



# Adi Shankara

## INSTITUTE OF ENGINEERING AND TECHNOLOGY, KALADY

Approved by AICTE & Affiliated to APJ Abdul Kalam Technological University

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### B TECH CIVIL ENGINEERING

#### 2019 Scheme Syllabus- Course Outcomes

#### S1S2 B.Tech (2019) Syllabus

COURSE NAME	COURSE CODE	COURSE OUTCOME CODE	COURSE OUTCOME STATEMENTS
<b>BASICS OF CIVIL &amp; MECHANICAL ENGINEERING</b>	<b>EST 120</b>	<b>CO 1</b>	Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
		<b>CO 2</b>	Explain different types of buildings, building components, building materials and building construction
		<b>CO 3</b>	Describe the importance, objectives and principles of surveying.
		<b>CO 4</b>	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
		<b>CO 5</b>	Discuss the Materials, energy systems, water management and environment for green buildings.
		<b>CO 6</b>	Analyse thermodynamic cycles and calculate its efficiency
		<b>CO 7</b>	Illustrate the working and features of IC Engines
		<b>CO 8</b>	Explain the basic principles of Refrigeration and Air Conditioning
		<b>CO 9</b>	Describe the working of hydraulic machines
		<b>CO 10</b>	Explain the working of power transmission elements
		<b>CO 11</b>	Describe the basic manufacturing, metal joining and machining processes
<b>BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING</b>	<b>EST 130</b>	<b>CO 1</b>	Apply fundamental concepts and circuit laws to solve simple DC electric circuits
		<b>CO 2</b>	Develop and solve models of magnetic circuits
		<b>CO 3</b>	Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state
		<b>CO 4</b>	Describe working of a voltage amplifier
		<b>CO 5</b>	Outline the principle of an electronic instrumentation system
		<b>CO 6</b>	Explain the principle of radio and cellular communication
<b>CIVIL &amp; MECHANICAL WORKSHOP</b>	<b>ESL 120</b>	<b>CO 1</b>	Name different devices and tools used for civil engineering measurements
		<b>CO 2</b>	Explain the use of various tools and devices for various field measurements

		<b>CO 3</b>	Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
		<b>CO 4</b>	Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
		<b>CO 5</b>	Compare different techniques and devices used in civil engineering measurements
		<b>CO 6</b>	Identify Basic Mechanical workshop operations in accordance with the material and objects
		<b>CO 7</b>	Apply appropriate Tools and Instruments with respect to the mechanical workshop trades
		<b>CO 8</b>	Apply appropriate safety measures with respect to the mechanical workshop trades
<b>PROGRAMING IN C</b>	<b>EST 102</b>	<b>CO 1</b>	Analyze a computational problem and develop an algorithm/flowchart to find its solution
		<b>CO 2</b>	Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.
		<b>CO 3</b>	Write readable C programs with arrays, structure or union for storing the data to be processed
		<b>CO 4</b>	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
		<b>CO 5</b>	Write readable C programs which use pointers for array processing and parameter passing
		<b>CO 6</b>	Develop readable C programs with files for reading input and storing output
<b>ELECTRICAL &amp; ELECTRONICS WORKSHOP</b>	<b>ESL 130</b>	<b>CO 1</b>	Demonstrate safety measures against electric shocks.
		<b>CO 2</b>	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols
		<b>CO 3</b>	Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings
		<b>CO 4</b>	Identify and test various electronic components
		<b>CO 5</b>	Draw circuit schematics with EDA tools
		<b>CO 6</b>	Assemble and test electronic circuits on boards
		<b>CO 7</b>	Work in a team with good interpersonal skills
<b>ENGINEERING GRAPHICS</b>	<b>EST 110</b>	<b>CO 1</b>	Draw the projection of points and lines located in different quadrants
		<b>CO 2</b>	Prepare multiview orthographic projections of objects by visualizing them in different positions
		<b>CO 3</b>	Draw sectional views and develop surfaces of a given object
		<b>CO 4</b>	Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
		<b>CO 5</b>	Convert 3D views to orthographic views

		<b>CO 6</b>	Obtain multiview projections and solid models of objects using CAD tools
<b>ENGINEERING MECHANICS</b>	<b>EST 100</b>	<b>CO 1</b>	Recall principles and theorems related to rigid body mechanics
		<b>CO 2</b>	Identify and describe the components of system of forces acting on the rigid body
		<b>CO 3</b>	Apply the conditions of equilibrium to various practical problems involving different force system.
		<b>CO 4</b>	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
		<b>CO 5</b>	Solve problems involving rigid bodies, applying the properties of distributed areas and masses
<b>ENGINEERING CHEMISTRY</b>	<b>CYT 100</b>	<b>CO 1</b>	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
		<b>CO 2</b>	Understand applications.
		<b>CO 3</b>	Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of nanomaterials.
		<b>CO 4</b>	Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering.
		<b>CO 5</b>	Study various types of water treatment methods to develop skills for treating wastewater.
<b>ENGINEERING CHEMISTRY LAB</b>	<b>CYL 120</b>	<b>CO 1</b>	Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses
		<b>CO 2</b>	Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs
		<b>CO 3</b>	Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds
		<b>CO 4</b>	Acquire the ability to understand, explain and use instrumental techniques for chemical analysis
		<b>CO 5</b>	Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments
		<b>CO 6</b>	Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum



## 2019 Scheme Syllabus- Course Outcomes

### S3S4 B.Tech (2019) Syllabus

COURSE NAME	COURSE CODE	COURSE OUTCOME CODE	COURSE OUTCOME STATEMENTS
<b>MECHANICS OF SOLIDS</b>	<b>CET201</b>	<b>CO1</b>	Recall the fundamental terms and theorems associated with mechanics of linear elastic deformable bodies. Remembering
		<b>CO2</b>	Explain the behavior and response of various structural elements under various loading conditions. Understanding
		<b>CO3</b>	Apply the principles of solid mechanics to calculate internal stresses/strains, stress resultants and strain energies in structural elements subjected to axial/transverse loads and bending/twisting moments. Applying
		<b>CO4</b>	Choose appropriate principles or formula to find the elastic constants of materials making use of the information available. Applying
		<b>CO5</b>	Perform stress transformations, identify principal planes/stresses and maximum shear stress at a point in a structural member. Applying
		<b>CO6</b>	Analyse the given structural member to calculate the safe load or proportion the cross section to carry the load safely. Analysing
<b>FLUID MECHANICS AND HYDRAULICS</b>	<b>CET 203</b>	<b>CO1</b>	Recall the relevant principles of hydrostatics and hydraulics of pipes and open channels
		<b>CO2</b>	Identify or describe the type, characteristics or properties of fluid flow
		<b>CO3</b>	Estimate the fluid pressure, perform the stability check of bodies under hydrostatic condition
		<b>CO4</b>	Compute discharge through pipes or estimate the forces on pipe bends by applying hydraulic principles of continuity, energy and/or momentum
		<b>CO5</b>	Analyze or compute the flow through open channels, perform the design of prismatic channels
<b>SURVEYING &amp; GEOMATICS</b>	<b>CET205</b>	<b>CO1</b>	Apply surveying techniques and principles of leveling for the preparation of contour maps, computation of area-volume and sketching mass diagram
		<b>CO2</b>	Apply the principles of surveying for triangulation

		<b>CO3</b>	Apply different methods of traverse surveying and traverse balancing
		<b>CO4</b>	Identify the possible errors in surveying and apply the corrections in field measurements
		<b>CO5</b>	Apply the basic knowledge of setting out of different types of curves
		<b>CO6</b>	Employ surveying techniques using advanced surveying equipments
<b>SUSTAINABLE ENGINEERING</b>	<b>MCN201</b>	<b>CO 1</b>	Understand the relevance and the concept of sustainability and the global initiatives in this direction
		<b>CO 2</b>	Explain the different types of environmental pollution problems and their sustainable solutions
		<b>CO 3</b>	Discuss the environmental regulations and standards
		<b>CO 4</b>	Outline the concepts related to conventional and non-conventional energy
		<b>CO 5</b>	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles
<b>DSIGN AND ENGINEERING</b>	<b>EST 200</b>	<b>CO 1</b>	Explain the different concepts and principles involved in design engineering.
		<b>CO 2</b>	Apply design thinking while learning and practicing engineering.
		<b>CO 3</b>	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.
<b>CIVIL ENGINEERING PLANNING &amp; DRAFTING LAB</b>	<b>CEL 201</b>	<b>CO1</b>	Illustrate ability to organise civil engineering drawings systematically and professionally
		<b>CO2</b>	Prepare building drawings as per the specified guidelines.
		<b>CO3</b>	Assess a complete building drawing to include all necessary information
		<b>CO4</b>	Create a digital form of the building plan using any drafting software
<b>SURVEY LAB</b>	<b>CEL 203</b>	<b>CO 1</b>	Use conventional surveying tools such as chain/tape and compass for plotting and area determination.
		<b>CO 2</b>	Apply levelling principles in field
		<b>CO 3</b>	Solve triangulation problems using theodolite
		<b>CO 4</b>	Employ total station for field surveying
		<b>CO 5</b>	Demonstrate the use of distomat and handheld GPS
<b>ENGINEERING GEOLOGY</b>	<b>CET202</b>	<b>CO 1</b>	Recall the fundamental concepts of surface processes, subsurface process, minerals, rocks, groundwater and geological factors in civil engineering constructions.
		<b>CO 2</b>	Identify and describe the surface processes, subsurface process, earth materials, groundwater and geological factors in civil engineering constructions.
		<b>CO 3</b>	Apply the basic concepts of surface and subsurface processes, minerals, rocks, groundwater and geological

			characteristics in civil engineering constructions.
		<b>CO 4</b>	Analyze and classify geological processes, earth materials and groundwater.
		<b>CO 5</b>	Evaluation of geological factors in civil engineering constructions
<b>GEOTECHNICAL ENGINEERING - I</b>	<b>CET 204</b>	<b>CO 1</b>	Explain the fundamental concepts of basic and engineering properties of soil
		<b>CO 2</b>	Describe the laboratory testing methods for determining soil parameters
		<b>CO 3</b>	Solve the basic properties of soil by applying functional relationships
		<b>CO 4</b>	Calculate the engineering properties of soil by applying the laboratory test results and the fundamental concepts of soil mechanics
		<b>CO 5</b>	Analyze the soil properties to identify and classify the soil
<b>TRANSPORTATION ENGINEERING</b>	<b>CET206</b>	<b>CO 1</b>	Apply the basic principles of Highway planning and design highway geometric elements
		<b>CO 2</b>	Apply standard code specifications in judging the quality of highway materials; designing of flexible pavements
		<b>CO 3</b>	Explain phenomena in road traffic by collection, analysis and interpretation of traffic data through surveys; creative design of traffic control facilities
		<b>CO 4</b>	Understand about railway systems, tunnel, harbour and docks
		<b>CO 5</b>	Express basics of airport engineering and design airport elements
<b>PROFESSIONAL ETHICS</b>	<b>HUT 200</b>	<b>CO 1</b>	Understand the core values that shape the ethical behaviour of a professional.
		<b>CO 2</b>	Adopt a good character and follow an ethical life.
		<b>CO 3</b>	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
		<b>CO 4</b>	Solve moral and ethical problems through exploration and assessment by established experiments.
		<b>CO 5</b>	Apply the knowledge of human values and social values to contemporary ethical values and global issues.
<b>MATERIAL TESTING LAB - I</b>	<b>CEL 202</b>	<b>CO1</b>	The understand the behaviour of engineering materials under various forms and stages of loading.
		<b>CO2</b>	Characterize the elastic properties of various materials.
		<b>CO3</b>	Evaluate the strength and stiffness properties of engineering materials under various loading conditions
<b>FLUID MECHANICS LAB</b>	<b>CEL 204</b>	<b>CO1</b>	Apply fundamental knowledge of Fluid Mechanics to corresponding experiments
		<b>CO2</b>	Apply theoretical concepts in Fluid Mechanics to respective experiments
		<b>CO3</b>	Analyse experimental data and interpret the results

		<b>CO4</b>	Document the experimentation in prescribed manner
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## 2019 Scheme Syllabus- Course Outcomes

### S5 S6 B.Tech (2019) Syllabus

COURSE NAME	COURSE CODE	COURSE OUTCOME CODE	COURSE OUTCOME STATEMENTS
STRUCTURAL ANALYSIS – I	CET301	CO1	Apply the principles of solid mechanics to analyse trusses. (Cognitive knowledge level: Applying)
		CO2	Apply various methods to determine deflections in statically determinate structures. (Cognitive knowledge level: Applying)
		CO3	Identify the problems with static indeterminacy and tackling such problems by means of the method of consistent deformations and energy principles. (Cognitive knowledge level: Understanding, Analysing, Applying)
		CO4	Apply specific methods such as slope deflection and moment distribution methods of structural analysis for typical structures with different characteristics. (Cognitive knowledge level: Understanding, Applying)
		CO5	Apply suitable methods of analysis for various types of structures including cables, suspension bridges and arches. (Cognitive knowledge level: Understanding, Applying)
		CO6	Analyse the effects of moving loads on structures using influence lines. (Cognitive knowledge level: Understanding, Analysing, Applying)
DESIGN OF CONCRETE STRUCTURES	CET303	CO1	Recall the fundamental concepts of limit state design and code provisions for design of concrete members under bending, shear, compression and torsion. (Cognitive knowledge level: Remembering/ Understanding)
		CO2	Analyse reinforced concrete sections to determine the ultimate capacity in bending, shear and compression. (Cognitive knowledge level: Applying)
		CO3	Design and detail beams, slab, stairs and footings using IS code provisions. (Cognitive knowledge level: Applying)
		CO4	Design and detail columns using IS code and SP 16 design charts. (Cognitive knowledge level: Applying)
		CO5	Explain the criteria for earthquake resistant design of structures and ductile detailing of concrete structures subjected to seismic forces. (Cognitive knowledge level: Understanding)



<b>GEOTECHNICAL ENGINEERING – II</b>	<b>CET 305</b>	<b>CO1</b>	Understand soil exploration methods
		<b>CO2</b>	Explain the basic concepts, theories and methods of analysis in foundation engineering
		<b>CO3</b>	Calculate bearing capacity, pile capacity, foundation settlement and earth pressure
		<b>CO4</b>	Analyze shallow and deep foundations
		<b>CO5</b>	Solve the field problems related to geotechnical engineering
<b>HYDROLOGY &amp; WATER RESOURCES ENGINEERING</b>	<b>CET 307</b>	<b>CO1</b>	Describe and estimate the different components of hydrologic cycle by processing hydrometeorological data
		<b>CO2</b>	Determine the crop water requirements for the design of irrigation canals by recollecting the principles of irrigation engineering
		<b>CO3</b>	Perform the estimation of streamflow and/or describe the river behavior and control structures
		<b>CO4</b>	Describe and apply the principles of reservoir engineering to estimate the capacity of reservoirs and their useful life
		<b>CO5</b>	Demonstrate the principles of groundwater engineering and apply them for computing the yield of aquifers and wells
<b>CONSTRUCTION TECHNOLOGY AND MANAGEMENT</b>	<b>CET309</b>	<b>CO1</b>	Describe the properties of materials used in construction Understand
		<b>CO2</b>	Explain the properties of concrete and its determination Understand
		<b>CO3</b>	Describe the various elements of building construction Understand
		<b>CO4</b>	Explain the technologies for construction Understand
		<b>CO5</b>	Describe the procedure for planning and executing public works Understand
		<b>CO6</b>	Apply scheduling techniques in project planning and control Application
<b>DISASTER MANAGEMENT</b>	<b>MCN 301</b>	<b>CO1</b>	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand).
		<b>CO2</b>	Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand).
		<b>CO3</b>	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand).
		<b>CO4</b>	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply)

		<b>CO5</b>	Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: Understand).
		<b>CO6</b>	Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand).
<b>MATERIAL TESTING LAB II</b>	<b>CEL331</b>	<b>CO1</b>	To describe the basic properties of various construction materials
		<b>CO2</b>	Characterize the physical and mechanical properties of various construction materials.
		<b>CO3</b>	Interpret the quality of various construction materials as per IS Codal provisions
<b>GEOTECHNICAL ENGINEERING LAB</b>	<b>CEL 333</b>	<b>CO1</b>	Identify and classify soil based on standard geotechnical experimental methods.
		<b>CO2</b>	Perform and analyze permeability tests
		<b>CO3</b>	Interpret engineering behavior of soils based on test results
		<b>CO4</b>	Perform laboratory compaction, CBR and in-place density test for fill quality control in the field.
		<b>CO5</b>	Evaluate the strength of soil by performing various tests viz. direct shear test, unconfined compressive strength test and triaxial shear test.
		<b>CO6</b>	Evaluate settlement characteristics of soils.
<b>STRUCTURAL ANALYSIS – II</b>	<b>CET302</b>	<b>CO1</b>	Understand the principles of plastic theory and its applications in structural analysis. (Cognitive knowledge level: Understanding, Applying)
		<b>CO2</b>	Examine the type of structure and decide on the method of analysis. (Cognitive knowledge level: Analysing, Applying)
		<b>CO3</b>	Apply approximate methods of analysis for framed structures to ascertain stress resultants approximately but quickly. (Cognitive knowledge level: Analysing, Applying)
		<b>CO4</b>	Apply the force method to analyse framed structures. (Cognitive knowledge level: Understanding, Analysing, Applying)
		<b>CO5</b>	Apply the displacement methods to analyse framed structures. (Cognitive knowledge level: Understanding, Analysing, Applying)
		<b>CO6</b>	Remember basic dynamics, understand the basic principles of structural dynamics and apply the same to simple structures. (Cognitive knowledge level: Remembering, Understanding, Applying)
<b>ENVIRONMENTAL ENGINEERING</b>	<b>CET 304</b>	<b>CO1</b>	To appreciate the role of environmental engineering in improving the quality of environment (Cognitive knowledge level: Understanding)
		<b>CO2</b>	To plan for collection and conveyance of water and waste water (Cognitive knowledge level: Applying)

		<b>CO3</b>	To enhance natural water purification processes in an engineered environment (Cognitive knowledge level: Analysing)
		<b>CO4</b>	To decide on appropriate technology for water and waste water treatment (Cognitive knowledge level: Evaluating)
<b>DESIGN OF HYDRAULIC STRUCTURES</b>	<b>CET306</b>	<b>CO1</b>	Elucidate the causes of failure, principles of design of different components of hydraulic structures
		<b>CO2</b>	Describe the features of canal structures and perform the design of alluvial canals
		<b>CO3</b>	Perform the hydraulic design of minor irrigation structures such as cross drainage works, canal falls, cross regulator
		<b>CO4</b>	Prepare the scaled drawings of different minor irrigation structures
		<b>CO5</b>	Describe the design principles and features of dams and perform the stability analysis of gravity dams
<b>COPREHENSIVE COURSE WORK</b>	<b>CET308</b>	<b>CO1</b>	Learn to prepare for a competitive examination
		<b>CO2</b>	Comprehend the questions in Civil Engineering field and answer them with confidence
		<b>CO3</b>	Communicate effectively with faculty in scholarly environments
		<b>CO4</b>	Analyze the comprehensive knowledge gained in basic courses in the field of Civil Engineering
<b>TRANSPORTATION ENGINEERING LAB</b>	<b>CEL332</b>	<b>CO1</b>	Analyse the suitability of soil as a pavement subgrade material
		<b>CO2</b>	Assess the suitability of aggregates as a pavement construction material
		<b>CO3</b>	Characterize bitumen based on its properties so as to recommend it as a pavement construction material.
		<b>CO4</b>	Design bituminous mixes for pavement layers
		<b>CO5</b>	Assess functional adequacy of pavements based on roughness of pavement surface.
<b>CIVIL ENGINEERING SOFTWARE LAB</b>	<b>CEL 334</b>	<b>CO1</b>	To undertake analysis and design of multi-storeyed framed structure, schedule a given set of project activities using a software.
		<b>CO2</b>	To prepare design details of different structural components, implementation plan for a project.
		<b>CO3</b>	To prepare a technical document on engineering activities like surveying , structural design and project planning.
<b>ADVANCED COMPUTATIONAL METHODS</b>	<b>CET312</b>	<b>CO1</b>	Describe the procedures or principles of numerical computational approaches Remembering/understanding
		<b>CO2</b>	Obtain the solution of simultaneous equations or eigen value problems Applying

		<b>CO3</b>	Apply appropriate data smoothing technique for a given set of data (Cognitive knowledge level: Applying)
		<b>CO4</b>	Obtain the numerical solutions of ordinary differential equations (Cognitive knowledge level: Applying)
		<b>CO5</b>	Obtain the numerical solutions for solving boundary value problems of ordinary and partial differential equations (Cognitive knowledge level: Applying)
		<b>CO6</b>	Describe the concepts or apply discretization based solution methods. (Cognitive knowledge level: Remembering/applying)
<b>GEOTECHNICAL INVESTIGATION</b>	<b>CET322</b>	<b>CO1</b>	The students will be able to understand the procedure, applicability, and limitations of various methods of geotechnical investigation (Cognitive knowledge level: Remembering, Understanding)
		<b>CO2</b>	The students will be able to make engineering judgments and take appropriate decisions related to geotechnical investigations (Cognitive knowledge level: Applying & Analysing)
		<b>CO3</b>	The students will be able to understand the procedure and applications of penetration tests and geophysical tests for exploration of the soil profile (Cognitive knowledge level: Remembering, Understanding)
		<b>CO4</b>	The students will be able to choose the right soil sampling technique and analyse the dependability of samples collected (Cognitive knowledge level: Applying & Analysing)
		<b>CO5</b>	The students will be able to understand the procedure and applications of field load tests and rock quality indices. (Cognitive knowledge level: Applying & Analysing)
<b>TRAFFIC ENGINEERING AND MANAGEMENT</b>	<b>CET332</b>	<b>CO1</b>	Identify the relationship among various traffic stream variables. (K2, K3)
		<b>CO2</b>	Apply traffic management measures and regulations so as to solve issues related to traffic flow in road network. (K2, K3)
		<b>CO3</b>	Explain the concept of capacity and LOS and its estimation for various traffic facilities (K2,K3)
		<b>CO4</b>	Identify the need for intersection control and design of various types.(K2,K3)
		<b>CO5</b>	Analyse causes of road accidents and suggest preventive measures (K2, K3)
<b>MECHANICS OF FLUID FLOW</b>	<b>CET342</b>	<b>CO1</b>	Describe and apply the principles of potential flow and viscous flow
		<b>CO2</b>	Perform the computations of turbulent flows through pipes and pipe bends by recollecting the relevant hydraulic principles
		<b>CO3</b>	Describe and apply the principles of the pressure and specific energy in open channel flow for practical applications

		<b>CO4</b>	Describe and apply the principles of unsteady flow for practical applications in pipes and channels
		<b>CO5</b>	Prepare physical models for performing experiments recalling the principles of fluid flow
<b>ADVANCED CONCRETE TECHNOLOGY</b>	<b>CET352</b>	<b>CO1</b>	To recall the properties and testing procedure of concrete materials as per IS code (Cognitive knowledge level: Remembering, Understanding)
		<b>CO2</b>	To describe the procedure of determining the properties of fresh and hardened concrete (Cognitive knowledge level: Remembering, Understanding)
		<b>CO3</b>	To design concrete mix using IS Code Methods. (Cognitive knowledge level: Applying & Analysing)
		<b>CO4</b>	To explain nondestructive testing of concrete (Cognitive knowledge level: Remembering, Understanding)
		<b>CO5</b>	To describe the various special types of concretes (Cognitive knowledge level: Remembering, Understanding)
<b>ENVIRONMENTAL IMPACT ASSESSMENT</b>	<b>CET 362</b>	<b>CO1</b>	To appreciate the need for minimizing the environmental impacts of developmental activities (Cognitive knowledge level: Understanding)
		<b>CO2</b>	To understand environmental legislation & clearance procedure in the country (Cognitive knowledge level: Remembering, Understanding)
		<b>CO3</b>	To apply various methodologies for assessing the environmental impacts of any developmental activity (Cognitive knowledge level: Applying & Analysing)
		<b>CO4</b>	To prepare an environmental impact assessment report (Cognitive knowledge level: Analysing & Evaluating)
		<b>CO5</b>	To conduct an environmental audit (Cognitive knowledge level: Analysing & Evaluating)
<b>FUNCTIONAL DESIGN OF BUILDINGS</b>	<b>CET372</b>	<b>CO1</b>	Develop an understanding of acoustical design and noise control techniques
		<b>CO2</b>	Understand elemental concepts of natural and artificial lighting designs
		<b>CO3</b>	Know the principles involved in the design of buildings for thermal comfort and influence of climate on design of buildings
		<b>CO4</b>	Have basic concept for electrical load calculation, plumbing design, HVAC load Calculation, functioning of elevators and escalators and rough cost estimation.
		<b>CO5</b>	Acquire knowledge of innovative construction concepts



### 2019 Scheme Syllabus- Course Outcomes

#### S7 S8 B.Tech (2019) Syllabus

COURSE NAME	COURSE CODE	COURSE OUTCOME CODE	COURSE OUTCOME STATEMENTS
DESIGN OF STEEL STRUCTURES	CET401	CO1	Explain the behavior and properties of structural steel members to resist various structural forces and actions and apply the relevant codes of practice
		CO2	Analyses the behavior of structural steel members and undertake design at both serviceability and ultimate limit states
		CO3	Explain the theoretical and practical aspects of Design of composite Steel Structure along with the planning and design aspects
		CO4	Apply a diverse knowledge of Design of Steel engineering practices applied to real life problems
		CO5	Demonstrate experience in the implementation of design of structures on engineering concepts which are applied in field Structural Engineering
ENVIRONMENTAL ENGG LAB	CEL411	CO1	Analyse various physico-chemical and biological parameters of water
		CO2	Compare the quality of water with drinking water standards and recommend its suitability for drinking purposes
SEMINAR	CEQ413	CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply)
		CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
		CO3	Prepare a presentation about an academic document (Cognitive knowledge level: Create).
		CO4	Give a presentation about an academic document (Cognitive knowledge level: Apply).
		CO5	Prepare a technical report (Cognitive knowledge level: Create).
PROJECT PHASE I	CED415	CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
		CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).

		<b>CO3</b>	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply)
		<b>CO4</b>	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
		<b>CO5</b>	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
		<b>CO6</b>	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply)
<b>PRESTRESSED CONCRETE</b>	<b>CET413</b>	<b>CO1</b>	Explain the concepts of prestressing and analyze prestressed concrete members for stresses and losses. (Cognitive knowledge level: Analyze)
		<b>CO2</b>	Analyze for flexure, shear and torsional resistance of PSC members. (Cognitive knowledge level: Analyze)
		<b>CO3</b>	Design pre-tensioned and post-tensioned members symmetrical about vertical axis. (Cognitive knowledge level: Apply/Create)
		<b>CO4</b>	Analyse the deflections of prestressed concrete members. (Cognitive knowledge level: Analyze)
		<b>CO5</b>	Analyze the transfer of prestress in pretensioned members, anchorage zone stresses in post tensioned members. (Cognitive knowledge level: Analyze)
		<b>CO6</b>	Analyze prestressing of statically indeterminate structures and design continuous members. (Cognitive knowledge level: Apply)
		<b>CO7</b>	Analyze composite construction of prestressed and in situ concrete. (Cognitive knowledge level: Apply)
		<b>CO8</b>	Analyze and design PSC slabs. (Cognitive knowledge level: Apply/ Create)
<b>GROUND IMPROVEMENT TECHNIQUES</b>	<b>CET423</b>	<b>CO1</b>	Classify different ground improvement methods based on the soil suitability
		<b>CO2</b>	Outline the basic concept/ design aspects of various ground improvement methods
		<b>CO3</b>	Identify the construction procedure of different ground improvement methods
		<b>CO4</b>	Choose different application of geosynthetics and soil stabilisation in Ground improvement
<b>HIGHWAY MATERIALS AND DESIGN</b>	<b>CET433</b>	<b>CO1</b>	Identify suitable materials for different types of pavements (K2, K3)
		<b>CO2</b>	Interpret material test results with respect to field conditions and standards (K2, K3)
		<b>CO3</b>	Apply the pavement material properties to analysis of pavements (K2,K3)
		<b>CO4</b>	Evaluate material properties and design pavement mixes.(K3,K4)

		<b>CO5</b>	Analyse and design the pavement, flexible or rigid, for the conditions prevailing at site (K3, K4)
<b>APPLIED HYDROLOGY</b>	<b>CET443</b>	<b>CO1</b>	Describe or estimate the different components of hydrologic cycle
		<b>CO2</b>	Explain the behavior of catchments and quantify the response of the catchment
		<b>CO3</b>	Apply the concept of hydrograph for runoff computation
		<b>CO4</b>	Apply hydrological and statistical principles for estimation of flood discharge
		<b>CO5</b>	Determine the aquifer parameters and assess the groundwater quality
<b>CONSTRUCTION PLANNING AND MANAGEMENT</b>	<b>CET453</b>	<b>CO1</b>	Apply knowledge of Planning and Management for planning and execution of Construction Projects (Cognitive knowledge level: Applying)
		<b>CO2</b>	Explain techniques for Project Planning, Scheduling, Construction Administration and Management (Cognitive knowledge level: Understanding)
		<b>CO3</b>	Identify the criteria for selecting the appropriate method and tools as per the requirement of each project or site. (Cognitive knowledge level: Understanding)
		<b>CO4</b>	Discuss the latest industry standards and technologies used in construction projects for planning and management. (Cognitive knowledge level: Understanding)
		<b>CO5</b>	Explain the financial and legal aspects involved in a construction project. (Cognitive knowledge level: Understanding)
<b>ADVANCED ENVIRONMENTAL ENGINEERING</b>	<b>CET463</b>	<b>CO1</b>	Explain various secondary treatment technologies for waste water (Cognitive knowledge level: Understand)
		<b>CO2</b>	Explain various tertiary treatment technologies and their applications (Cognitive knowledge level: Understand)
		<b>CO3</b>	Explain engineering principles to dimension various treatment units (Cognitive knowledge level: Analyse)
		<b>CO4</b>	Identify appropriate technology for controlling air pollution (Cognitive knowledge level: Understand)
<b>OPTIMISATION TECHNIQUES IN CIVIL ENGINEERING</b>	<b>CET473</b>	<b>CO1</b>	Formulate engineering design problem as an optimization problem. (Cognitive knowledge level: Applying)
		<b>CO2</b>	Apply suitable optimization technique to the design problem at hand. (Cognitive knowledge level: Applying)
		<b>CO3</b>	Evaluate the problem as linear or nonlinear optimization problem and design the optimization technique. (Cognitive knowledge level: Evaluate)
		<b>CO4</b>	Evaluate the problem as single variable or multi-variable optimization problem and design the



			corresponding optimization technique (Cognitive knowledge level: Evaluate)
		<b>CO5</b>	Formulate linear programming problem for engineering applications and evaluate the solution. (Cognitive knowledge level: Evaluate)
		<b>CO6</b>	Familiarise with transportation and assignment problems and genetic algorithm. (Cognitive knowledge level: Applying)
<b>ENVIRONMENTAL IMPACT ASSESSMENT</b>	<b>CET415</b>	<b>CO1</b>	Explain the need for minimizing the environmental impacts of developmental activities (Cognitive knowledge level: Understand)
		<b>CO2</b>	Outline environmental legislation & clearance procedure in the country (Cognitive knowledge level: Remember, Understand)
		<b>CO3</b>	Apply various methodologies for assessing the environmental impacts of any developmental activity (Cognitive knowledge level: Apply & Analyse)
		<b>CO4</b>	Prepare an environmental impact assessment report (Cognitive knowledge level: Analyse & Evaluate)
		<b>CO5</b>	Conduct an environmental audit (Cognitive knowledge level: Analyse & Evaluate)
<b>APPLIED EARTH SYSTEMS</b>	<b>CET425</b>	<b>CO1</b>	Explain the concept of earth as a system of interrelated components and associated exogenic/endogenic processes.
		<b>CO2</b>	Appraise geological agents and their respective erosion, transportation and deposition regimes and landforms formed.
		<b>CO3</b>	Contemplate constraints and processes that continuously affect earth's surface and its stability and consistency.
		<b>CO4</b>	Evaluate/investigate the significance of Plate tectonics theory to explain the geodynamic features and processes of earth's surface.
		<b>CO5</b>	Develop an understanding of oceanographic and atmospheric regimes and their sway on other subsystems and process thereof.
		<b>CO6</b>	Understand implications of human interaction with the Earth system
<b>INFORMATICS FOR INFRASTRUCTURE MANAGEMENT</b>	<b>CET435</b>	<b>CO1</b>	Explain the fundamental concepts of data science, informatics & internet of things (Cognitive knowledge level: )Remembering, Understanding
		<b>CO2</b>	Identify the use of geomatics in planning and site selection of infrastructure projects (Cognitive knowledge level: Applying & Analysing)
		<b>CO3</b>	Apply building informatics in construction, monitoring and project management (Cognitive knowledge level: Applying & Analysing)
		<b>CO4</b>	Utilize IoT technology in infrastructure management (Cognitive knowledge level: Applying & Analysing)

<b>NATURAL DISASTERS AND MITIGATION</b>	<b>CET445</b>	<b>CO1</b>	Explain interaction between subsystems of earth that give rise to hazards and their potential for disasters
		<b>CO2</b>	Explain the evolving concepts and thoughts of management of hazards and disasters
		<b>CO3</b>	Analyse the causes behind natural disasters and evaluate their magnitude and impacts
		<b>CO4</b>	Create management plans for hazards and disasters, and understand the roles of agencies involved.
		<b>CO5</b>	Explain the concept of sustainable development and EIA and their role in mitigating disasters
<b>ENVIRONMENTAL HEALTH AND SAFETY</b>	<b>CET455</b>	<b>CO1</b>	Explain the Toxicology and Occupational Health associated with industries
		<b>CO2</b>	Identify chemical and microbial agents that originate in the environment and can impact human health.
		<b>CO3</b>	Describe various measures to ensure safety in Construction industry.
		<b>CO4</b>	Explain the effect of air and water pollution on environment.
		<b>CO5</b>	Describe the safety measures against various environmental hazards.
<b>GEOINFORMATICS</b>	<b>CET465</b>	<b>CO1</b>	Explain basic concepts of GIS and spatial data (Cognitive knowledge level: Understand)
		<b>CO2</b>	Explain various datatypes and database management (Cognitive knowledge level: Understand)
		<b>CO3</b>	Choose various spatial data collection technologies & analysis techniques (Cognitive knowledge level: Apply)
		<b>CO4</b>	Demonstrate the use of GIS in various applications (Cognitive knowledge level: Apply)
<b>QUANTITY SURVEYING AND VALUATION</b>	<b>CET402</b>	<b>CO1</b>	Define basic terms related to estimation, quantity surveying and contract document. (Cognitive knowledge level: Remembering)
		<b>CO2</b>	Interpret the item of work from drawings and explain its general specification and unit of measurement. (Cognitive knowledge level: Understanding)
		<b>CO3</b>	Make use of given data from CPWD DAR/DSR for calculating the unit rate of different items of work associated with building construction (Cognitive knowledge level: Applying)
		<b>CO4</b>	Develop detailed measurement (including BBS) and BoQ of a various work like buildings, earthwork for road, sanitary and water supply work (Cognitive knowledge level: Applying)
		<b>CO5</b>	Explain various basic terms related to valuation of land and building (Cognitive knowledge level: Understanding)
		<b>CO6</b>	Develop valuation of buildings using different methods of valuation. (Cognitive knowledge level: Understanding)

			Applying)
<b>PROJECT PHASE II</b>	<b>CED416</b>	<b>CO1</b>	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply)
		<b>CO2</b>	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
		<b>CO3</b>	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply)
		<b>CO4</b>	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
		<b>CO5</b>	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze)
		<b>CO6</b>	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).
<b>ADVANCED STRUCTURAL DESIGN</b>	<b>CET414</b>	<b>CO1</b>	Design and detail cantilever retaining wall and understand the design principles of Counter fort retaining wall. And Design and detail deep beams (Cognitive knowledge level: Applying Understanding)
		<b>CO2</b>	Design and detail water tanks as per IS code provisions (Cognitive knowledge level: Applying)
		<b>CO3</b>	Explain Concept of yield line theory and design of different slab using yield line theory Design of Flat slabs using IS code provisions. (Cognitive knowledge level: Understanding Applying)
		<b>CO4</b>	Analyse and design Cold form light gauge section. (Cognitive knowledge level: Applying)
		<b>CO5</b>	Use of latest industry standard formula, table, design aids used for design of beams and portal frames under pattern loading. (Cognitive knowledge level: Understanding Applying)
<b>GEOENVIRONMENTAL ENGINEERING</b>	<b>CET424</b>	<b>CO1</b>	Outline the geo-environmental considerations of waste containment
		<b>CO2</b>	Explain the contaminant transport mechanism
		<b>CO3</b>	Choose the suitable system for waste containment and its various components
		<b>CO4</b>	Plan suitable remediation method for contaminated site
<b>RAILWAY AND TUNNEL ENGINEERING</b>	<b>CET434</b>	<b>CO1</b>	Explain the role of railways in national development and carry out geometric design of railway track by identifying component parts of railway track
		<b>CO2</b>	Design railway operation and control systems
		<b>CO3</b>	Analyze factors affecting railway accidents and understand the modern developments in railways and develop an awareness about the maintenance of

			railway system.
		<b>CO4</b>	Explain about the importance, types and methods of construction of tunnel
		<b>CO5</b>	Develop and analyze design aspects of ventilation, lining and lighting in tunnels
<b>IRRIGATION AND DRAINAGE ENGINEERING</b>	<b>CET444</b>	<b>CO1</b>	Determine the crop water requirement and understand the design of various surface irrigation methods
		<b>CO2</b>	Perform scheduling of irrigation and evaluate irrigation system performance
		<b>CO3</b>	Estimate properties of soil water zone, design open drains
		<b>CO4</b>	Perform design of various drainage systems
		<b>CO5</b>	Compute leaching requirement and design of drainage systems considering crop water requirement and leaching requirement
<b>CONSTRUCTION METHODS AND EQUIPMENT</b>	<b>CET454</b>	<b>CO1</b>	Explain the various construction procedures for sub structures and super structures. Remembering, (Cognitive knowledge level: Understanding)
		<b>CO2</b>	Describe the various construction activities involved in underground and under water construction (Cognitive knowledge level: Understanding)
		<b>CO3</b>	Demonstrate basic knowledge about construction equipment and machineries (Cognitive knowledge level: Remembering, Understanding)
		<b>CO4</b>	Explain the equipment used for production of aggregates and concreting (Cognitive knowledge level: Understanding)
		<b>CO5</b>	Select construction equipment appropriate to tasks. (Cognitive knowledge level: Applying)
<b>AIRQUALITY MANAGEMENT</b>	<b>CET464</b>	<b>CO1</b>	Explain the sources of air pollution and different types of air pollutant.
		<b>CO2</b>	Describe the effect of air pollutants on vegetation, animals, materials and human health
		<b>CO3</b>	Discuss the different methods of ambient air quality monitoring system which supports an air quality management program.
		<b>CO4</b>	Explain the meteorological aspects of air pollutant dispersion.
		<b>CO5</b>	Describe the various air pollution control strategies that can be undertaken to meet the air quality goals.
<b>URBAN PLANNING AND ARCHITECTURE</b>	<b>CET474</b>	<b>CO1</b>	Classify the elements of Architecture and fundamental principles of architectural design
		<b>CO2</b>	Explain the origin and evolution of World Architecture, Indian Architecture and Architecture of Kerala
		<b>CO3</b>	Explain the basic principles of sustainability and resource-based planning

		<b>CO4</b>	Explain the evolution of planning and impact of urbanization
		<b>CO5</b>	Evaluate and assess the planning process and its legislation in India
<b>BRIDGE ENGINEERING</b>	<b>CET416</b>	<b>CO1</b>	Prepare General Arrangement Design of bridges.
		<b>CO2</b>	Explain various loads on bridge and methods of structural analysis of bridges
		<b>CO3</b>	Design culverts and common bridge superstructures such as RCC Solid slab and T-beam & slab and its reinforcement detailing.
		<b>CO4</b>	Design composite superstructure such as PSC I girders and steel plate girders with RCC deck slab
		<b>CO5</b>	Identify various bearings and design of bridge substructures and foundation
<b>ADVANCED FOUNDATION DESIGN</b>	<b>CET426</b>	<b>CO1</b>	Explain allowable soil pressure and safe bearing capacity, evaluate safe bearing capacity of shallow foundations by IS formula
		<b>CO2</b>	Proportion and design pile foundations, evaluate settlement of pile groups , uplift capacity of single and group of piles in clay
		<b>CO3</b>	Calculate the deflection and ultimate lateral load capacity of vertical piles
		<b>CO4</b>	Evaluate the load carrying capacity of under reamed piles and load capacity and uplift resistance of belled piers
		<b>CO5</b>	Calculate depth of embedment for cantilever sheet pile walls in clay and sand, Analyse the considerations for design of machine foundations
<b>TRANSPORTATION PLANNING</b>	<b>CET436</b>	<b>CO1</b>	Identify the need for transportation planning, the issues and challenges related to transportation and its interaction with urban structure and land use (K3)
		<b>CO2</b>	Apply the concept of travel demand and analyse its role in transportation planning and to apply the concept in systems approach to transportation planning process. (K3,K4)
		<b>CO3</b>	Apply the concept of delineation of study area, sampling of data, and data collection techniques for the four stage planning process and to analyse the techniques for predicting trip generation.(K3,K4)
		<b>CO4</b>	Apply and analyse the methods for predicting trip distribution, mode split and traffic assignment (K3, K4)
		<b>CO5</b>	Apply the land use transport models and to analyse the sustainable approaches to transportation planning and preparation of comprehensive mobility plan with application of GIS (K3, K4)
		<b>CO1</b>	Explain the fundamental concepts of data science, informatics & internet of things Remembering, (Cognitive knowledge level: Understanding)

<b>INFORMATICS FOR INFRASTRUCTURE MANAGEMENT</b>	<b>CET446</b>	<b>CO2</b>	Identify the use of geomatics in planning and site selection of infrastructure projects (Cognitive knowledge level: Applying & Analysing)
		<b>CO3</b>	Apply building informatics in construction, monitoring and project management (Cognitive knowledge level: Applying& Analysing)
		<b>CO4</b>	Utilize IoT technology in infrastructure management (Cognitive knowledge level: Applying& Analysing)
<b>REPAIR AND REHABILITATION OF BUILDINGS</b>	<b>CET456</b>	<b>CO1</b>	Recall the basics ideas and theories associated with Concrete technology and Masonry structures. (Cognitive knowledge level: Remembering)
		<b>CO2</b>	Understand the need and methodology of repair and rehabilitation of structures, the various mechanisms used, and tools for diagnosis of structures (Cognitive knowledge level: Understanding)
		<b>CO3</b>	Identifying the criterions for repairing / maintenance and the types and properties of repair materials used in site. Learn various techniques for repairing damaged and corroded structures (Cognitive knowledge level: Understanding)
		<b>CO4</b>	Proposing wholesom solutions for maintenance/rehabilitation and applying methodologies for repairing structures or demolishing structures. (Cognitive knowledge level: Applying)
		<b>CO5</b>	Analyse and asses the damage to structures using various tests (Cognitive knowledge level: Analysing)
<b>ENVIRONMENTAL REMOTE SENSING</b>	<b>CET466</b>	<b>CO1</b>	Describe the physics of remote sensing Remembering
		<b>CO2</b>	Explain the concepts of image processing (Cognitive knowledge level: Understanding)
		<b>CO3</b>	Explain existing technologies, data products and algorithms useful in environmental remote sensing (Cognitive knowledge level: Understanding)
		<b>CO4</b>	Show the role of remote sensing in monitoring land, vegetation, soil, air and water (Cognitive knowledge level: Applying)
<b>BUILDING SERVICES</b>	<b>CET476</b>	<b>CO1</b>	Recommend appropriate water management services
		<b>CO2</b>	Develop a system for the management of waste
		<b>CO3</b>	Identify suitable electrical and mechanical building services
		<b>CO4</b>	Recall the various firefighting services
		<b>CO5</b>	Choose relevant materials and practices for good acoustics
		<b>CO6</b>	Propose sustainable construction materials, methods, and practices
<b>EARTHQUAKE RESISTANT DESIGN</b>	<b>CET418</b>	<b>CO1</b>	Formulate appropriate SDOF models of simple structural systems under dynamic loads apply them to the solution of engineering problems.

		<b>CO2</b>	Analyze and interpret the dynamic response of SDOF systems for various dynamic inputs.
		<b>CO3</b>	Develop appropriate mathematical models for 2 DOF systems MDOF shear building models and estimate the natural frequencies and vibration modes for the same.
		<b>CO4</b>	Explain the basics of engineering seismology, ground motion characteristics, behavior of structures to ground motion and appreciate the various principles of seismic design philosophy
		<b>CO5</b>	Apply the provisions of various Indian seismic design standards for the estimation of seismic demand over structures
<b>SOIL STRUCTURE INTERACTION</b>	<b>CET428</b>	<b>CO1</b>	Explain elastic soil behavior related to bearing capacity and settlement
		<b>CO2</b>	Identify the significance of SSI in foundation design
		<b>CO3</b>	Explain various soil idealizations for SSI
		<b>CO4</b>	Apply the mathematical models for 1- Dimensional soil structural analysis
		<b>CO5</b>	Apply SSI for general engineering design problems
<b>AIRPORT, SEAPORT AND HARBOUR ENGINEERING</b>	<b>CET438</b>	<b>CO1</b>	Explain the basic principles of planning and design for site selection, Airport components based on air traffic characteristics
		<b>CO2</b>	Explain the basic design principles of Runway orientation, basic runway length and corrections required, Geometric design of runways, Design of taxiways and aprons, Terminal area planning,
		<b>CO3</b>	Explain various aspects such as Airport markings, Lighting of runway approaches, taxiways and aprons, Air traffic control methods.
		<b>CO4</b>	Explain the basic principles ,site selection characteristics ,lay out ,break waters, quays, piers, wharves, jetties, transit sheds and warehouses - navigational aids - light houses, signals - types – Moorings
		<b>CO5</b>	Explain the basics of Docks – Functions and types - dry docks, wet docks arrangement of basins and docks
<b>HYDROCLIMATOLOGY</b>	<b>CET448</b>	<b>CO1</b>	Explain the role of meteorological variables on the hydrology of a region
		<b>CO2</b>	Describe the characteristics of hydrologic extremes and climate change
		<b>CO3</b>	Apply statistical methods in modeling of hydro-climatic extremes
		<b>CO4</b>	Describe its procedures for modeling hydrologic impact of climate change
		<b>CO5</b>	Apply statistical principles in the characterization of hydrologic data

<b>SUSTAINABLE CONSTRUCTION</b>	<b>CET458</b>	<b>CO1</b>	Explain the fundamental concepts of sustainability
		<b>CO2</b>	Describe the properties and uses of sustainable building materials
		<b>CO3</b>	Identify suitable construction techniques and practices for sustainable buildings
		<b>CO4</b>	Discuss the standards and guidelines for sustainable buildings
		<b>CO5</b>	Comment on the role of BIM and automation in sustainable construction
<b>CLIMATE CHANGE AND SUSTAINABILITY</b>	<b>CET468</b>	<b>CO1</b>	Explain the fundamental concepts of climate and its influencing factors
		<b>CO2</b>	Explain the factors affecting climate change and the harmful impacts due to climate change
		<b>CO3</b>	Discuss the problems due to urbanization and the need for sustainable development
		<b>CO4</b>	Demonstrate the various adaptation and mitigation techniques for combating climate change
		<b>CO5</b>	Discuss multilateral agreements on climate change, Case studies on Climate change
<b>BUILDING INFORMATION MODELLING</b>	<b>CET478</b>	<b>CO1</b>	Explain the concept and advantages of BIM
		<b>CO2</b>	Apply the various processes on a BIM model
		<b>CO3</b>	Appraise the collaborative and interoperability capabilities of BIM
		<b>CO4</b>	Explain BIM execution plan
		<b>CO5</b>	Explain the principles of integrated project delivery