

# AL AZHAR COLLEGE OF ENGINEERING & TECHNOLOGY

## 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>	Summarize 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>	Analyze 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 multi view 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 multi view projections and solid models of objects using CAD tools
		<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>ENGINEERING MECHANICS</b>	<b>EST 100</b>	<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 characterization of nanomaterial.
		<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 analyzing 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

**AL AZHAR COLLEGE OF ENGINEERING & TECHNOLOGY**  
**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>	Analyze the given structural member to calculate the safe load or proportion the cross section to carry the load safely.
<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 principle 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 organize 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 leveling 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>	To understand the behavior 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>	Analyze experimental data and interpret the results
		<b>CO4</b>	Document the experimentation in prescribed manner

**AL AZHAR COLLEGE OF ENGINEERING & TECHNOLOGY**  
**2019 Scheme Syllabus- Course Outcomes**

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

<b>COURSE NAME</b>	<b>COURSE CODE</b>	<b>COURSE OUTCOME CODE</b>	<b>COURSE OUTCOME STATEMENTS</b>
<b>STRUCTURAL ANALYSIS – I</b>	<b>CET301</b>	<b>CO1</b>	Apply the principles of solid mechanics to analyses trusses. (Cognitive knowledge level: Applying)
		<b>CO2</b>	Apply various methods to determine deflections in statically determinate structures. (Cognitive knowledge level: Applying)
		<b>CO3</b>	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, Analyzing, Applying)
		<b>CO4</b>	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)
		<b>CO5</b>	Apply suitable methods of analysis for various types of structures including cables, suspension bridges and arches. (Cognitive knowledge level: Understanding, Applying)
		<b>CO6</b>	Analyze the effects of moving loads on structures using influence lines. (Cognitive knowledge level: Understanding, analyzing, Applying)
<b>DESIGN OF CONCRETE STRUCTURES</b>	<b>CET303</b>	<b>CO1</b>	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)
		<b>CO2</b>	Analyze reinforced concrete sections to determine the ultimate capacity in bending, shear and compression. (Cognitive knowledge level: Applying)
		<b>CO3</b>	Design and detail beams, slab, stairs and footings using IS code provisions. (Cognitive knowledge level: Applying)
		<b>CO4</b>	Design and detail columns using IS code and SP 16 design charts. (Cognitive knowledge level: Applying)
		<b>CO5</b>	Explain the criteria for earthquake resistant design of structures and ductile detailing of concrete structures subjected to seismic forces. (Cognitive knowledge level: Understanding)
		<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>GEOTECHNICAL ENGINEERING – II</b>	<b>CET 305</b>	<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 hydro meteorological 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 stream flow 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 organize 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>	Analyze 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

# AL AZHAR COLLEGE OF ENGINEERING & TECHNOLOGY

## 2019 Scheme Syllabus- Course Outcomes

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

COURSE NAME	COURSE CODE	COURSE OUTCOME CODE	COURSE OUTCOME STATEMENTS
<b>DESIGN OF STEEL STRUCTURES</b>	<b>CET401</b>	<b>CO1</b>	Explain the behavior and properties of structural steel members to resist various structural forces and actions and apply the relevant codes of practice
		<b>CO2</b>	Analyses the behavior of structural steel members and undertake design at both serviceability and ultimate limit states
		<b>CO3</b>	Explain the theoretical and practical aspects of Design of composite Steel Structure along with the planning and design aspects
		<b>CO4</b>	Apply a diverse knowledge of Design of Steel engineering practices applied to real life problems
		<b>CO5</b>	Demonstrate experience in the implementation of design of structures on engineering concepts which are applied in field Structural Engineering
<b>ENVIRONMENTAL ENGG LAB</b>	<b>CEL411</b>	<b>CO1</b>	Analyse various physico-chemical and biological parameters of water
		<b>CO2</b>	Compare the quality of water with drinking water standards and recommend its suitability for drinking purposes
<b>SEMINAR</b>	<b>CEQ413</b>	<b>CO1</b>	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply)
		<b>CO2</b>	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
		<b>CO3</b>	Prepare a presentation about an academic document (Cognitive knowledge level: Create).
		<b>CO4</b>	Give a presentation about an academic document (Cognitive knowledge level: Apply).
		<b>CO5</b>	Prepare a technical report (Cognitive knowledge level: Create).
<b>PROJECT PHASE I</b>	<b>CED415</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>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 geo synthetics and soil stabilization 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>	Familiarize 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 INFRASTRUCTUR E 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>CO1</b>	Explain interaction between subsystems of earth that give rise to hazards and their potential for disasters



<b>NATURAL DISASTERS AND MITIGATION</b>	<b>CET445</b>	<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: Applying)
			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>CO2</b>	Identify the use of geomatics in planning and site selection of infrastructure projects (Cognitive knowledge level: Applying & Analysing)

<b>INFORMATICS FOR INFRASTRUCTURE MANAGEMENT</b>	<b>CET446</b>	<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 wholesum 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>CO1</b>	Explain the fundamental concepts of sustainability

<b>SUSTAINABLE CONSTRUCTION</b>	<b>CET458</b>	<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