LORDSINSTITUTE OF ENGINEERINGANDTECHNOLOGY
(An Autonomous Institution) DEPARTMENT OF CIVILENGINEERING
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-24]

(w.e.f. Academic Year 2025-26)

B.E. III-Semester (Tentative)

S. No	Course Code	Category	Course Title	Scheme of Instruction				Scheme of Examination			Credits
				L	T	P/D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	U24MA302	BSC	Mathematics- III (PDE, P&S)	3	-	-	3	40	60	3	3
2	U24EE305	ESC	Fundamentals of Electrical Engineering	2	-	-	2	40	60	3	2
3	U24CE301	ESC	Strength of Materials-I	3	-	-	3	40	60	3	3
4	U24CE302	PCC	Engineering Geology	2	-	-	2	40	60	3	2
5	U24CE303	PCC	Building Materials and Construction Practices*	3	-	-	3	40	60	3	3
6	U24CE304	PCC	Fluid Mechanics	3	-	-	3	40	60	3	3
Practical/ Laboratory Course											
7	U24CE3L1	ESC	Strength of Materials Lab	-	-	3	3	25	50	3	1.5
8	U24CE3L2	PCC	Engineering Geology Lab	-	-	3	3	25	50	3	1.5
9	U24EP3L1	HSMC	Design Thinking Lab	-	-	3	3	25	50	3	1.5
Skill Development Course											
10	U24IT3L1	ESC	Programming Language-I	-	-	3	3	25	50	3	1.5
Bridge Course*											
11	U24CS3L2	ESC	C Programming Lab	-	-	3	3	50	-	-	-
12	U24EN3L2	HSMC	Effective Communication Skills Lab	-	-	3	3	50	-	-	-
Total				**16**	-	**12 (*18)**	**28 (*34)**	**365 (*465)**	**510**	**30**	**22**

***Bridge Course for Lateral Entry Students only.**

L: Lecture (Hrs/Wk/Sem) **T**: Tutorial (Hrs/Wk/Sem) **P**: Practical **D**: Drawing (Hrs/Wk/Sem)

CIE: Continuous Internal Evaluation
SEE: Semester End Examination
BSC: Basic Science Course
ESC: Engineering Science Course
MA: Mathematics
EN: English
PCC: Professional Core Courses
ME: Mechanical Engineering
CS: Computer Science
**TW: ***Term Work
HSMC: Humanities & Social Sciences Including Management Courses

Note:

1. Each contact hour isa Clock Hour.
2. The duration of the practical classis three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

Course Code	Course Title						Core / Elective
U24CE301	STRENGTH OF MATERIALS -I						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Engineering Mechanics	3	-	-	-	40	60	3

Course Objectives

1. Analyzing the behavior of materials under different types of loads, including axial, shear, and bending loads, and understand the concepts of stress, strain, and elasticity.
2. Understanding the concepts of shear force and bending moment in beams, and learn to calculate and draw shear force and bending moment diagrams for different types of beams and loads.
3. Analyzing the behavior of beams under bending loads, including the calculation of stresses and strains, and understand the concepts of moment of resistance and section modulus.
4. Understanding the concepts of direct and bending stresses in structural elements, including columns, beams, and thin cylinders, and learn to calculate stresses and strains.
5. Analyzing the behavior of structural elements under complex loading conditions, including principal stresses and torsion, and understand the concepts of Mohr's circle and principal stresses.

Course Outcomes

After Completion of this course, the student will be able to

1. Calculate stresses and strains in simple structural elements, including bars and beams, and understand the effects of different loading conditions.
2. Analyze and design beams for different loading conditions, including point loads, uniformly distributed loads, and couples.
3. Design and analyze beams for bending stresses, including the selection of suitable beam sections and materials.
4. Analyze and design structural elements for combined direct and bending stresses, including the calculation of stresses and strains.
5. Calculate principal stresses and maximum shear stresses in structural elements, and design and analyze shafts for torsion and power transmission.

UNIT-I

Simple Stresses and Strains: Definitions of stresses and strains, Hooke's Law, Modulus of Elasticity, Stress - Strain curve for ductile materials, Elastic constants, compound bars and temperature stresses.

Strain Energy: Strain energy and resilience in statically determinate bars subjected to gradually applied, suddenly applied, impact and shock loads.

UNIT-II

Shear Force and Bending Moment: Introduction and Basic concepts of Shear Force and Bending Moment, Different types of beams and loads, shear force and bending moment diagrams for cantilever, simply supported and overhang Beams subjected to different kinds of loads viz., point loads, uniformly distributed loads, uniformly varying loads and couples.

UNIT-III

Bending Stresses in Beams: Introduction, Pure Bending or Simple Bending, Theory of Simple Bending with Assumptions, Expression for Bending Stress, Neutral Axis and Moment of Resistance, Bending Stresses in Symmetrical Sections, Section Modulus for Various Shapes or Beam Sections.

Shear Stresses in Beams: Introduction, Equation of shear stresses, shear stresses distribution Diagram across rectangular, circular, T and I section.

UNIT-IV

Direct and Bending Stresses: Introduction, Resultant Stress when a Column of Rectangular Section is subjected to an Eccentric Load and a Load which is Eccentric to both Axes, core of sections.

Thin Cylinders: Introduction, Thin Cylindrical Vessel Subjected to Internal Pressure, Stresses in a Thin Cylindrical Vessel Subjected to Internal Pressure, Expression for Circumferential Stress (or Hoop Stress) and longitudinal Stress, Efficiency of a Joint, Effect of Internal Pressure on the Dimensions of a Thin Cylindrical Shell

UNIT-V

Torsion of Circular Shafts: Introduction, Derivation of Shear Stress Produced in a Circular Shaft Subjected to Torsion, Maximum Torque Transmitted by a Circular Solid and Hollow Shaft, Power Transmitted by Shafts, Expression for Torque in Terms of Polar Moment of Inertia, Polar Modulus.

Springs:

Introduction, types of springs, forms of springs, closely coiled helical springs subjected to axial Load and axial twist, opened coiled helical springs, springs in series and parallel.

Text Books:

1. Dr. R.K Bansal, a text book of Strength of materials, Laxmi Publications (P) Ltd, Sixth Edition: 2015
2. R.S Khurmi, Strength of materials, S. Chand and company, New Delhi.
3. Timoshenko, S. P., & Gere, J. M. (1961). Theory of Elastic Stability (2nd ed.). McGraw-Hill.
4. Hibbeler, R. C. (2017). Mechanics of Materials (10th ed.). Pearson Education.

Suggested Readings:

1. S.S. Bhavikatti, Strength of materials, Vikas PublishingHouse,2002.
2. Ferdinand P Beer, Johnston and De Wolf., Mechanics of Materials, Tata McGraw-Hill, 2004.
3. R. Subramanian, Strength of Materials, Oxford University Press, NewDelhi2005
4. D.S. Prakash Rao, Strength of Materials-A Practical Approach, Universities Press,1999
5. R.K. Rajput, A Textbook of Strength of Materials, S. Chand Publications,2007.

Course Code	Course Title:						Core/Elective
U24CE302	ENGINEERING GEOLOGY						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	2	-	-	-	40	60	2

Course Objectives

1. Mineralogy, rock formation & types and geological structures
2. Utility of rocks as a construction material with qualifying properties
3. Geological problems associated with dams, reservoirs, tunnels and other geological hazards

Course Outcomes

After Completion of this course, the student will be able to

1. Identify various minerals, rocks and analyze geological structures.
2. Explain rock weathering, classify various soils and understand hydrogeology.
3. Classify land forms based on their geomorphology and evaluate the engineering properties of rocks.
4. Examine rocks for their suitability in various construction applications.
5. Investigate and identify the geological problems in dams, reservoirs and tunnels, and explain the geological causes of earthquakes, tsunamis and landslides.

UNIT-I

Introduction: Importance of geology from Civil Engineering point of view

Mineralogy: Mineral, Origin and Composition, Physical properties of minerals, Susceptibility of minerals to weathering, Rock forming minerals.

Petrology: Igneous, Sedimentary and Metamorphic Rocks, Geological description and Indian occurrence of Granite, Basalt, Dolerite, Gabbro, Laterite, Sandstone Shale, Limestone Slate, Gneiss, Quartzite, Marble, Khonda lite and Chamockite.

Structural geology: Folds, Joints and Faults, Fundamental types, Mechanism origin and Classification, Field identification and Engineering analysis of Geological structures.

UNIT-II

Weathering of rocks: Weathering processes and its end-products, Susceptibility of rocks to Weathering, Assessment of the degree of weathering and its classification

Geology of soils: Formation, Geological Classification, Description and Engineering use of soils, Indian soil types.

Hydrogeology: Hydrologic Cycle, Water Table, Aquifers, Occurrence of ground water in various Lithological Formations, Geological control for Ground Water Movement, Springs, Ground Water Exploration and Ground Water Provinces of India.

UNIT-III

Geomorphology: Evolution, Characteristics Features and Engineering considerations of Fluviatile, Aeolian, Glacial and Marine land forms.

Rock mechanics: Engineering properties of rocks, Stress-Strain behavior of rocks, Site investigation, Aerial Photographs, Geophysical studies, Electrical Resistivity and Seismic Refraction methods.

UNIT-IV

Construction Material - ROCK: Geological considerations for the selection of Concrete Aggregate, Highway and Runway Aggregates, Building Stones, Decorative Stones.

Geological Hazards: Geological aspects of Earthquakes, Tsunamis and Landslides.

UNIT-V

Geology of Dams: Types of dams, Problems associated with Dam Foundations and Analysis of dam failure, Engineering Geology of major dam sites of India.

Geology of Reservoirs: Problems associated with Reservoirs, Engineering Geological investigations for demand water tightness in reservoir site.

Geology of Tunnels: Stand-up time of different rocks, Engineering Geological investigations of tunnels in rock, Problems in tunneling.

Text Books:

1. Engineering Geology by N. Chenna kesavulu, McMillan, India Ltd. 2005
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.

3. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014.
4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications.

Suggested Readings:

1.F.G.Bell, Engineering Geology, Elsevier, 2007.
2. Dimitri P. Krynine and William R. Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distributors, First Edition, 1998.
3. B.P. Attewel and I.W. fanner, principles of engineering geology, chapman and hall 1976.
4. Officers of the Geological survey of India, Engineering Geology case histories, miscellaneous pub. No. 29, 1975.

Course Code	Course Title						Core/Elective
U24CE303	BUILDING MATERIALS AND CONSTRUCTION PRACTICES*						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
--	3	-	-	-	40	60	3

Course Objectives

1. To know characteristics and properties of basic building materials used in civil engineering
2. To enable the students, understand the concept of mix design, casting, curing and testing of concrete
3. To understand the properties of fresh concrete
4. To impart knowledge on the paint and emerging materials
5. To facilitate the students to know the construction practices

Course Outcomes

After Completion of this course the student will be able to

1. Know the properties of basic materials used in construction industry
2. Know the criteria for selection of good constituents required for making quality concrete
3. Knowledge on the concepts of mix design for manufacturing good quality concrete
4. Understand the concept of paint and emerging materials in construction industry.
5. Understand the construction practices involved in construction industry

UNIT–I

Basic Construction Materials Stones:
Uses of stones as building materials. Characteristics of good building stones. Classification of stones. Quarrying, various methods. Dressing and polishing of stones.
Bricks: classification, different manufacturing methods, tests, selection criteria.
Cement Concrete blocks: Autoclaved Aerated Concrete Blocks, Sizes, the requirement of good blocks.

UNIT–II

Constituents of Concrete Cement: Ingredients, Chemical composition, basic properties of cement compounds, Manufacturing process, Hydration of cement- heat of hydration, physical properties of Portland cements, Indian standard tests and specification, various types and grades of cement, Blended cement, storage of cement.
Coarse and fine Aggregate: Characteristics of good coarse and fine aggregates for manufacture of concrete, Significance and application of coarse and fine aggregate for the production of good quality concrete.

UNIT–III

Mortar: Different types of mortars, preparation, setting and curing. Manufacturing methods of mortar.
Timber: Timber as a building material and its uses. Various types of timber. Seasoning and its importance. Preservation of wood. Laminates and their uses.
Reinforcing steel: Types of reinforcement, specifications to rage and handling**.**

UNIT–IV

Paints, Varnish and Distemper: Constituents, characteristics of good paints, Bases, vehicles, thinners and coloring pigments. Painting of different types of surfaces; types of varnish, and application. Types of distemper, and application.
Emerging Building Materials: Energy conservation in buildings. Recycled materials, local materials and industrial waste products as a means of sustainable development, Glass, composites and smart material, Bitumen, Polymers, Fibers, and Industrial waste products.

UNIT–V

Form work and scaffolding: Requirements, types, materials, accessories, reuses and maintenance.
Flooring: Characteristics of good floors. Common types of floors. Stone flooring, concrete flooring, terrazzo flooring. Ceramic and mosaic tiles. Industrial floors. Methods of construction, and maintenance Cement mortar plastering, Pointing, White and Color washing, Damp Proofing and Water Proofing.
Introduction To Advance Construction Materials: Overview of Construction Materials, Smart Materials, Nanomaterials in Construction, Sustainable and Eco-friendly Materials.

Text Books:

1. P. C Varghese, Building Materials, Prentice Hall of India
2. MS Shetty; Concrete Technology, S. Chand Publication New Delhi
3. S.K.Duggal,BuildingMaterials,4th edition New Age Publication
4. B.C Purnima, Ashok Jain, Arun Jain, BuildingConstruction.11edition, Laxmi Publication
5. P.K. Mehta and Paulo J .M. Montero, Concrete: microstructure, properties and materials", The McGraw Hill Company

Suggested Readings:

1. Building Materials and Construction, Jena and sahu, Mc. Graw.
2. Materials for Civil and Construction engineers, Mamlouk and Z Aniewski, Pearson
3. Building Construction, S.P. Bindra and S.P. Arora, Dhanpat Rai Publication
4. Building Materials and Building Construction byP.C Varghese
5. Civil Engineering materials byT.T.T.I Chandigarh, Tata Mc Grew Hills
6. Building Materials and Construction by Rangawla, Sushil Kumar.
7. Building Materials by S.K. Basu and A.K Ray, S.K Lahiri &Co,(P) ltd.

Course Code	Course Title						Core/ Elective
U24CE304	FLUID MECHANICS						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3			--	40	60	3

Course Objectives

1. To understand the fundamental properties and behavior of fluids.
2. To analyze fluid kinematics and classify different types of fluid flow.
3. To apply principles of fluid dynamics including Bernoulli's and momentum equations.
4. To learn various techniques for fluid flow measurements.
5. To understand flow through pipes including laminar and turbulent flow regimes and associated losses.

Course Outcomes

After Completion of this course, the student will be able to

1. Understand and apply fundamental fluid properties and hydrostatic principles to measure pressure and analyze forces on submerged surfaces.
2. Analyze various types of fluid flow using kinematic concepts and apply the continuity equation to flow problems.
3. Apply Euler's, Bernoulli's, and momentum equations to understand fluid motion and solve practical flow problems.
4. Use appropriate instruments and techniques to measure fluid pressure, velocity, and discharge in closed and open channel systems.
5. Evaluate laminar and turbulent flows in pipes, calculate head losses, and analyze pipe networks using empirical relations and diagrams.

UNIT-I

Properties of Fluid

Distinction between a fluid and a solid; Properties of fluids – Viscosity, Newton law of viscosity; vapor 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 unsteady, uniform, non-uniform-, one-, two and three- dimensional flows. Concept of streamline, stream tube, path line and streak line.

Law of mass conservation

continuity equation from control volume and system analysis. Rotational and Irrotational flows, Stream function, Velocity potential function, flow net.

UNIT-III

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

UNIT-IV

Measurement of Pressure: Piezometer and Manometers - Bourdon Gauge. Measurement of Velocity: Pitot tube and Current meter. Measurement of Discharge in pipes and tanks: Venturi-meter, Orifice-meter, nozzle meter, elbow meter and rotameter. Flow through mouthpiece and orifice. Measure of Discharge in Free surface flows: Notches and weirs.

UNIT-V

Flow through Pressure Conduits: Reynold's Experiment and its significance. Upper and Lower Critical Reynold's numbers, Critical velocity. Hydraulic gradient. Laminar flow through circular pipes. Hagen Poiseuille equation. Turbulent flow characteristics. Head loss through pipes. Darcy-Weisbach equation. Friction factor. Minor loss, Pipes in Series and Pipes in parallel.

Text Books:

1. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics including Hydraulics Machines, Standard Book House, Delhi, 2019.
2. Bansal R.K., A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2018.
3. Ojha C.S.P., Berndtsson R., Chandramouli P.N., Fluid Mechanics and Machinery, Oxford University Press, 2012.
4. Rajput R.K., Fluid Mechanics and Hydraulic Machines, S. Chand & Co., 2013.

Suggested Readings:

1. K. Srinivas Raju and D. Nagesh Kumar, "Fluid Mechanics: Problem Solving using MATLAB", PHI Learning; 1st edition, 2020 R
2. K. Subramanya, "Theory and Applications of Fluid Mechanics", Tata McGraw-Hill Publishing Company Ltd., New Delhi,1993
3. A. K. Jain, "Fluid Mechanics," Khanna Publishers, 2018
4. B. S. Pani, "Fluid Mechanics: A Concise Introduction", PHI Publications, 2016.

Course Code	Course Title						Core / Elective
U24CE3L1	STRENGTH OFMATERIALS LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Engineering Mechanics lab	-	-	-	3	25	50	1.5

Course Objectives

The objectives of this course are to impart knowledge of:

1. Material properties through experiments like uni-axial tension tests.
2. Material behavior under different loading conditions.
3. Material hardness and impact resistance testing methods.
4. Applying theoretical concepts of strength of materials to practical problems.
5. Designing and conducting experiments to determine material properties.

Course Outcomes

After Completion of this course, the student will be able to

1. Demonstrate the Stress-strain behavior of ductile material.
2. Compare Young's modulus of different materials by conducting deflection test on different types of beams
3. Calculate rigidity modulus by spring test and torsion test.
4. Evaluate compressive strength of brick.
5. Find Hardness number and Impact strength of given Specimens.

List of Experiments:

1. Uni-axial tension test on a specimen of ductile material.
2. Stress–Strain characteristics of a ductile material.
3. Brinell's hardness test.
4. Compression test on brick.
5. Bending test on simply supported beam of Timber.
6. Izod impact test
7. Compression test on close coiled helical spring.
8. Torsion test on a specimen of ductile material.
9. Bending test on Cantilever beam of Steel.
10. Bending test on simply supported beam of Steel.
11. Shear test on mild steel.
12. Charpy impact test.

Note: At least 10 experiments should be conducted in the semester

Text Books:

1. D.S. Prakash Rao, Strength of Materials-A Practical Approach, Universities Press,1999.
2. R.K. Rajput, A Text book of Strength of Materials, S. Chand Publications,2007
3. S.S. Rattan, "Strength of Materials", McGraw Hill Education.
4. R.K. Rajput, "Strength of Materials and Mechanics of Solids", S. Chand Publishing, Latest Edition.
5. R.C. Hibbeler, "Mechanics of Materials", Pearson Education,

Suggested Readings:

1. R. Subramanian, Strength of Materials, Oxford University Press, New Delhi2005.
2. S.S. Bhavikatti, Strength of materials, Vikas Publishing House, 2002.
3. Ferdinand P Beer, Johnston and De Wolf., Mechanics of Materials, Tata McGraw-Hill, 2004

Course Code	Course Title					Core/ Elective
U24CE3L2	ENGINEERING GEOLOGY LAB					Core
Prerequisite	Contact Hours per Week			CIE	SEE	Credits
	L	T	D/P			
ENGINEERING GEOLOGY	-	-	3	25	50	1.5

Course Objectives

The objectives of this course are to:

1. Hands-on experience to study the Geological aspects of various rocks.
2. Evaluate the Physical and Engineering properties of Minerals and Rocks.
3. Provides exposure to various Geological tests.

Course Outcomes

After completing this course, the student will be able to:

1. Identify the Physical and Engineering properties of Minerals and Rocks.
2. Analyze and measure Structural aspects of rocks using models.
3. Carryout field experiment and studies such as VES.
4. Study the Topographical and GSI maps.
5. Perform studies such as Slake durability test.

LIST OF EXPERIMENTS

1. Identification and description of Physical properties of Minerals.
2. Identification and description of Geological and Geotechnical characteristics of Igneous rocks.
3. Identification and description of Geological and Geotechnical characteristics of Sedimentary rocks
4. Identification and description of Geological and Geotechnical characteristics of Metamorphic rocks.
5. Determination of apparent specific gravity, porosity and water absorption of different rocks.
6. Study of structural geology models (wooden models).
7. Measurement of dip of planar feature by clinometers compass.
8. Vertical electrical sounding VES field experiment.
9. Study of topographical maps.
10. Structural geology problems (strike, dip, three-point problems).
11. Study of geological survey of India (GSI works) maps and reports.
12. Slake durability test on soft rock.

Note: Atleast10 experiments should be conducted in the semester.

Text Books:

1. F.G. Bell, Engineering Geology, Elsevier, 2007.
2. Dimitri P. Krynine and William R. Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distributors, First Edition, 1998

Suggested Readings:

1. B.P. Attewel and I.W. fanner, principles of engineering geology, chapman and hall 1976.
2. Officers of the geological survey of India, engineering geology case histories, miscellaneouspub.No.29, 1975.

LORDSINSTITUTE OF ENGINEERINGAND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF CIVILENGINEERING
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-24]
(w.e.f. Academic Year 2025-26)
B.E. IV-Semester (Tentative)

S. No	Course Code	Category	Course Title	Scheme of Instruction				Scheme of Examination			Credits
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U24EN401	HSMC	English For Technical Communication	2	-	-	2	40	60	3	2
2	U24MB401	HSMC	Business Economics and Financial Analysis	2	-	-	2	40	60	3	2
3	U24CE401	PCC	Surveying and Geomatics*	3	-	-	3	40	60	3	3
4	U24CE402	PCC	Strength of Materials-II	3	-	-	3	40	60	3	3
5	U24CE403	PCC	Hydraulic Engineering	3	-	-	3	40	60	3	3
6	U24CE404	PCC	Transportation Engineering	2	-	-	2	40	60	3	2
Practical /Laboratory Course											
7	U24CE4L1	PCC	Surveying and Geomatics Lab	-	-	3	3	25	50	3	1.5
8	U24CE4L2	PCC	Hydraulics and Hydraulic Machinery Lab	-	-	3	3	25	50	3	1.5
9	U24CE4L3	PCC	Transportation Engineering Lab	-	-	3	3	25	50	3	1.5
Skill Development Course											
10	U24IT4L3	ESC	Programming Language-II		-	3	3	25	50	3	1.5
Total				**15**	**-**	**12**	**27**	**340**	**560**	**30**	**21**

L: Lecture (Hrs/Wk/Sem) **T**: Tutorial (Hrs/Wk/Sem) **P**: Practical
D: Drawing (Hrs/Wk/Sem)

CIE: Continuous Internal Evaluation
SEE: Semester End Examination
ESC: Engineering Science Courses
PCC: Professional Core Courses
EN: English
ME: Mechanical Engineering
HSMC: Humanities &Social Sciences Including Management Courses
CS: Computer Science
MB: Management Studies
TW: *Term Work

Note:

1. Each contact hour is a Clock Hour.
2. The duration of thepractical classis three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.
3. At the end of IV semester students should undergo summer Industrial Internship of two-week duration- Credits for Summer Internship will be awarded in V semester.

Course Code	Course Title						Core/ Elective
U24CE401	SURVEYING & GEOMATICS*						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

1. To study the basic concept and principle of surveying.
2. To know the field applications and concepts of leveling survey and contouring.
3. Study the basic concepts and trigonometric leveling and field applications.
4. Know the principle of aerial photogrammetry and its applications.
5. Study the various application of GPS and Remote sensing.

Course Outcomes

After Completion of this course, the student will be able to

1. Understand the basic principles of Surveying and Instrumentation
2. Compute the lengths, areas, bearings of given field.
3. Apply the basic working principles of theodolite and total station
4. Analyze Photogrammetry, remote sensing and determine the deflections of horizontal and vertical curves by using various methods
5. Application of EDM & GPS of surveying by various methods

UNIT-I

Introduction: Basic Principles of Surveying, Concepts of surveying, various classifications of surveying.

Chain survey- Concepts of survey lines offsets. Errors in chain survey. Measurement of area - Simpson's method, average ordinate, mid ordinate and trapezoidal rules. Basics of compass survey and plane table survey- accessories and methods.

UNIT-II

Leveling: Definition of leveling, terms used in leveling. Instruments of leveling, methods of booking levels, Height of Instrument and Rise and fall methods. Concepts of balancing levels. Types of leveling, reciprocal leveling, profile leveling, precise leveling. Correction to refraction, errors in leveling.

Contours Definition of contours, Characteristics of contours, contour interval, methods of contouring- direct and indirect. Development and use of contour maps

UNIT-III

Theodolite Surveying: Definition of Theodolite surveying, Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT-IV

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry. **Curves**: Theory of simple curves, setting out of simple curves by linear and angular methods, Elements of simple compound curve & Reverse curve, Elements of Transition curve, Length of transition curve, Vertical Curves, Types of vertical curves, Length of vertical curve. Uses of curves

UNIT-V

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying.

Electromagnetic wave theory - 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. B.C. Punmia, Vol 1,2 &3, Lakshmi Publisher, New Delhi,1994
2. Arora K.R, Vol 1,2 &3, Standard Book House, New Delhi,2005
3. Surveying & Levelling, 2/E—Subramanian—Oxford University Press
4. Surveying and Levelling Vol. II by T. P. Kanetkar and S. V. Kulkarni Pune Vidyarthi Publication.

Suggested Readings:

1. T.M lilles and R.W. Kiefer Remote sensing and Image Interpretation, John Wiley &Sons 1994
2. Anji Reddy, M., Remote Sensing and Geographical Information System, B.S Publications,2001.
3. Remote sensing and Geographical Information System, By A. M. Chandra and S. K. Ghosh, Narosa Publishing House
4. Remote Sensing & GIS,2/E—Bhatta– Oxford University Press
5. GPS Satellite Surveying—Alfred Leick—Wiley.

Course Code	Course Title						Core/ Elective
U24CE402	STRENGTH OFMATERIALS-II						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Strength of Materials-I	3	-	-	-	40	60	3

Course Objectives

1. Understanding the behavior of beams under various loading conditions and determining deflection and slope using analytical and energy methods.
2. Analyzing statically indeterminate structures such as propped cantilevers, fixed beams, and continuous beams using appropriate theorems.
3. Gaining insight into the stability and buckling of columns under axial and eccentric loading using theoretical and empirical formulas.
4. Applying energy methods for deflection analysis in beams, frames, and pin-jointed trusses using Castigliano's theorems and the unit load method.
5. Developing the ability to assess stresses due to unsymmetrical bending and locate shear centers in asymmetric sections.

Course Outcomes

After Completion of this course, the student will be able to

1. Recall fundamental concepts of deflection in beams and various methods used such as double integration, Macaulay's, and moment area methods.
2. Understand the behavior and analysis of indeterminate beams including propped cantilevers, fixed beams, and continuous beams using the Three-Moment Theorem.
3. Apply theoretical principles to solve problems on strength and stability of columns and struts under axial and eccentric loading using standard formulae.
4. Analyze the deflection of beams, frames, and trusses using energy-based approaches like Castigliano's theorems and the unit load method.
5. Evaluate the stresses in unsymmetrical bending and compute the shear center for various cross-sections to ensure structural stability.

UNIT-I

Deflections of Beams: Double integration method, Macaulay's method, Strain energy method (Castigliano's first theorem) for determining the slope and deflection for cantilever, simply supported and overhanging beams carrying one, two-point loads, uniformly distributed load, uniformly varying load and Couple. Introduction and application of Moment area method, Conjugate beam method.

UNIT-II

Propped Cantilever: Introduction – Reaction of a prop, S.F and B.M diagrams for a propped cantilever carrying point load at the center and at intermediate point, uniformly distributed load and propped at the free end.

Fixed Beams: Introduction – Determination of fixing moments for a fixed beam carrying point load at the center, eccentric load, U.D.L and U.V.L. Drawing of S.F.D and B.M.D.

Continuous Beams: Introduction-Application of Clapeyron's theorem of three moments to continuous beams with various support conditions to determine B.M.D**.**

UNIT-III

Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Failure of a column – Crushing load – Euler's column theory – Assumptions – End conditions for long columns – 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 – Prof. Perry's formula – Column analogy method.

Beam Columns:

Laterally loaded struts subjected to uniformly distributed and concentrated loads.

UNIT-IV

Energy Methods: Strain energy in linear elastic system – Expression of strain energy due to axial load, bending moment and shear force – Castigliano's first and second theorems up to degree of redundancy one for beams, frames and pin-jointed plane trusses. Unit load method – Deflections of simple beams and pin-jointed plane trusses.

UNIT-V

Unsymmetrical Bending: 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: Concept and importance of shear center – Shear flow – Determination of shear center for simple sections such as T-sections and Channel sections with one axis of symmetry.

Text Books:

1. Dr. R.k Bansal, A text book of strength of materials, Laxmi publication (P) Ltd. sixth edition.
2. S. Ramamrutham and R Narayanan, a text book of strength of materials, Dhanpathrai publishing company.
3. S.S. Bhavikatti, Strength of materials, Vikas PublishingHouse,2002
4. R.K. Rajput, A Textbook of Strength of Materials, S. Chand Publications,2007

References:

1. D.S. Prakash Rao, Strength of Materials-A Practical Approach, Universities Press,1999.
2. R. Subramanian, Strength of Materials, Oxford University Press, NewDelhi2005.
3. Ferdinand P Beer, Johnston and De Wolf., Mechanics of Materials, Tata McGraw-Hill, 2004.
4. Dr, B.C punmia ,Dr. Ashok kumar jain and Dr.arun kumar jain, mechanics of materials
5. R.C Hibbler, A text book of Mechanics of materials, Prentice Hall Publications.
6. T.D Gunneswara Raoand M.Andal, A text book of strength of materials, Cambridge Publishers.
7. B.S. Basavarajaiah and P.Mahadevappa, A text book of strength of materials, 3 rd Edition, Universities press.

Course Code	Course Title						Core/ Elective
U24CE403	HYDRAULIC ENGINEERING						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Fluid Mechanics	3	-	-	-	40	60	3

Course Objectives

1. Study various aspects of open channel flow.
2. Learn the concepts of boundary layer theory
3. Discuss the performance and design of hydraulic turbines
4. Familiarize with reaction turbines and its design, understand performance of reaction turbines and centrifugal pump
5. Apply their knowledge of fluid mechanics in addressing problems in hydraulic machinery.

Course Outcomes

After Completion of this course, the student will be able to

1. Compute velocity, specific energy and critical depth in steady uniform flow through open channels
2. Determine water surface profiles, hydraulic jumps and surges in nonuniform flow through open channels
3. Explain growth and separation of boundary layer and evaluate drag & lift forces for various shapes of bodies in a medium
4. Evaluate the performance characteristics and perform design of turbines for various conditions of head, discharges and power
5. Evaluate the performance characteristics and perform design of centrifugal pump for various conditions of head, discharges and power

UNIT-I

Steady uniform flow through open channels: Descriptions and definitions, difference between pipe flow and channel flow, velocity and pressure distribution in channel cross section, energy and momentum correction coefficients, friction to flow in open channel, uniform flow, Manning's and Chezy's formulae, most efficient channel cross-section, specific energy, Critical depth, Computation of critical depth.

UNIT-II

Gradually varied flow: Significance of Froude Number, dynamic equation of gradually varied flow, classification of gradually varied flow profiles, computation of flow profiles and characteristics of flow profiles. Hydraulic Jump- Momentum equation for a jump in horizontal rectangular channel, energy dissipation in hydraulic jumps.

UNIT-III

Impact of Jets: Force exerted by a jet on a stationary and moving plate; Force exerted on a curved plate, Force exerted by a jet of water on a series of straight plates and curved plates.

UNIT-IV

Turbines: Classification of turbines. Work done and efficiency in Pelton Wheel, Francis turbine and Kaplan turbine. Unit quantities and specific speed. Performance characteristics of turbines.

UNIT-V

Centrifugal Pumps: Components and functioning of a centrifugal pump- manometric head and efficiency, work done by impeller, priming of pump and minimum starting speed, specific speed and performance of centrifugal pumps.

Text Books:

1. Bansal R.K., "A Textbook Of Fluid Mechanics And Hydraulic Machines", Laxmi Publications, 2018.
2. Modi P.N., Seth S.M., "Hydraulics and Fluid Mechanics including Hydraulics Machines", Standard Book House, 2019
3. R. L. Streeter, G. Z. Watters, and J. K. Vennerd, "Elementary Fluid Mechanics", John Wiley International Publications, 7th Edition, 1996
4. K. Subrmanya, "Flow in Open Channel", Tata McGraw Hill Publishers, 5th Edition, 2019

Suggested Readings:

1. Ven Te Chow" Open-Channel Hydraulics" International Student Edition, McGraw-Hill, 2009.
2. Rama Durgaiah D., "Fluid Mechanics and Machinery" New Age International Publishers, 2002
3. K Srinivasa Raju and D Nagesh Kumar, "Fluid Mechanics problem solving using MATLAB" Prentice Hall of India, 2020
4. http://nptel.ac.in/courses/105103096/3, Hydraulic
5. http://nptel.ac.in/courses/105107059/,FluidMechanics

Course Code	Course Title						Core/ Elective
U24CE404	TRANSPORTATION ENGINEERING						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Surveying & Geomatics	2	-	-	-	40	60	2

Course Objectives

1. To know about the history of highway development, surveys and classification of roads.
2. To study about the geometric design of highways
3. To know about the flexible pavement & pavement materials and design.
4. To know about the rigid pavement analysis and design.
5. To study about railway engineering and different types of rails, sleepers.

Course Outcomes

After Completion of this course, the student will be able to

1. To understand the history of highway development, surveys and classification of roads.
2. To study about the geometric design of highways.
3. To know about the flexible pavement & pavement materials and design.
4. To know about the rigid pavement analysis and design
5. To study about railway engineering and different types of rails, sleepers.

UNIT-I

Highway development and planning: History and Importance of Highways, Characteristics of road transport, Current Road development plans in India, Highway development in India, Highway planning, Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, Detailed Project Report preparation, PPP schemes of Highway Development in India.

UNIT-II

Highway Geometric Design: Width of Pavement, Formation and Land, Cross Slopes etc.; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance.

Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves **Vertical Alignment**: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves.

UNIT-III

Pavement Design: Introduction to Pavement Design: Types of pavements and their typical cross sections: flexible, rigid and composite.

Flexible Pavement analysis and design: Introduction to multi layered analysis, IRC 37-2012 method of flexible pavement design.

UNIT-IV

Rigid pavement analysis and design: Factors controlling rigid pavement design, types of stresses in rigid pavements, critical load positions, load stresses and temperature stresses in interior, corner and edge locations of jointed plain cement concrete pavement slabs, IRC 58-2015 method of rigid pavement design; Overlay Designs: Types of overlays on flexible and rigid pavements.

UNIT-V

Railway Engineering: Different types of gauges, Permanent way component parts and its functions. Rails – various types and functions, creep of rails, coning of wheels, Track fittings and fastenings, Sleepers- various types and functions, merits and demerits, ballast, various types and functions and sub grade preparation, Points and Crossing, Turnouts.

Text Books:

1. KadiyaliL. R, "Traffic Engineering and Transportation Planning", Khanna Publishers,2016
2. ITE Hand Book, Highway Engineering Hand Book, McGraw-Hill.
3. Srinivasa Kumar R.," Pavement Design", Orient Blacks wan Pvt. Ltd., NewDelhi,2013.
4. R. Srinivasa Kumar, Transportation Engineering (Railways, Airport, Docks Harbor), Universities Press, 2014.
5. Transportation Engineering author SP Chandola Published S.Chand,2008

Suggested Readings:

1. Srinivasa Kumar R.," Pavement Design", Orient Black swan Pvt. Ltd., New Delhi, 2013.
2. R. Srinivasa Kumar, Transportation Engineering (Railways, Airport, Docks Harbour), Universities Press, 2014.
3. KadiyaliL. R "Traffic Engineering and Transportation Planning", Khanna Publishers,2016
4. Khanna S.K., Justo C.E. G., Veer Raghavan A., "HighwayEngineering",10thEdition, Nem Chand&Bros,2015.
5. Transportation Planning Handbook by ITE; Michael D. Meyer.
6. Highway engineering handbook: building and rehabilitating the infrastructure by Roger L. Brocken brough, editor, Kenneth J. Boedecker, Jr., editor.

Course Code	Course Title					Core / Elective
U24CE4L1	SURVEYING AND GEOMATICS LAB					Core
Prerequisite	Contact Hours per Week			CIE	SEE	Credits
	L	T	D/P			
SURVEYING AND GEOMATICS	-	-	3	25	50	1.5

Course Objectives

1. To Study and understand the different methods in Survey field work
2. To Study the basic concept of trigonometrical leveling, and field applications
3. To analyze the Curves for Survey work related to Roads and Railways

Course Outcomes

After the completion of the course, the student will be able to:

1. Compute lengths, areas and bearings of the given field work.
2. Understand the basic working principles of theodolite and total station.
3. Compute setting out data for setting out of horizontal curves by various methods
4. Computation of setting out data for horizontal and vertical curves by various methods.
5. Understand the basic concepts related to Photogrammetry, RS and GPS.

List of Experiments:

1. Chain Survey**:** Study of chains, setting out works, Chaining and Marking Perpendicular offset.
2. Compass Traversing – Measuring Bearings &arriving included angles.
3. Radiation method, intersection methods by plane table survey.
4. Levelling – Longitudinal and cross-section and plotting.
5. Measurement of Horizontal and vertical angle by theodolite.
6. Trigonometric leveling using theodolite.
7. Single plane and Double plane method.
8. Introduction to Total Station and its Applications.
9. Determining the difference in elevation between two points using Total Station.
10. Determination of area enclosed in a closed traverse by using Total Station.
11. Setting of simple curves with the help of Total Station
12. Global Positioning Systems (GPS): Determination of Latitude and Longitude of any four stations and Computation of the area.

Note: At least 10 experiments should be conducted in the semester.

Text Books:

1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni , Pune Vidyarthi Griha Prakashan.
2. Surveying and Levelling by Subramanian, Oxford University Press.

Suggested Readings:

1. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain , Laxmi Publications.

Course Code	Course Title						Core / Elective
U24CE4L2	HYDRAULICS AND HYDRAULIC MACHINERY LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
FLUIDMECHANICS	-	-	-	3	25	50	1.5

Course Objectives:

1. Provide understanding of practical applications of open and curved channels.
2. Application of force concepts on jets and hydraulic machines
3. Determination of characteristics curves of turbines and pumps

Course Outcomes:

After Completion of this course, the student will be able to

1. Competence in understanding flow phenomenon in open channels
2. Ability to analyze the force acting due to jets concept and its application in hydraulic machines
3. Competence in working principles of hydraulic pumps and turbines
4. To interpret the results obtained in the laboratory for various experiments
5. Get the knowledge on different hydraulic machinery and write a technical laboratory report.

List of Experiments:

1. Verification of Bernoulli's equation.
2. Determination of Friction factor of a pipe line.
3. Determination of Minor losses in pipe.
4. Calibration of Venturi meter / Orifice Meter.
5. Calibration of Triangular / Rectangular/Trapezoidal Notch.
6. Determination of a vane coefficient.
7. Determination of Manning's and Chezy's constants for Open channel flow.
8. Classification of flow by Reynolds Experiment.
9. Performance Characteristics of a single stage/ multi stage Centrifugal Pump.
10. Study of universal characteristic curves of a Pelton Wheel.
11. Study of universal characteristic curves of a Francis turbine.
12. Study of universal characteristic curves of a Kaplan turbine.

Text Books:

1. S. K. Som, and Biswas, G, „Fluid Mechanics and Fluid Machines", Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Yuan, S. W. Foundation of Fluid Mechanics", Prentice-Hall India Pvt. Ltd., New Delhi, 1976.

Suggested Readings:

1. C.S.P. Ojha, R. Berndtsson, P.N. Chandramouli, „Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2010
2. A.K. Mohanty, „Fluid Mechanics", Prentice-Hall India Pvt. Ltd., New Delhi, 1994
3. P.N. Modi," Hydraulics and Fluid Mechanics Including Hydraulics Machines", Standard Book House, New Delhi, 2013.

Course Code	Course Title						Core/ Elective
U24CE4L3	TRANSPORTATION ENGINEERING LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Transportation Engineering				3	25	50	1.5

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. To Understand the characteristics of Coarse Aggregate used in pavements by performing basic tests.
2. Selection of right quality of bitumen and coarse aggregate to be used in pavement construction.
3. Analyze the traffic flow and delays at intersections and sections of roads.

Course Outcomes

After Completion of this course, the student will be able to

1. To Understand the characteristics of Coarse Aggregate used in pavements by performing basic tests.
2. To Understand the characteristics of Bitumen by performing basic tests.
3. Collect traffic data by conducting traffic volume studies at intersections and sections of roads.
4. Analyze traffic flow characteristics from the collected traffic data.
5. Select suitable software to analyze the level of service and delays for peak hour.

List of Experiments:

A) Tests on Road Aggregate

1) Aggregate crushing value test
2) Aggregate impact value test
3) Specific gravity
4) Los Angeles abrasion test
5) Aggregate shape test (flakiness & elongation)
6) Water Absorption
7) Soundness

B) Tests on Bitumen

1) Penetration Test.
2) Ductility Test
3) Softening point test
4) Specific gravity test
5) Viscosity test

C) Experiments on Traffic

1) Traffic Volume study (a) at mid-section (b) at intersection
2) Spot speed study
3) Speed and delay study
4) Origin and Destination Study

Text Books:

1. Kadiyali L R, "Traffic Engineering and Transportation Planning", Khanna Publishers,2016
2. Srinivasa Kumar R.," Pavement Design", Orient Black swan Pvt.Ltd., NewDelhi,2013.
3. Transportation Engineering author SP Chandola Published S. Chand,2008
4. Transportation Planning Handbook by ITE; Michael D. Meyer.

Suggested Readings:

1. Relevant IS and IRC Codes of Practice.
2. Relevant ASTM and AASHTO Codes of Practice
3. Khanna, S. K. and Justo, C.E.G., Highway Material Testing (laboratory manual). Nem Chand & Bros, Roorkee (2000)