

**ANNA UNIVERSITY CHENNAI**  
**KATHIR COLLEGE OF ENGINEERING, COIMBATORE**

**DEPARTMENT OF CIVIL ENGINEERING**

**R2017 REGULATION**

**PROGRAMME OUTCOMES (POs)**

Students graduating from Civil Engineering should be able to:

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

**PO2.Problem analysis:** Identity, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3.Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4.Conduct investigations of complex problems:** Use research – based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5.Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to

comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in self, and lifelong learning in the broadest context of technological change.

### **PROGRAM SPECIFIC OUTCOME (PSOs)**

**PSO 1:** Students shall have skills and knowledge to work on projects on urban and rural housing, infrastructure, environment and sustainability.

**PSO 2:** Students shall be enriched with professional skills to design structural components in various facets of construction.

### **COURSE OUTCOMES**

<b>I - SEMESTER</b>	
<b>Course code</b>	<b>C101</b>
<b>Subject code</b>	<b>HS8151</b>
<b>Subject name</b>	<b>Communicative English</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
<b>CO2</b>	Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
<b>CO3</b>	Read different genres of texts adopting various reading strategies.
<b>CO4</b>	Listen/view and comprehend different spoken discourses/excerpts in different accents.
<b>CO5</b>	Gaining capacity, skills enabling the students to write personal letters, official letters and E-mails in English effectively. Enabling students to enhance their conversational skills in spoken and written forms.

<b>Course code</b>	<b>C102</b>
<b>Subject code</b>	<b>MA8151</b>
<b>Subject name</b>	<b>Engineering Mathematics – I</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Have basic knowledge and understanding in one field of materials, integral and differential calculus.
<b>CO2</b>	Utilize methods of integration to compute volumes of objects with circular shaped aspects, and compute lengths of curves.
<b>CO3</b>	Read and understand problem descriptions, then be able to formulate equations modelling the problem usually by applying geometric or physical principles.
<b>CO4</b>	Use integration to compute problems important in physics and engineering.
<b>CO5</b>	Find the area of plane curves and volume of solids using double and triple integrals.

<b>Course code</b>	<b>C103</b>
<b>Subject code</b>	<b>PH8151</b>
<b>Subject name</b>	<b>Engineering Physics</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Have knowledge on the basics of physics related to properties of matter, optics, and acoustics.
<b>CO2</b>	Apply these fundamental principles to solve practical problems related to materials used for engineering applications.
<b>CO3</b>	Understand working principle of a LASER, components and working of different laser system and their engineering applications
<b>CO4</b>	Understand the principle and working of particle detectors
<b>CO5</b>	Examine the characteristics of laser and optical fiber.

<b>Course code</b>	<b>C104</b>
<b>Subject code</b>	<b>CY8151</b>
<b>Subject name</b>	<b>Engineering Chemistry</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Apply this knowledge to the analysis and design of batteries.
<b>CO2</b>	Phase rule concept is used to know the heat treatment process of alloy.
<b>CO3</b>	Know the properties of Lubricants.
<b>CO4</b>	The knowledge gained on polymer chemistry, thermodynamics, Spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.
<b>CO5</b>	Outline the synthesis, characteristics and the applications of nano materials.

<b>Course code</b>	<b>C105</b>
<b>Subject code</b>	<b>GE8151</b>
<b>Subject name</b>	<b>Problem Solving and Python Programming</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Develop algorithmic solutions to simple computational problems.
<b>CO2</b>	Read, write, execute by hand simple Python programs.
<b>CO3</b>	Structure simple Python programs for solving problems.
<b>CO4</b>	Decompose a Python program into functions.
<b>CO5</b>	Represent compound data using Python lists, tuples, dictionaries. Read and write data from/to files in Python Programs.

<b>Course code</b>	<b>C106</b>
<b>Subject code</b>	<b>GE8152</b>
<b>Subject name</b>	<b>ENGINEERING GRAPHICS</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Perform free hand sketching of basic geometrical constructions and multiple views of objects.
<b>CO2</b>	Do orthographic projection of lines and plane surfaces.
<b>CO3</b>	Draw projections and solids and development of surfaces.
<b>CO4</b>	Prepare isometric and perspective sections of simple solids.
<b>CO5</b>	Demonstrate computer aided drafting.

<b>Course code</b>	<b>C107</b>
<b>Subject code</b>	<b>GE8161</b>
<b>Subject name</b>	<b>Problem Solving and Python Programming Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Write, test, and debug simple Python programs.
<b>CO2</b>	Implement Python programs with conditionals and loops.
<b>CO3</b>	Develop Python programs step-wise by defining functions and calling them.
<b>CO4</b>	Use Python lists, tuples, dictionaries for representing compound data.
<b>CO5</b>	Read and write data from/to files in Python.

<b>Course code</b>	<b>C108</b>
<b>Subject code</b>	<b>BS8161</b>
<b>Subject name</b>	<b>Physics and Chemistry Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Apply physics principles of optics and thermal physics to evaluate engineering properties of materials.
<b>CO2</b>	Outfit with hands-on knowledge in the quantitative chemical analysis of water quality related parameters
<b>CO3</b>	Determine the DO content in water sample by winkler's method and molecular weight of polymer by Ostwald viscometer.
<b>CO4</b>	Find the strength of an acid using pH meter and conductometer
<b>CO5</b>	Estimate the amount of weak and strong acids in a mixture by conductometer

<b>II - SEMESTER</b>	
<b>Course code</b>	<b>C109</b>
<b>Subject code</b>	<b>HS8251</b>
<b>Subject name</b>	<b>Technical English</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, and argue using appropriate communicative strategies.
<b>CO2</b>	Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
<b>CO3</b>	Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
<b>CO4</b>	Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
<b>CO5</b>	Enhancing student's skills in report writing, job application, paragraph writing and other forms of writing skills.

<b>Course code</b>	<b>C110</b>
<b>Subject code</b>	<b>MA8251</b>
<b>Subject name</b>	<b>Engineering Mathematics – II</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions.
<b>CO2</b>	Solve problems related to engineering applications by using these techniques.
<b>CO3</b>	To have an ability of mathematical modelling of systems using differential equations and ability to solve the differential equations.

<b>CO4</b>	Use Green's theorem to evaluate line integrals along simple closed contours on the plane and use Stokes' theorem to give a physical interpretation of the curl of a vector field.
<b>CO5</b>	Expand functions of two variables as Taylor's and Laurent's series and evaluate Contour integrals using Cauchy's formula.

<b>Course code</b>	<b>C111</b>
<b>Subject code</b>	<b>PH8201</b>
<b>Subject name</b>	<b>Physics for CivilEngineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	The students will have knowledge on the Heat transfer through fenestrations, thermal insulation and its benefits
<b>CO2</b>	The students will acquire knowledge on the acoustic properties of buildings
<b>CO3</b>	The students will get knowledge on various lighting designs for buildings
<b>CO4</b>	The students will gain knowledge on the properties and performance of engineeringmaterials
<b>CO5</b>	The students will understand the hazards of buildings

<b>Course code</b>	<b>C112</b>
<b>Subject code</b>	<b>BE8251</b>
<b>Subject name</b>	<b>Basic Electrical, Electronics and Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Understand electric circuits and working principles of electrical machines
<b>CO2</b>	Understand the concepts of various electronic devices
<b>CO3</b>	Choose appropriate instruments for electrical measurement for a specific application
<b>CO4</b>	Clarify the working of basic electronic devices such as diode, transistor and rectifier.
<b>CO5</b>	Demonstrate operation of digital devices such as logic gates, counters, flip-flops analog to digital converts and digital to analog converters.

<b>Course code</b>	<b>C113</b>
<b>Subject code</b>	<b>GE8291</b>
<b>Subject name</b>	<b>Environmental Science and Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
<b>CO2</b>	Public awareness of environmental is at infant stage.
<b>CO3</b>	Ignorance and incomplete knowledge haslead to misconceptions
<b>CO4</b>	Development and improvement in std. of living has lead to serious environmental disasters.
<b>CO5</b>	Explain the causes of population growth and explosion.

<b>Course code</b>	<b>C114</b>
<b>Subject code</b>	<b>GE8292</b>
<b>Subject name</b>	<b>Engineering Mechanics</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Illustrate the vectorial and scalar representation of forces and moments
<b>CO2</b>	Analyze the rigid body in equilibrium
<b>CO3</b>	Evaluate the properties of surfaces and solids
<b>CO4</b>	Calculate dynamic forces exerted in rigid body
<b>CO5</b>	Determine the friction and the effects by the laws of friction

<b>Course code</b>	<b>C115</b>
<b>Subject code</b>	<b>GE8261</b>
<b>Subject name</b>	<b>Engineering Practices Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Fabricate carpentry components and pipe connections including plumbing works.
<b>CO2</b>	Use welding equipments to join the structures.
<b>CO3</b>	Carry out the basic machining operations.
<b>CO4</b>	Make the models using sheet metal works. Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings.
<b>CO5</b>	Carry out basic home electrical works and appliances. Measure the electrical quantities. Elaborate on the components, gates, soldering practices.

<b>Course code</b>	<b>C116</b>
<b>Subject code</b>	<b>CE8211</b>
<b>Subject name</b>	<b>Computer Aided Building Drawing</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	The students will be able to draft the plan & elevation
<b>CO2</b>	The students will be able to plot sectional views of the buildings
<b>CO3</b>	Ability to draw the industrial structure elements
<b>CO4</b>	To introduce the students to draft the plan, elevation and sectional views of Buildings with load bearing & sloping roof
<b>CO5</b>	The students will development and control rules satisfying orientation and functional requirements as per National Building Code.

<b>III - SEMESTER</b>	
<b>Course code</b>	<b>C201</b>
<b>Subject code</b>	<b>MA 8353</b>
<b>Subject name</b>	<b>TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
<b>CO2</b>	Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
<b>CO3</b>	To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems
<b>CO4</b>	Appreciate the physical significance of Fourier series techniques in solving one- and two-dimensional heat flow problems and one-dimensional wave equations.
<b>CO5</b>	To understand the mathematical principles on transform and partial differential equations would provide them the ability to formulate

<b>Course code</b>	<b>C202</b>
<b>Subject code</b>	<b>CE8301</b>
<b>Subject name</b>	<b>Strength of Materials I</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	The students will be able to understand the concepts of stress and strain, principal stresses and principal planes
<b>CO2</b>	The students will be able to determine Shear force and bending moment in beams and understand concept of theory of simple bending
<b>CO3</b>	The students will be able to calculate the deflection of beams by different methods and selection of method for determining slope or deflection
<b>CO4</b>	The students will be able to apply basic equation of torsion in design of circular shafts and helical springs



<b>CO5</b>	The students will be able to analyze the pin jointed plane and space trusses
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<b>Course code</b>	<b>C203</b>
<b>Subject code</b>	<b>CE8302</b>
<b>Subject name</b>	<b>Fluid Mechanics</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Get a basic knowledge of fluids in static, kinematic and dynamic equilibrium
<b>CO2</b>	Understand and solve the problems related to equation of motion
<b>CO3</b>	Gain knowledge about dimensional and model analysis
<b>CO4</b>	Learn types of flow and losses of flow in pipes
<b>CO5</b>	Understand and solve the boundary layer problems

<b>Course code</b>	<b>C204</b>
<b>Subject code</b>	<b>CE 8351</b>
<b>Subject name</b>	<b>Surveying</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	The use of various surveying instruments and mapping
<b>CO2</b>	Measuring Horizontal angle and vertical angle using different instruments
<b>CO3</b>	Methods of Leveling and setting Levels with different instruments
<b>CO4</b>	Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth
<b>CO5</b>	Concept and principle of modern surveying

<b>Course code</b>	<b>C205</b>
<b>Subject code</b>	<b>CE 8391</b>
<b>Subject name</b>	<b>Construction Materials</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Compare the properties of most common and advanced building materials
<b>CO2</b>	Understand the typical and potential applications of lime, cement and aggregates
<b>CO3</b>	Know the production of concrete and also the method of placing and making of concrete elements
<b>CO4</b>	Understand the applications of timbers and other materials
<b>CO5</b>	Understand the importance of modern material for construction

<b>Course code</b>	<b>C206</b>
<b>Subject code</b>	<b>CE8392</b>
<b>Subject name</b>	<b>Engineering Geology</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies
<b>CO2</b>	Get basics knowledge on properties of minerals
<b>CO3</b>	Understand the methods of study on geological structure
<b>CO4</b>	Gain knowledge about types of rocks, their distribution and uses
<b>CO5</b>	Understand the application of geological investigation in projects such as dams, tunnels, bridges, roads, airport and harbor

<b>Course code</b>	<b>C207</b>
<b>Subject code</b>	<b>CE8311</b>
<b>Subject name</b>	<b>Construction Materials Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Understanding of the behavior of Fine Aggregates
<b>CO2</b>	Understanding of the behavior of Coarse Aggregates
<b>CO3</b>	Understanding of the behavior of Concrete
<b>CO4</b>	Understanding of the behavior of Bricks and Blocks
<b>CO5</b>	Knowledge in the area of testing of construction materials and components of construction elements experimentally

<b>Course code</b>	<b>C208</b>
<b>Subject code</b>	<b>CE8361</b>
<b>Subject name</b>	<b>Surveying Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset
<b>CO2</b>	Determination of elevation of an object using single plane method when base is inaccessible/inaccessible
<b>CO3</b>	Determination of Tacheometric Constants
<b>CO4</b>	Determination of distance and difference in elevation between two inaccessible points using Total station
<b>CO5</b>	Possess knowledge about Survey field techniques

<b>Course code</b>	<b>C209</b>
<b>Subject code</b>	<b>HS8381</b>
<b>Subject name</b>	<b>Interpersonal Skills/Listening and Speaking</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	At the end of the course Learners will be able to listen and respond appropriately
<b>CO2</b>	At the end of the course Learners will be able to participate in group discussions
<b>CO3</b>	At the end of the course Learners will be able to make effective presentations
<b>CO4</b>	At the end of the course Learners will be able to participate confidently and appropriately in conversations both formal and informal
<b>CO5</b>	At the end of the course Learners will be able to improve general and academic listening skills

<b>IV - SEMESTER</b>	
<b>Course code</b>	<b>C210</b>
<b>Subject code</b>	<b>MA8491</b>
<b>Subject name</b>	<b>Numerical Methods</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Understand the basic concepts and techniques of solving algebraic and transcendental equations
<b>CO2</b>	Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations
<b>CO3</b>	Apply the numerical techniques of differentiation and integration for engineering problems
<b>CO4</b>	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations
<b>CO5</b>	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications

<b>Course code</b>	<b>C211</b>
<b>Subject code</b>	<b>CE8401</b>
<b>Subject name</b>	<b>Construction Techniques and Practices</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Know the different construction techniques and structural systems
<b>CO2</b>	Understand various techniques and practices on masonry construction, flooring, and roofing
<b>CO3</b>	Plan the requirements for substructure construction
<b>CO4</b>	Know the methods and techniques involved in the construction of various types of superstructures
<b>CO5</b>	Select, maintain and operate hand and power tools and equipment used in the building construction sites

<b>Course code</b>	<b>C212</b>
<b>Subject code</b>	<b>CE8402</b>
<b>Subject name</b>	<b>Strength of Materials II</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles
<b>CO2</b>	Analyze propped cantilever, fixed beams and continuous beams using theorem of three moment equation for external loadings and support settlements
<b>CO3</b>	Find the load carrying capacity of columns and stresses induced in columns and cylinders
<b>CO4</b>	Determine principal stresses and planes for an element in three-dimensional state of stress and study various theories of failure
<b>CO5</b>	Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beam

<b>Course code</b>	<b>C213</b>
<b>Subject code</b>	<b>CE8403</b>
<b>Subject name</b>	<b>Applied Hydraulic Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Apply their knowledge of fluid mechanics in addressing problems in open channels
<b>CO2</b>	Able to identify an effective section for flow in different cross sections
<b>CO3</b>	To solve problems in uniform, gradually and rapidly varied flows in steady state conditions
<b>CO4</b>	Understand the principles, working and application of turbines
<b>CO5</b>	Understand the principles, working and application of pumps

<b>Course code</b>	<b>C214</b>
<b>Subject code</b>	<b>CE8404</b>
<b>Subject name</b>	<b>Concrete Technology</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	The various requirements of cement, aggregates and water for making concrete
<b>CO2</b>	The effect of admixtures on properties of concrete
<b>CO3</b>	The concept and procedure of mix design as per IS method
<b>CO4</b>	The properties of concrete at fresh and hardened state
<b>CO5</b>	The importance and application of special concretes

<b>Course code</b>	<b>C215</b>
<b>Subject code</b>	<b>CE8491</b>
<b>Subject name</b>	<b>Soil Mechanics</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Classify the soil and assess the engineering properties, based on index properties
<b>CO2</b>	Understand the stress concepts in soils
<b>CO3</b>	Understand and identify the settlement in soils
<b>CO4</b>	Determine the shear strength of soil
<b>CO5</b>	Analyze both finite and infinite slopes

<b>Course code</b>	<b>C216</b>
<b>Subject code</b>	<b>CE8481</b>
<b>Subject name</b>	<b>Strength of Materials Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally
<b>CO2</b>	Knowledge in the area of testing on steel rod
<b>CO3</b>	Knowledge in the area of testing on wood
<b>CO4</b>	Knowledge in the area of testing on metal
<b>CO5</b>	Knowledge in the area of testing on spring
<b>Course code</b>	<b>C217</b>
<b>Subject code</b>	<b>CE8461</b>
<b>Subject name</b>	<b>Hydraulic Engineering Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	The students will be able to measure flow in pipes and determine frictional losses
<b>CO2</b>	The students will be able to develop characteristics of pumps and turbines
<b>CO3</b>	Students should be able to verify the principles studied in theory by performing Flow Measurement

<b>CO4</b>	Students should be able to verify the principles studied in theory by performing Losses in Pipes
<b>CO5</b>	Students should be able to verify the principles studied in theory by Determination of Metacentric height

<b>Course code</b>	<b>C218</b>
<b>Subject code</b>	<b>HS8461</b>
<b>Subject name</b>	<b>ADVANCED READING AND WRITING</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	The students will be able to strengthen the reading skills of students of engineering
<b>CO2</b>	The students will be able to enhance their writing skills with specific reference to technical writing
<b>CO3</b>	Students should be able to develop students' critical thinking skills
<b>CO4</b>	Students should be able to provide more opportunities to develop their project and proposal writing skills
<b>CO5</b>	Students should be able to display critical thinking in various professional contexts

<b>V - SEMESTER</b>	
<b>Course code</b>	<b>C301</b>
<b>Subject code</b>	<b>CE 8501</b>
<b>Subject name</b>	<b>Design of Reinforced Cement Concrete Elements</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Understand the various design methodologies for the design of RC elements
<b>CO2</b>	Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion
<b>CO3</b>	Design the various types of slabs and staircase by limit state method
<b>CO4</b>	Design columns for axial, uniaxial and biaxial eccentric loadings
<b>CO5</b>	Design of footing by limit state method

<b>Course code</b>	<b>C302</b>
<b>Subject code</b>	<b>CE8502</b>
<b>Subject name</b>	<b>Structural Analysis I</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Analyze continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by strain energy method
<b>CO2</b>	Analyze the continuous beams and rigid frames by slope deflection method
<b>CO3</b>	Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway
<b>CO4</b>	Analyze the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method
<b>CO5</b>	Understand the concept of matrix stiffness method and analysis of continuous beams, pin-jointed trusses and rigid plane frames

<b>Course code</b>	<b>C303</b>
<b>Subject code</b>	<b>EN8491</b>
<b>Subject name</b>	<b>Water Supply Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	An insight into the structure of drinking water supply systems, including water transport, treatment and distribution
<b>CO2</b>	The knowledge in various unit operations and processes in water treatment
<b>CO3</b>	An ability to design the various functional units in water treatment
<b>CO4</b>	An understanding of water quality criteria and standards, and their relation to public health
<b>CO5</b>	The ability to design and evaluate water supply project alternatives on basis of chosen criteria

<b>Course code</b>	<b>C304</b>
<b>Subject code</b>	<b>CE8591</b>
<b>Subject name</b>	<b>Foundation Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Understand the site investigation, methods and sampling
<b>CO2</b>	Get knowledge on bearing capacity and testing methods
<b>CO3</b>	Design shallow footings
<b>CO4</b>	Determine the load carrying capacity, settlement of pile foundation
<b>CO5</b>	Determine the earth pressure on retaining walls and analysis for stability

<b>Course code</b>	<b>C305</b>
<b>Subject code</b>	<b>GI8013</b>
<b>Subject name</b>	<b>Advanced Surveying</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Know the astronomical surveying
<b>CO2</b>	Do the photogrammetric surveying and interpretation
<b>CO3</b>	Solve the field problems with Total station
<b>CO4</b>	Know the GPS surveying and the data processing
<b>CO5</b>	Understand the route surveys and tunnel alignments

<b>Course code</b>	<b>C306</b>
<b>Subject code</b>	<b>CE8511</b>
<b>Subject name</b>	<b>Soil Mechanics Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	To develop skills to test the soils for their index and engineering properties and to characterize the soil based on their properties
<b>CO2</b>	To develop skills to test the soils for determination of Index Properties
<b>CO3</b>	To develop skills to test the soils for determination of in-situ density and compaction characteristics
<b>CO4</b>	To develop skills to test the soils for determination of engineering properties
<b>CO5</b>	Students are able to conduct tests to determine both the index and engineering properties of soils and to characterize the soil based on their properties

<b>Course code</b>	<b>C307</b>
<b>Subject code</b>	<b>CE8512</b>
<b>Subject name</b>	<b>Water and Waste Water Analysis Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	To analyze the physical, chemical and biological characteristics of water and wastewater
<b>CO2</b>	To quantify the dosage requirement for coagulation process
<b>CO3</b>	To study the growth of micro-organism and its quantification
<b>CO4</b>	To quantify the sludge
<b>CO5</b>	Quantify the pollutant concentration in water and wastewater



<b>Course code</b>	<b>C308</b>
<b>Subject code</b>	<b>CE8513</b>
<b>Subject name</b>	<b>Survey Camp</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Enable the students to get practical training in the field work
<b>CO2</b>	Involve work on a large area
<b>CO3</b>	Student shall have mapped and contoured the area
<b>CO4</b>	Use of GPS to determine latitude and longitude and locate the survey camp location
<b>CO5</b>	Survey exercises in other area also based on site condition to give good exposure on survey
<b>VI - SEMESTER</b>	
<b>Course code</b>	<b>C309</b>
<b>Subject code</b>	<b>CE8601</b>
<b>Subject name</b>	<b>Design of Steel Structural Elements</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Understand the concepts of various design philosophies
<b>CO2</b>	Design common bolted and welded connections for steel structures
<b>CO3</b>	Design tension members and understand the effect of shear lag
<b>CO4</b>	Understand the design concept of axially loaded columns and column base connections
<b>CO5</b>	Understand specific problems related to the design of laterally restrained and unrestrained steel beams

<b>Course code</b>	<b>C310</b>
<b>Subject code</b>	<b>CE8602</b>
<b>Subject name</b>	<b>Structural Analysis II</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Draw influence lines for statically determinate structures and calculate critical stress resultants
<b>CO2</b>	Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams
<b>CO3</b>	Analyze of three hinged, two hinged and fixed arches
<b>CO4</b>	Analyze the suspension bridges with stiffening girders
<b>CO5</b>	Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames

<b>Course code</b>	<b>C311</b>
<b>Subject code</b>	<b>CE8603</b>
<b>Subject name</b>	<b>Irrigation Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Have knowledge and skills on crop water requirements
<b>CO2</b>	Understand the methods and management of irrigation
<b>CO3</b>	Gain knowledge on types of Impounding structures
<b>CO4</b>	Understand methods of irrigation including canal irrigation
<b>CO5</b>	Get knowledge on water management on optimization of water use
<b>Course code</b>	<b>C312</b>
<b>Subject code</b>	<b>CE8604</b>
<b>Subject name</b>	<b>Highway Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Get knowledge on planning and aligning of highway
<b>CO2</b>	Geometric design of highways
<b>CO3</b>	Design flexible and rigid pavements
<b>CO4</b>	Gain knowledge on Highway construction materials, properties, testing methods
<b>CO5</b>	Understand the concept of pavement management system, evaluation of distress and maintenance of pavements

<b>Course code</b>	<b>C313</b>
<b>Subject code</b>	<b>EN8592</b>
<b>Subject name</b>	<b>Wastewater Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	An ability to estimate sewage generation and design sewer system including sewage pumping stations
<b>CO2</b>	The required understanding on the characteristics and composition of sewage, self-purification of streams
<b>CO3</b>	An ability to perform basic design of the unit operations and processes that are used in sewage treatment
<b>CO4</b>	Understand the standard methods for disposal of sewage
<b>CO5</b>	Gain knowledge on sludge treatment and disposal

<b>Course code</b>	<b>C314</b>
<b>Subject code</b>	<b>CE8001</b>
<b>Subject name</b>	<b>Ground Improvement Techniques</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Gain knowledge on methods and selection of ground improvement techniques
<b>CO2</b>	Understand dewatering techniques and design for simple cases
<b>CO3</b>	Get knowledge on in-situ treatment of cohesionless and cohesive soils
<b>CO4</b>	Understand the concept of earth reinforcement and design of

	reinforced earth
<b>CO5</b>	Get to know types of grouts and grouting technique
<b>Course code</b>	<b>C315</b>
<b>Subject code</b>	<b>CE8611</b>
<b>Subject name</b>	<b>Highway Engineering Laboratory</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	To learn the principles and procedures of testing of highway materials
<b>CO2</b>	Techniques to characterize various test on aggregates
<b>CO3</b>	Techniques to characterize various test on bitumen
<b>CO4</b>	Techniques to characterize various tests on bituminous mixes
<b>CO5</b>	Demonstration of any one field testing equipment like skid resistancetester/ Benkelman beam etc.

<b>Course code</b>	<b>C316</b>
<b>Subject code</b>	<b>CE8612</b>
<b>Subject name</b>	<b>Irrigation and Environmental Engineering Drawing</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Student shall conceive, design and draw the irrigationand environmental engineering structures in detail showing the plan, elevation andSections
<b>CO2</b>	Course will be able to design and draw various units ofMunicipal water treatment plants
<b>CO3</b>	Course will be able to design and draw various units ofsewage treatment plants
<b>CO4</b>	Design principles irrigation engineering
<b>CO5</b>	Design principles environmentalengineering

<b>Course code</b>	<b>C317</b>
<b>Subject code</b>	<b>HS8581</b>
<b>Subject name</b>	<b>Professional Communication</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Apply appropriate communication skills across settings, purposes, and audiences.
<b>CO2</b>	Demonstrate knowledge of communication theory and application.
<b>CO3</b>	Practice critical thinking to develop innovative and well-founded perspectives related to the students' emphases.
<b>CO4</b>	Build and maintain healthy and effective relationships. Use technology to communicate effectively in various settings and contexts.
<b>CO5</b>	Demonstrate appropriate and professional ethical behavior.
<b>VII - SEMESTER</b>	
<b>Course code</b>	<b>C401</b>
<b>Subject code</b>	<b>CE8701</b>
<b>Subject name</b>	<b>Estimation, Costing and Valuation Engineering</b>

<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Estimate the quantities for buildings
<b>CO2</b>	Rate Analysis for all Building works, canals, and Roads and Cost Estimate
<b>CO3</b>	Understand types of specifications, principles for report preparation, tender notices types
<b>CO4</b>	Gain knowledge on types of contracts
<b>CO5</b>	Evaluate valuation for building and land

<b>Course code</b>	<b>C402</b>
<b>Subject code</b>	<b>CE8702</b>
<b>Subject name</b>	<b>Railways, Airports, Docks and Harbor Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Understand the methods of route alignment and design elements in Railway Planning and Constructions
<b>CO2</b>	Understand the Construction techniques and Maintenance of Track laying and Railway stations
<b>CO3</b>	Gain an insight on the planning and site selection of Airport Planning and design
<b>CO4</b>	Analyze and design the elements for orientation of runways and passenger facilities systems
<b>CO5</b>	Understand the various features in Harbors and Ports, their construction, coastal protection works and coastal Regulations to be adopted

<b>Course code</b>	<b>C403</b>
<b>Subject code</b>	<b>CE8703</b>
<b>Subject name</b>	<b>Structural Design and Drawing</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls
<b>CO2</b>	Design and draw flat slab as per code provisions
<b>CO3</b>	Design and draw reinforced concrete and steel bridges
<b>CO4</b>	Design and draw reinforced concrete and steel water tanks
<b>CO5</b>	Design and detail the various steel trusses and gantry girders

<b>Course code</b>	<b>C404</b>
<b>Subject code</b>	<b>CE8007</b>
<b>Subject name</b>	<b>Traffic Engineering and Management</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach
<b>CO2</b>	Analyze traffic problems and plan for traffic systems various uses

<b>CO3</b>	Design Channels, Intersections, signals and parking arrangements
<b>CO4</b>	Develop Traffic management Systems
<b>CO5</b>	Intelligent Transport System for traffic management, enforcement and education

<b>Course code</b>	<b>C405</b>
<b>Subject code</b>	<b>CE8711</b>
<b>Subject name</b>	<b>Creative and Innovative Project</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Knowledge acquired in Civil Engineering to do a mini project
<b>CO2</b>	Students to come up with designs, fabrication or algorithms
<b>CO3</b>	Students to come up with programs expressing their ideas in a novel way
<b>CO4</b>	To identify a topic of interest in consultation with Faculty/Supervisor
<b>CO5</b>	Carryout the design / fabrication or develop computer code

<b>Course code</b>	<b>C406</b>
<b>Subject code</b>	<b>CE8712</b>
<b>Subject name</b>	<b>INDUSTRIAL TRAINING</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks
<b>CO2</b>	To develop skills in facing and solving the field problems
<b>CO3</b>	The students individually undertake training in reputed civil engineering companies for the specified duration
<b>CO4</b>	The intricacies of implementation textbook knowledge into practice
<b>CO5</b>	The concepts of developments and implementation of new techniques

**VIII - SEMESTER**

<b>Course code</b>	<b>C407</b>
<b>Subject code</b>	<b>GE8076</b>
<b>Subject name</b>	<b>Professional Ethics in Engineering</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Create an awareness on Engineering Ethics and Human Values
<b>CO2</b>	To instill Moral and Social Values and Loyalty and to appreciate the rights of others
<b>CO3</b>	Engineers as Expert Witnesses and Advisors
<b>CO4</b>	Intellectual Property Rights (IPR)&Discrimination
<b>CO5</b>	Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

<b>Course code</b>	<b>C408</b>
<b>Subject code</b>	<b>CE8020</b>
<b>Subject name</b>	<b>Maintenance, Repair and Rehabilitation of Structures</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	The importance of maintenance and assessment method of distressed structures
<b>CO2</b>	The strength and durability properties, their effects due to climate and temperature
<b>CO3</b>	Recent development in concrete
<b>CO4</b>	The techniques for repair and protection methods
<b>CO5</b>	Repair, rehabilitation and retrofitting of structures and demolition methods

<b>Course code</b>	<b>C409</b>
<b>Subject code</b>	<b>CE8811</b>
<b>Subject name</b>	<b>Project work</b>
<b>COURSE OUTCOMES</b>	
<b>CO1</b>	Identify a topic in advanced areas of Civil Engineering Identify methods and materials to carry out experiments/develop code
<b>CO2</b>	Review literature to identify gaps and define objectives & scope of the work Reorganize the procedures with a concern for society, environment and ethics
<b>CO3</b>	Generate and implement innovative ideas for social benefit Analyze and discuss the results to draw valid conclusions
<b>CO4</b>	Develop a prototypes/models, experimental set-up and software systems necessary to meet the objectives Prepare a report as per recommended format and defend the work
<b>CO5</b>	Explore the possibility of publishing papers in peer reviewed journals/conference proceedings