DEPARTMENT OF CIVIL ENGINEERING

Vision

To achieve excellence that leads Civil Engineering in academics with high technical competencies by imparting quality technical education to meet the current and future challenges in the field of Civil Engineering moreover to emerges as a leader for the betterment of society.

Mission

- **To produce competent Civil Engineers with technical and management skill, research quality and ethical values to serve the society and nation.**
- **To make the department a centre of excellence in the field of civil engineering.**
- **To promote creative thinking in minds of budding engineers to face the upcoming challenges.**
- **To provide knowledge with emphasis on the development of leadership qualities in the students.**
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- **To promote quality education with consultancy and research for industrial and social needs.**

Programme Outcomes

PO1 Engineering Knowledge: Apply the knowledge of mathematics, science engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 Design/Development of solution: Design solution for complex engineering problems and design system components or process that meet the specified needs with appropriate consideration for the public health and safety and the culture, societal and environmental consideration.

PO3 Modern Tool Usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of limitations.

PO4 The engineers and society: apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO5 Environmental & Sustainability: Understand the impact of the professional engineering solution in the societal and environmental contexts make meaning of the world by connecting people, ideas, books, media and technology.

Program Educational Objectives (PEOs)

PEO1- Plan, analyze, design, construct, manage, advance and maintain various systems in civil engineering.
PEO2- To achieve excellence and pursue professional licensure and certification.
PEO3- Engage in lifelong learning and pursue advanced level studies.
PEO4- Career advancement and demonstrate managerial skills through active participation in the civil engineering profession to serve the society.

Program Specific Outcomes (PSO's)

PSO1- Students will emphasize the importance of working in a team effectively and to communicate properly within the team to achieve the desired outcome.

PSO2- Educating students with fundamental mathematical, scientific, and engineering knowledge to have a significant and positive long-term impact on the field of civil engineering.

PSO3- The graduates will plan, produce detailed drawings, write specification, and prepare cost estimates.

PSO4- Graduates will have a broad understanding of economic, environmental, social, health and safety factors involved in infrastructural development.

PSO5- Graduates will be motivated for continuous self-learning in engineering practice and will carry on research in advanced areas of civil engineering so as to offer engineering services to the society, ethically and responsibly.

III SEM - Fluid Mechanics – I Laboratory

Course Outcomes

CO1	Understand the importance and practical significance of various fluid properties
CO2	Comprehend and estimate various forces acting on partially and fully submerged bodies
CO3	Evaluate the importance of various parameters on the fluid motion.
CO4	Know various flow measuring devices with their practical applications
CO5	Illustrate the concept of impulse momentum principle, dimensional analysis and model analysis of a fluid phenomenon

List of Experiments

1	Determination of Metacentric height and its importance.
2	Calibration of Venturimeter and its practical utility
3	Calibration of Orifice meter and its practical utility
4	Calibration of Rectangular Notches/ V-Notches.
5	Calibration of Rectangular Notches/ V-Notches
6	Hydraulic Coefficients of an orifice.
7	Hydraulic Coefficients of a Mouthpiece.
8	Verification of Bernoulli's Theorem
9	Impact of jet apparatus

Content Beyond the syllabus

1	Determination of Stability and Buoyancy for a Floating Body Under Different Load Conditions.
2	Flow Visualization and Streamline Study Using a Hele-Shaw Apparatus

III SEM - Solid Mechanics Laboratory

Course Outcomes

CO1	Understand the behaviour of materials under different stress and strain conditions.
CO2	Evaluate and draw shear force diagram and bending moment diagram and their relation.
CO3	Formulate the bending and shear stresses equations and able to draw bending and shear stress diagrams.
CO4	Formulate slope and Deflection equations for beams subjected to various loads by Macauley's method
CO5	Analyse and Evaluate the torsion in circular section, Direct and Bending Stresses

List of Experiments

1	To Study Various Types of Strain Gauge Apparatus
2	To Determine The Tensile Strength of Steel Specimen
3	To Perform Hardness Test on Various Metals. (Brinnell Hardness Test & Dynamic Hardness Test.
4	To Perform Standard Torsion Test on Metals
5	To Perform The Impact Test on Metal (Izod/Charpy)
6	To Determine The Spring Constant of Closely Coiled Spring.
7	To Perform Shear Test on Different Metals
8	To Perform Fatigue Test on Mild Steel Bar.
9	To Perform Bending Test on Wooden Beam And Find Its Flexural Rigidity

Content Beyond the syllabus

1	Study of Stress Concentration Around Circular and Sharp-Edged Holes.
2	Experimental Determination of Stress-Strain Curve for Composite Materials.

III SEM - Geotechnical Engineering Laboratory

Course Outcomes

CO1	To impart knowledge about index properties and their determination.
CO2	Introduce to the students, the principle permeability and seepage in the soil.
CO3	To impart knowledge about engineering properties and their determination.
CO4	Familiarize the students with the procedures used for Shallow and Deep foundation.
CO5	To impart knowledge about Basic Geology.

List of Experiments

1	Moisture content and Specific gravity of soil.
2	Grain size Analysis (Sieve Analysis).
3	Consistency limit, plastic limit and liquid limit of soil.
4	Hydrometer Analysis.
5	Constant Head Permeability test of or Falling Head Permeability test.
6	Consistency limit of soil (shrinkage limit).
7	Field Density by sand replacement method.
8	Field Density by core cutter method.
9	Unconfined compression test.
10	Direct shear Test.
11	Triaxial shear test (Demonstration).
12	Study of Plate load Test.
13	Proctors compaction Test and Proctor needle test.

Content Beyond the syllabus

1	Measurement of Soil pH and Its Effect on Engineering Properties
2	Study of Seepage Forces and Piping Phenomena Using a Flow Net Model.

III SEM - Building Construction & Elementary Building Drawing Laboratory

Course Outcomes

CO1	Identify components of a building.
CO2	Differentiate and identify types of building materials.
CO3	Select appropriate material for building construction.
CO4	Plan various construction related activities and their quality control.
CO5	Know & identify the latest techniques and materials used.

List of Experiments

1	Development of a given line plan of a residential building. Draw to a scale of 1: 50 1. Detailed Plan. 2. Elevation. 3. Section.
2	Following Sketches pertaining to the above plan (with Standard Dimensions) a. Door- Panelled door b. Window c. Stair d. Masonry e. Lintel
3	Prepare working drawing of Foundation Plan (on tracing paper) for the above Residential Building Plan. It should contain detailed foundation plan with foundation details. (Use suitable scale 1:50 or 1:100)
4	4. Draw sketches using computer software of the following: 1. Foundations- two plates a) Line sketches of shallow and deep footing. b) Details of any one of the shallow footings. 2. Arches- two plates.

Content Beyond the syllabus

1	Preparation of Working Drawings for Electrical and Plumbing Layouts for a Residential Building.
2	Preparation of Isolated, Combined, and Raft Foundation Drawings.

III SEM - Geotechnical Engineering Laboratory

Course Outcomes

CO1	To impart knowledge about index properties and their determination.
CO2	Introduce to the students, the principle permeability and seepage in the soil.
CO3	To impart knowledge about engineering properties and their determination.
CO4	Familiarize the students with the procedures used for Shallow and Deep foundation.
CO5	To impart knowledge about Basic Geology.

List of Experiments

1	Determination of Metacentric height and its importance.
2	Calibration of Venturimeter and its practical utility
3	Calibration of Orifice meter and its practical utility
4	Calibration of Rectangular Notches/ V-Notches.
5	Calibration of Rectangular Notches/ V-Notches
6	Hydraulic Coefficients of an orifice.
7	Hydraulic Coefficients of a Mouthpiece.
8	Verification of Bernoulli's Theorem
9	Impact of jet apparatus

Content Beyond the syllabus

1	Study of Pressure Variation in a U-Tube and Inclined Tube Manometer.
2	Study of Pelton Wheel Turbine Efficiency at Different Load Conditions.

IV SEM - Concrete Technology Laboratory

Course Outcomes

CO1	Think logically for development Concrete technology application in field of Civil Engineering
CO2	Gain an experience in the implementation of Concrete Materials on Engineering concepts which are applied on Construction Fields
CO3	Understand the process of mix design of concrete.
CO4	Differentiate special concrete from conventional concrete.
CO5	Analyse causes of deterioration of concrete components

List of Experiments

1	To determine the Normal consistency of cement .
2	To determine initial and final setting times of cement.
3	To determine soundness of cement.
4	To determine soundness of cement.
5	To determine particle shape , texture and elongation/ flakiness index of aggregate
6	Sieve analysis and particle size distribution of aggregate.
7	To determine crushing value test, Impact value and Abrasion value of given aggregate.
8	To determine Bulk Density, Specific Gravity, Absorption & Moisture Content of Aggregate.
9	To determine Bulking and Percentage silt in sand.
10	To determine Workability - Slump test, Compaction factor of concrete.
11	Concrete mix design Road note 4 method, I.S. Method and ACI Method.
12	To determine Compressive strength of concrete cube.
13	To determine the quality of concrete by using Rebound hammer/ Ultrasonic Pulse Velocity Instrument.

Content Beyond the syllabus

1	Study of Aggregate Packing Density for Optimized Concrete Mix Design.
2	Split Tensile Strength Test of Concrete Cylinders.

IV SEM – Structural Analysis Laboratory

Course Outcomes

CO1	Apply knowledge to analyse determinate and indeterminate structures.
CO2	Apply knowledge to perform analysis of beams and frames using Slope Deflection Method and Moment Distribution Method.
CO3	Apply knowledge of Influence Line Diagram to analyse structural members for rolling loads.
CO4	Apply knowledge of Direct Stiffness Method to analyse Beams and Plane Frames.
CO5	Apply knowledge of Direct Stiffness Method to formulate Stiffness Matrix, Transformation Matrix, Load Matrix to analyse Plane Truss.

List of Experiments

1	Verification of Maxwell's reciprocal theorem using simply supported beam.
2	Verification of Maxwell's reciprocal theorem using simply supported truss.
3	Horizontal thrust in two hinged arch.
4	ILD for Horizontal thrust in two hinged arch.
5	Horizontal thrust in three hinged arch.
6	ILD for Horizontal thrust in three hinged arch.
7	Verification of flexural rigidity using simply supported beam.
8	Analysis of a continuous beam using computer software.
9	Analysis of a plane frame using computer software.
10	Analysis of a plane truss using computer software.

Content Beyond the syllabus

1	Experimental Study of Load Redistribution in a Three-Hinged vs. Two-Hinged Arch.
2	Finite Element Analysis (FEA) of a Simply Supported Beam Using ANSYS/STAAD Pro.

IV SEM – Environmental Engineering Laboratory

Course Outcomes

CO1	Have knowledge of characteristics of water, drinking water standards and necessity of treatment.
CO2	Design various units of conventional water treatment plant.
CO3	Understand the characteristics of waste water, necessity of treatment, types of treatment processes
CO4	Equip with the basic knowledge related to design of waste water treatment
CO5	Understand of significance of air pollution, solid waste, climate change, geo environment etc

List of Experiments

1	Determination of pH
2	Determination of Conductivity
3	Determination of Turbidity
4	Determination Chlorides
5	Determination of Solid's (Suspended & dissolved)
6	Determination of Acidity and alkalinity
7	Determination of Dissolved Oxygen
8	Determination of Available Chlorine
9	Jar Test(optimum dose of coagulant)
10	Determination of Residual Chlorine
11	Only demonstration of COD, BOD.
12	Bacteriological Plate count and MPN tests

Content Beyond the syllabus

1	
2	

IV SEM – Transportation Engineering Laboratory

Course Outcomes

CO1	Define and describe different objectives and requirements of Highway Development and Planning, Alignments.
CO2	Explain, Discriminate and Design various Geometric Features of Highways & Pavement Design
CO3	Understand, analyse, apply and evaluate the parameters of Traffic Engineering.
CO4	Explain and describe various terms in railway engineering and should be able to explain, discriminate and design various geometric features of railway track.
CO5	Understand the aircraft characteristics and terminal area functions, analyse, and evaluate the basic runway length, orientation of runway.

List of Experiments

1	A. Test on Soil 1. CBR Test 2. AASHO Classification 3. Test on Stabilized soil
2	B. Test on Aggregate 1. Specific Gravity & Water Absorption 2. Crushing Value test on Aggregate 3. Abrasion Value test on Aggregate 4. Impact Value test on Aggregate
3	C. Test on Bitumen 1. Penetration Test 2. Softening Point Test 3. Ductility Test 4. Specific gravity of bitumen
4	D. Study experiments 1. Bituminous Mix Design 2. Road Construction Machineries 3. Road Safety Audit

Content Beyond the syllabus

1	Measurement of Soil Resilient Modulus for Pavement Design.
2	California Bearing Ratio (CBR) Test on Subgrade Soil Under Soaked and Unsoaked Conditions.

IV SEM – Surveying & Geomatics Laboratory

Course Outcomes

CO1	Measure length and bearing of lines using various instruments and calculate area of given field.
CO2	Use the theodolite to measure angle and distances for traversing also identify and correct the errors in traverse. Design and lay-out the various types of curves.
CO3	To carry out levelling and contouring also able to determine volume of earthwork.
CO4	Use modern instrument like Total work station, GPS, DGPS for surveying and able to prepare maps in CAD
CO5	Use Remote Sensing and Geographical Information System(GIS), UAV Drone and LiDAR Survey.

List of Experiments

1	Determination of area of given polygon by tape and cross staff survey.
2	Measurement of area of plot by plane table surveying.
3	Determination of elevation of various points with Auto level.
4	Levelling - Longitudinal and cross-section andplotting
5	Measurement of Horizontal angle by using theodolite
6	Measurement of vertical angle and Trigonometric levelling using theodolite
7	Determination of Tacheometric constants
8	Determination of elevation of points, horizontal distance and gradient by tachometric survey
9	Setting out of simple circular curve by offsets from chord produced method
10	Setting out of simple circular curve by Rankine method of tangential angle
11	Determination of height, remote elevation, distance between 2-3 points using total station
12	Determination of Area using total station.
13	Determination of Area using DGPS.
14	CONTOUR MAP: contouring using DGPS.
15	Topo-sheet: Understanding and identification of different features of drawing.
16	Lay-out marking of building plan
17	Study of EDM, GPS, Digital Planimeter.

Content Beyond the syllabus

1	GPS-Based Geodetic Surveying for Accurate Latitude and Longitude Determination.
2	Study of Ridge and Valley Identification Using Contour Mapping Techniques.

V SEM – Hydraulics Laboratory

Course Outcomes

CO1	Understand the concepts related to boundary layer theory and determination of drag and lift forces
CO2	Apply the knowledge of theories and equations of pipe flow in analysing and designing the pipe network systems and to discuss effects of water hammer pressures.
CO3	Use the concepts of uniform and critical flow through open channels, design of efficient channel sections and application of specific energy concept.
CO4	Understand gradually varied flow analysis and its computation, and its application in open channel flow.
CO5	Understand and apply basics principles related to turbines & Pumps in water Resources planning

List of Experiments

1	Determination of Frictional factor of a pipe line
2	Determination of minor losses through a pipe system
3	Determination of critical slope of an open channel
4	Study on Main characteristics of a centrifugal pump
5	Study on operating characteristics of a reciprocating pump
6	Study on operating characteristics of a centrifugal pump
7	Study on main characteristics of reciprocating pump
8	Analysis of Hydraulic jump in open channel
9	Determination of coefficient of impact of jet
10	Study of characteristics of a Pelton wheel
11	Study of characteristics of a Francis Turbine
12	Study of Reynolds's experiment
13	Determination Chesy's and Manning constants
14	Analysis of a Water Distribution network by Hardy cross method

Content Beyond the syllabus

1	Study of Flow Separation and Wake Formation in Pipe Bends.
2	Study of Flow Over a Broad-Crested and Sharp-Crested Weir.

V SEM – Civil Engineering Material Testing & Evaluation Laboratory

Course Outcomes

CO1	Evaluate the role of materials in Civil Engineering
CO2	Know the mechanical behaviour and properties of steel and concrete by standard testing procedures for identifying their performance
CO3	Explain special materials, composite materials and use of new techniques in constructions for satisfying the future needs of industry.
CO4	Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice
CO5	Evaluate and write a technical laboratory report.

List of Experiments

1	Tests on cement (Any Two) Field test on cement, Fineness, Normal consistency, Initial and Final Setting times, Specific gravity, Soundness, Compressive strength,
2	Tests on fine aggregate (Any Two) Grain size distribution, Uniformity coefficient and fineness modulus, Specific gravity. Density, Void ratio, Bulking & Absorption
3	Tests on coarse aggregate (Any Two) Grain size distribution, Uniformity coefficient and fineness modulus, Specific gravity, Density, Void ratio, Absorption
4	Concrete mix Design
5	Test on concrete by using IS code method (Any Two) (a) Workability test, Slump test, Compaction factor test, Flow table test, Vee-Bee Consist meter, (b) Compressive strength, Split tensile strength, Flexure test on beams, Modulus of elasticity
6	Tests on bricks Crushing strength, water absorption and efflorescence
7	Tensile and Compressive strength of materials & concrete composites
8	Tests on polymers and polymer-based materials
9	Testing on Ceramic Floor, Wall Tiles, Paver-blocks, Mosaic tiles, IS code recommendations.
10	Study of non-destructive testing of concrete (NDT)
11	Field density of bituminous roads

Content Beyond the syllabus

1	Study of Cement Performance with Different Admixtures (Pozzolanic, Plasticizers).
2	Study of Recycled Aggregates for Sustainable Concrete Mix Design.

VI SEM – Surveying - II Laboratory

Course Outcomes

CO1	Carry forward the concepts of basic surveying techniques
CO2	Operate various survey instruments effectively with precision
CO3	Use different types of techniques in various surveying problems
CO4	Apply the concepts of modern surveying techniques & instrumentation.
CO5	Take – up mini project using different surveying techniques.

List of Experiments

1	Determination of constants of Tacheometer
2	Determination of elevation of points by Tacheometric surveying
3	Determination of elevation of points and horizontal distance between them by Tacheometric survey
4	Determination of gradient of given length of road by Tacheometric survey
5	Determination of gradient of given length of road by Tacheometric survey
6	Setting out of simple circular curve by offsets from chord produced method
7	Setting out of simple transition curve by tangential angle method
8	Use of Advanced techniques of surveying.
9	Topo-sheet: Understanding and identification of different features of drawing

Content Beyond the syllabus

1	Application of Tacheometry in River Cross-Section and Flood Level Analysis.
2	Use of Remote Sensing and GIS for Land Use and Land Cover Classification.

VI SEM – Fluid Mechanics - II Laboratory

Course Outcomes

CO1	Understand the concepts related to boundary layer theory and determination of drag and lift forces.
CO2	Apply the knowledge of theories and equations of pipe flow in analysing and designing the pipe network systems and its components including water hammer pressures.
CO3	Use the concepts of uniform and critical flow through open channels including design of efficient channel sections.
CO4	Use the concepts of uniform and critical flow through open channels including design of efficient channel sections.
CO5	Understand and apply basics related to Turbines & Pumps in Water Resources planning.
CO6	Make use of specific energy concepts in the analysis of open channel flow.
CO7	Undertake Gradually Varied Flow analysis and its computation.

List of Experiments

1	Study of flow around immersed bodies
2	Determination of Darcy-Weisbach friction factor for given pipes
3	Determination of Manning's or Chezy's constant for an open channel.
4	Developing specific energy diagram for a rectangular channel.
5	Study of GVF profiles
6	Study of hydraulic jump in a horizontal rectangular channel. 7. Study and performance of Francis turbine.
7	Study and performance of Francis turbine
8	Study and performance of Pelton Wheel turbine.
9	Study and performance of Centrifugal pump.
10	Study and performance of Reciprocating pump.
11	Problem on pipe network analysis manually and using application software.

Content Beyond the syllabus

1	Study of Drag and Lift Forces on Aerofoil-Shaped Bodies Using Wind Tunnel Experiment.
2	Study of Flow Transitions from Subcritical to Supercritical Using Specific Energy Curves.

Programme Outcome (PO's) of M. Tech. Structural Engineering:

PO-1: Demonstrate the thorough knowledge of profession and implement it for enrichment of quality of life in the society.

PO-2: Demonstrate design skills by using software and technical support.

PO-3: Demonstrate the ability to undertake the research projects in various fields of civil engineering using software and experimental techniques.

PO-4: Demonstrate ability for team work and lifelong learning.

Programme Educational Objectives (PEOs) of PG Structural Engineering

The educational objectives of the postgraduate Programme of PG Structural Engineering are:

PEO-1: To provide quality education in the field of structural engineering to empower the students to meet the technological needs and socio-economic challenges.
PEO-2: To develop the design capability among students so that have the ability to innovate, develop and implement it for economic growth and enrichment of quality of life.
PEO- 3: To promote quality research and undertake research projects related to experimental investigation and use of software techniques, keeping in view the day to day needs of the society.
PEO-4: To impart knowledge related to structural engineering field in depth and breadth so that the students are able to understand and analyze the problems in various interdisciplinary fields of civil engineering.
PEO-5: To impart practical knowledge and to develop among students the ability to work with others.

M-Tech [Structural Engineering] Matrix Analysis Lab

Course Outcomes

CO1	Understand the different types of structures
CO2	Apply the matrix stiffness method to model the behavior of planar trusses, beams, and frames;
CO3	Analyze any multistoried building using Matrix Stiffness methods of structural analysis.
CO4	Recognize special effects on behavior of structures.
CO5	Implement the method developing their own computer program to analyze structures

List of Experiments

1	Analyse a continuous beam with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
2	Analyse a continuous beam with sinking of support with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
3	Analyse a plane truss with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method. Conclude it from both the result.
4	Analyse a plane truss subjected to inclined roller support with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
5	Analyse a plane truss subjected to temperature effect and lack of fit with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
6	Analyse a space truss with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
7	Analyse a plane frame with maximum three degree of Kinematic Indeterminacy, using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
8	Analyse a plane grid using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
9	Analyse a multi storied frame structure subjected to horizontal forces using software package.

Content Beyond the syllabus

1	Analysis of Continuous Beams with Variable Cross-Sections Using FEM-Based Software.
2	Influence Line Diagram (ILD) Generation for Continuous Beams Using Manual & Software Analysis.

M-Tech [Structural Engineering] Structural Dynamics Lab

Course Outcomes

CO1	An ability to apply knowledge of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response.
CO2	Ability to identify, formulate and solve engineering problems having motions varying with time. This will be accomplished by having students model, analyze and modify a vibratory structure, in order to achieve specified requirements.
CO3	Understanding professional and ethical responsibilities. This will be accomplished by emphasizing the importance of understanding how structural vibrations may affect safety and reliability of engineering systems.
CO4	An ability to Understand IS codes related to earthquake loading.

List of Experiments

1	To study various instruments for imparting dynamic forces.
2	To study various instruments for the response of vibrating structure.
3	To study the response of a single degree of lumped mass system subjected to base excitation.
4	To study the response of a two degree of freedom system building frame subjected to base motion.
5	To study the response of a multi degree of lumped mass system.
6	Verification of natural frequency of SDOF model under free vibration.
7	To study the liquefaction of soil structure.
8	To study the Earthquake induced waves in rectangular water tank.
9	To calculate horizontal seismic force of building using IS-1893.
10	To calculate the lateral forces in water tank due to Earthquake when water tank is empty and water tank is full by IS-1893.

Content Beyond the syllabus

1	Response Spectrum Analysis of a Multi-Story Frame Using SAP2000/ETABS.
2	Experimental Study of Mode Shapes in Beams Using Vibration Measurement Sensors.

M-Tech [Structural Engineering] Finite Elements Method Lab

Course Outcomes

CO1	An ability to identify the information required to conduct a structural analysis using finite element software
CO2	An ability to interpret the solutions obtained from finite element analyses.
CO3	An ability to have basic skills in using commercial finite element software and effective presentation of their analysis results.
CO4	An ability to communicate effectively in writing to report (both textually and graphically) the method used, the implementation and the numerical results obtained.

List of Experiments

1	Analysis of 2D truss
2	Analysis of Bar subjected to various loading conditions
3	Analysis of beam subjected to various loading conditions
4	Analysis of Plane Stress problem (Plate, Plate with hole) using triangular & Quadrilateral element
5	Analysis of Plain Strain problem (Retaining wall, Culvert) using triangular & Quadrilateral element
6	Analysis of Axisymmetric problem (Cylinder, foundation) using triangular & Quadrilateral element
7	Analysis of 3D beams (Cantilever and Simply Supported) subjected to various loading conditions

Content Beyond the syllabus

1	Study of Torsional Stresses in Beams Using Finite Element Discretization.
2	Study of Stress Variations in an Axisymmetric Footing Under Different Soil Conditions.

Programme Outcome (PO's) of M. Tech. Transportation Engineering

PO1: Demonstrate skill for planning, design, construction and maintenance of transportation projects.

PO2: Assessment of environmental and its allied issues to the construction of the transportation projects

PO3: Demonstrate skills to use modern engineering tools, software and equipments to analyze problems and evolve solutions

PO4: To enhance communication skills and successfully apply research aptitude among students to R &D activities and consultancy works.

Programme Educational Objectives (PEOs) of PG Structural Engineering

The educational objectives of the postgraduate Programme of PG Transportation Engineering are:

PEO-1: Study in the field of transportation engineering provides opportunities for understanding the transportation problems and their solutions through the sustainable land-use transportation planning, infrastructure planning, design, construction, management and environmental protection measures.

M-Tech [Transportation Engineering] Transportation Lab

Course Outcomes

CO1	Ability to characterise the road aggregates
CO2	Ability to characterise the paving grade bitumen.
CO3	Ability to characterise the Sub-grade Soil.
CO4	Ability to characterise the bituminous mix.

List of Experiments

1	**Tests on Aggregate** Aggregate Crushing value Test, Ten percent fine value Test, Blending of aggregate, Aggregate Impact value Test, Angularity no, specific gravity & bulk density of aggregate Test, Stripping value of aggregate Test
2	**Tests on Bitumen** Bitumen content by centrifugal extractor apparatus Test, Ductility Test, Softening point Test, Penetration value and grade of bitumen Test, Specific gravity Test
3	**Test on Sub-grade Soil** CBR Test, CBR test by dynamic cone penetrometer, North Dakota cone Test
4	**Test on bituminous** mix Marshall Stability Test

Content Beyond the syllabus

1	Study of Bitumen Aging Using Rolling Thin Film Oven Test (RTFOT).
2	Study of Swelling Index and Shrinkage Limit of Expansive Soil.