna Publishers,1999
2. Strength of Materials and mechanics of solids Vol-2 by B.C. Punmia, Laxmi Publications, New Delhi, 2015
3. Structural Analysis -I & II by S.S. Bhavikatti, Vikas Publishing House Pvt. Ltd, 2021.

25QACE405: ENGINEERING GEOLOGY

B.Tech. II Year II Sem.

L	T	P	C
2	0	0	2

Course Objectives: The objective of this Course is 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: At the end of the course, the student 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. Principles of Engineering Geology (2023) by K.V.G.K. Gokhale– B.S. Publications
2. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd.2005
3. Engineering Methods by D. Venkat Reddy; VikasPublishers2015.
4. Engineering Geology by S K Duggal K Pandey McGraw Hill Education Pvt.Ltd 2014

REFERENCE BOOKS:

1. F.G. Bell, Fundamental of Engineering B.S. Publications,2005.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers– P.C. Varghese PHI

25QAMS406: INNOVATION AND ENTREPRENEUSHIP

B.Tech. II Year II Sem.

L	T	P	C
2	0	0	2

Course Objectives: The objective of this Course is to

- develop entrepreneurial mindset among civil engineering students
- encourage innovative thinking for solving real-world infrastructure problems
- equip students with the basics of business planning, startup creation, and IP rights
- bridge the gap between engineering solutions and market needs

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

- Understand the fundamentals of innovation, creativity, and entrepreneurs
- Identify opportunities and develop innovative solutions in civil engineering
- Prepare business models and feasibility studies for civil-related startups
- Apply principles of intellectual property, prototyping, and product development
- Demonstrate leadership and teamwork in entrepreneurial projects

UNIT 1:

Introduction to Innovation & Entrepreneurship Innovation vs. Invention vs. Creativity Entrepreneurial traits and motivation Types of Entrepreneurs (Tech, Social, Green, Civil-focused) Successful startup case studies in infrastructure and civil engineering

UNIT 2:

Design Thinking & Ideation Empathy and user-centered design Problem identification in civil/environmental infrastructure Brainstorming and idea validation Rapid prototyping for construction materials, smart structures, etc.

UNIT 3:

Business Model & Start-Up Ecosystem Elements of a business model (Canvas model) Market analysis and feasibility Minimum Viable Product (MVP) Government schemes for startups (Startup India, Atal Innovation Mission) Incubators, accelerators, and funding options

UNIT 4:

Legal and Financial Aspects Basics of intellectual property rights (patents, copyrights, trademarks) Financial planning, budgeting, and cost estimation Funding options: Bootstrapping, Angel investors, VCs Civil engineering-specific legal compliance (construction, land use, etc.)

UNIT 5:

Innovation in Civil Engineering Smart city innovations Green building materials and sustainable design Entrepreneurship opportunities in construction tech, project management, surveying tech Automation in civil engineering – BIM, drones, 3D printing, etc.

TEXT BOOKS:

1. “Innovation and Entrepreneurship” by Peter F. Drucker
2. “Entrepreneurship Development” by S.S. Khanka
3. “Design Thinking” by Tim Brown

REFERENCE BOOKS:

1. AICTE Innovation Cell & Startup India Toolkit
2. Case studies on civil engineering startups (e.g., Katerra, Brick & Bolt, etc.)

25QACE407: ENGINEERING GEOLOGY LAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: Engineering Geology Theory

Course Objectives: The objective of this Course is to

- Develop practical skills in identifying minerals and rocks based on physical and chemical properties.
- Classify minerals and rocks into appropriate geological groups.
- Understand crystallography and crystal systems through visual identification.
- Apply techniques for identification of igneous, sedimentary, and metamorphic rocks.
- Interpret geological maps and recognize topographical and structural features.
- Solve basic structural geology problems related to folds, faults, and unconformities.

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

- Accurately identify minerals from various mineral groups using hand specimens.
- Classify and identify igneous rocks based on texture, structure, and mineral content.
- Classify and identify sedimentary rocks and interpret their depositional environments.
- Identify and distinguish metamorphic rocks and their textures and structures.*)*
- Interpret topographic features and geological structures from maps and identify conventional geological symbols.
- Analyze and solve basic structural geology problems involving folds, faults, and unconformities

List of Experiments

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
7. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps. Identification of symbols in maps.
9. Simple structural Geology Problems (Folds, Faults & Unconformities)

LAB EXAMINATION PATTERN:

1. Description and identification of SIX minerals
2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks) Interpretation of a Geological map along with a geological section.
3. Simple strike and Dip problems.
4. Microscopic identification of rocks.

25QACE408: HYDRAULICS AND HYDRAULIC MACHINERY LAB

B.Tech. II Year II Sem.

L	T	P	C
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Course Objectives: The objective of this Course is to

- I**dentify** the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
- E**xplain** the standard measurement techniques of fluid mechanics and their applications.
- I**llustrate** the students with the components and working principles of the Hydraulic machines-different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- A**nalyze** the laboratory measurements and to document the results in an appropriate format.

Course Outcomes: Students who successfully complete this course will have demonstrated ability to:

- **Describe** the basic measurement techniques of fluid mechanics and its appropriate application.
- **Interpre**t the results obtained in the laboratory for various experiments.
- **Discover** the practical working of Hydraulic machines-different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- **Compare** the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
- Write a technical laboratory report

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 Francis turbine
12. Performance characteristics of Kaplan Turbine
13. Performance Characteristics of a single stage/multistage Centrifugal Pump

25QACE409: COMPUTER AIDED BUILDING DRAFTING LAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Course Objectives: The objective of this Course is 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: After completion of the course, the student should 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.
- Draw and 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.

TEXT BOOKS:

1. Computer Aided Design Laboratory by M.N. Sesha Praksh & Dr.G.S. Servesh–Laxmi Publications.
2. Engineering Graphics by P.J. Sha–S. Chand&Co.
3. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao–Radiant Publishing House.

REFERENCE BOOKS:

1. Civil Engineering Drawing-I by S. Mahaboob Basha– Falcon Publishers
2. Building drawing by M.G. Shah-Tata McGraw-Hill Education
3. Structural Engineering Drawing by S. Mahaboob Basha–Falcon Publishers

25QACE410: DIGITAL SURVEYING LAB

B.Tech. II Year II Sem.

L	T	P	C
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Course Objectives: The objective of this Course is to

- familiarize students with advanced survey instruments such as Total Station, Digital Level, and GPS.
- provide hands-on training in digital data collection and interpretation.
- enhance the capability of students in applying modern survey techniques in civil engineering practices.

Course Outcomes: After successful completion of this course, students will be able to:

- Handle and operate Total Station, GPS, and Digital Level effectively.
- Perform field surveys, including traversing, levelling, and contouring using digital instruments.
- Transfer and process survey data using basic CAD/GIS tools.
- Develop topographical maps and reports based on digital survey data.

List of Experiments *(Two Hours/Week)*:

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

SOFTWARE/TOOLS TO BE USED:

- Total Station (Leica, Sokkia, or equivalent)
- Digital Level
- GPS Devices (Handheld or DGPS)
- Surveying Software: AutoCAD / Civil 3D / GIS (optional introduction)

RECOMMENDED BOOKS AND MANUALS:

1. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Surveying Vol. 1 & 2, 18th Edition, 2020, Laxmi Publications Pvt. Ltd., ISBN: 9789380856596.
2. Satheesh Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, 2nd Edition, 2017, Pearson Education India, ISBN: 9789332587697.
3. R. Subramanian, Surveying and Levelling, 2nd Edition, 2014, Oxford University Press, ISBN: 9780199456154.
4. N.N. Basak, Surveying and Levelling, 3rd Edition, 2017, McGraw Hill Education (India), ISBN: 9789353161598.
5. Satheesh Gopi, GPS Surveying: Theory and Applications, 1st Edition, 2015, Pearson Education India, ISBN: 9789332541088.
6. Total Station and GPS Surveying – User Manuals, Manufacturer Guides (Leica Geosystems, Sokkia, Topcon, etc.).

25QAVA400: INDIAN KNOWLEDGE SYSTEM

B.Tech. II Year II Sem. **L T P C**
1 0 0 1

Bharat is considered one of the oldest civilizations of the world. Some of the archaeological evidences proved the existence of Indus Valley Civilization in 7000 B.C. Bhartiya traditions, culture, cultural activities, rituals, sacraments, painting, art of dancing, art of singing etc. is being practised till the modern times without knowing scientific approaches behind that. Eternity of Indian knowledge system proved itself that not only many rituals but also many traditions, many streams of knowledge like astrology, mathematics, physics, chemistry, biology, language studies, yoga and meditation had been following from the starting till now with some changes, in the form of traditions.

This course is for undergraduate students to inculcate Indian values. It will promote advance study and inter disciplinary research on all aspects of the Indian knowledge system.

Course Objectives: This course aims:

1. To provide a tribune of the rich culture and traditions of Indian knowledge system to students of various disciplines.
2. To introduce historical account on the education and scientific literature available in ancient Indian traditions and its connections with ancient Indian Philosophy
3. To give insights about the applications of Bharatiya Jnana Parampara
4. To introduce Indian approach towards health and wellbeing
5. To elaborate vast contribution of ancient Indian researchers, engineers, scientists and architects to the modern world

Course Outcomes: Students will be able to:

1. Understand nature, scope and related fields of Indian knowledge system.
2. Demonstrate the scientific literature available in ancient Indian traditions
3. Understanding the application of Bharatiya Jnana Parampara
4. Understand Indian approach towards Wellbeing
5. Appreciate vast contribution of ancient Indian researchers, engineers, scientists and architects to the modern world

Unit 1: **Introduction to Indian Knowledge Systems**
Meaning**,** Nature, Scope and Salient Aspects of Bharatiya Jnana Parampara - Introduction to Vedas, Upanishads, Vidya, Kala, Jnana, Shastra - Practices and Continuity of Tradition

Unit 2: Overview of History of Indian Education and Scientific Literature
Gurukul System - Role of Sanskrit in Natural Language Processing - Scientific Literature - Vedic Literature - Available Scientific Treatises - Interlinkings

Unit 3: Introduction to Scientific Theories from Pure Sciences from Ancient Indian Knowledge Systems
Overview of theories from available ancient Indian Literature about Physics, Chemistry and Mathematics - Interlinkings and applications

Unit 4: Introduction to Ancient Indian Wellness Systems
Concept of Wellness – Yoga System - Ayurveda System - Ancient Indian Aesthetics

Unit 5: Development of Engineering, Science, Technology & Fine Arts in India
Various Industries - Silk, Cotton and Ship Building - Evolution of Indian Fine Arts – Cave and Temple Architecture, Vastu - Vidya, Sculpture, Forts and Stepwells, Observatories and Paintings - Music and Natyakala - Cultural Traditions & Folk Arts

❖ **Pedagogy for Teachers: Apart from Class Room Instruction, the following Methods are Suggested.**

1. Project based activities and learning.
2. Presentation and case studies.
3. Film screening and book reviews.
4. Visit to historical places, archives centre, research centre or library nearby.

***Note**: Activities mentioned above are only suggestive. Teacher-educators should encourage students to be innovative.*

Suggested Readings:

1. B. Mahadevan, Bhat Vinayak and Nagendra Pavan R.N., (2022) '*Introduction to Indian Knowledge Systems: Concepts and Applications*' PHI learning PVT, New Delhi ISBN [9789391818203]
2. Dharmapal (1971) '*Indian Science and Technology in the Eighteenth Century*'. Other India Press, Goa.
3. Kapil Kapoor, Singh Avdhesh Kumar, (2005) '*Indian Knowledge Systems*' D.K. Printworld (P) Ltd. ISBN 10: 8124603367 / ISBN 13: 9788124603369
4. Chakradeo, Ujwala, Temples of Bharat, Aayu Publications, New Delhi, 2024.
5. D.N. Bose, S.N. Sen and B. V. Subbarayappa, *A Concise History of Science in India*, Indian National Science Academy, New Delhi, 2009.
6. Datta B. and A. N. Singh, *History of Hindu Mathematics: Parts I and II*, Asia Publishing House, Bombay, 1962.
7. Kapoor, K. (2021), *Indian Knowledge System: Nature, Philosophy, Character in Indian Knowledge System*, vol. 1, Pub. Indian Institute of Advanced Studies, Shimla
8. Mahadevan, B., Bhat, V.R., Pavana, N. (2022), Philosophical Systems, in Introduction to Indian Knowledge System, Pub. PHI Learning, New Delhi.
9. Mahadevan, B., Bhat, V.R., Pavana, N. (2022), Knowledge: Framework and Classification, in Introduction to Indian Knowledge System, Pub. PHI Learning, New Delhi.

Video Resources:

1. Introductory lectures by Prof. Gauri Mahulikar
2. Introductory lectures by Prof. Kapil Kapoor

Websites:

- https://iksin dia.org/index.php
- Official Website of IKS- Indian Knowledge System
- https://www.youtube.com/watch?v=uKcf-hSlcUE
- Address by Prof Kapil Kapoor | Indian Institute of Advanced Study (FDP 2021)
- https://www.youtube.com/watch?v=MDJTXNiH2_A
- Mukul Kanitkar on Bharatiya Knowledge System
- https://www.youtube.com/watch?v=uARMhv97pjk
- https://www.youtube.com/watch?v=oTwgf56GbsA
- Scientific History of India | Mukul Kanitkar Lecture in DTU
- https://youtu.be/gNJNmPJqXJc?si=WFBbuUT65mLZzpOW
- Ancient India's Scientific Achievements & Contribution in Mathematics, Astronomy, Science & Medicine