



REGULATIONS 2017

COURSE ARTICULATION MATRIX

B.TECH.

CIVIL ENGINEERING

**SCHOOL OF INFRASTRUCTURE
 DEPARTMENT OF CIVIL ENGINEERING**

COURSE ARTICULATION MATRIX

B.Tech. Civil Engineering – Regulations 2017

Program Outcomes (POs):

1 . Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2 . Identify, formulate, research literature, and analyses complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3 . 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.
4 . 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.
5 . 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.
6 . 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.
7 . Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8 . Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice



9 . Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10 . 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.

11 . Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12 . Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change

13 . Identify suitable construction materials, techniques and practices for Civil Engineering construction.

14 . Plan, analyze, design and estimate civil engineering structures using relevant software and appropriate codal provisions.

15 . Characterize water & wastewater and design sustainable water supply & sanitation schemes.

COURSE OUTCOMES (COS) PROGRAM OUTCOMES (POS) MATRICES:

Course Outcomes (COs):

Course: Engineering Geology [CEC1211]															
Term: 2 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	2	3	1								2	1	
CO2	1	1	1	1	1								2	1	
CO3	2	1	3		1	3	3			2			2	2	
CO4	1	1	3	2	1	3	3			1			3	2	
Avg	2	1	2	2	1	3	3	0	0	2	0	0	2	2	0

CO1: Examine the geological parameters in construction, planning and design.

CO2: Demarcate and differentiate between rock types and minerals to be used as construction materials with respect to its economic value.

CO3: Identify the areas of weakness in a zone and to eradicate the weakness during the civil engineering projects.

CO4: Identify the necessary geological conditions of tunnels, dams and reservoirs.

Course Outcomes (COs):

Course: Building Construction and Practices [CEC1212]															
Term: 2 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	1		2	1	2				2	2	3		
CO2	2	1	1		2	1	2				2	2	3		
CO3	2	1	1		2	1	2				2	2	3		
CO4	2	1	2		2	1	2				2	2	3		
CO5	2	1	2		2	1	2				2	2	3		
CO6	2	1	2		2	1	2				2	2	3		
Avg	2	1	2	0	2	1	2	0	0	0	2	2	3	0	0

CO1: Select the type of cement, and stones to be used based on the application, properties and test results.

CO2: Perform the tests on brick, clay and concrete products

CO3: Explain the properties and types of timber, bitumen, steel, aluminum, polymers and composites.

CO4: Identify the different components in a building and its functions

CO5: Choose the type of roofs, slabs, windows and doors used in the construction of a building.

CO6: Suggest the type of construction practices to be followed in site for various situations.



Course Outcomes (COs):

Course: Civil Engineering Drawing [CEC1213]															
Term: 2 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3		3		3							3	2	3	
CO2	1	1	1									3	1	2	
CO3	1	2		1								3	2	2	
CO4	1	2		2								3	1	1	
CO5	1	2	1	1								3		2	
CO6	1											3		2	
Avg	1	2	2	1	3	0	0	0	0	0	0	3	2	2	0

CO1: Prepare plan, elevation of the various substructure and superstructure components of a building.

CO2: Identify the sign and symbols as per BIS and develop a simple house plan and their sectional views.

CO3: Prepare a plan, elevation and sectional view of a masonry wall for a residential building. develop a plan and sectional view for different types of RCC buildings using cad software.

CO4: Develop a plan and sectional view for different types of RCC buildings using cad software.

CO5: Recognise and construct a plan and sectional view of an industrial building using drafting software.

CO6: Locate and plan various service lines for a residential building as per codal provisions.



Course Outcomes (COs):

Course: Mechanics of Solids [CEC2101]															
Term: 3 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2	2	1				2	2	2	2	3	1	
CO2	2	2	2	1	1				2	2	2	2	3	1	
CO3	1	2	2	1	1					1			2	2	
CO4	1	2	2	2	1				1		1		1	1	
CO5	1	2	1	1	1					1	1		1	2	
CO6	1	2	2						1					2	
Avg	2	2	2	1	1	0	0	0	2	2	2	2	2	2	0

CO1: Describe stress, strain, elastic constants and their relationship.

CO2: Draw bending moment, shear force and axial force diagrams for statically determinate beams and sketch the deflected shapes.

CO3: Determine the stresses and deflection for various types of beams using various methods.

CO4: Determine the torsion equation and solve the problems based on torsion.

CO5: Determine the principal stresses and strains based on various methods.

CO6: Analyze the twodimensional truss by using various methods.



Course Outcomes (COs):

Course: Surveying [CEC2102]															
Term: 3 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	1											2	2	
CO2	1	1											2	2	
CO3	1	1											2	2	
CO4	1	1											2	2	
CO5	1	1											2	2	
CO6			2	2									2	2	
Avg	1	1	2	2	0	0	0	0	0	0	0	0	2	2	0

CO1: Differentiate between map and plan , to classify different types of surveying and to identify map symbols.

CO2: Obtain linear measurements and to correct the error using chain or tape

CO3: Correct the angular measurements with the help of theodolite & compass, use tachometer to compute distances

CO4: Determine the elevation of points and generate the surfaces of a given terrain using plane table and method of triangulation

CO5: Understand the working principle and operations of total station and EDM

CO6: Set out curves to prepare engineering projects and prepare preliminary and location survey for highways, railways and tunnel.



Course Outcomes (COs):

Course: Mechanics of Fluids [CEC2103]															
Term: 3 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	1	1		1	1					1		3	2
CO2	2	2	1	1		1	1					1		3	2
CO3	2	2	1	2		1	1		1			1		3	2
CO4	2	2	1	2		1	1		1			1		3	2
CO5	2	2	1	2		1	1		1			1		3	2
CO6	2	2	1	2		1	1		1			1		3	2
Avg	2	2	1	2	0	1	1	0	1	0	0	1	0	3	2

CO1: Describe fluid properties, forces causing flow and will be able to solve problems involving fluid properties and fluid pressure measurements.

CO2: Compute the magnitude and location of hydrostatic forces on vertical, inclined and curved submerged surfaces and analyze the equilibrium of floating bodies.

CO3: Analyze the flow using principles of fluid kinematics

CO4: Solve fluid problems using principle of fluid dynamics

CO5: Describe the concepts of boundary layer theory, application off the concepts in determining the separation of boundary layer and to analyze the laminar and turbulent flows in circular pipes.

CO6: Apply the principles of dimensional analysis for fluid flow problems



Course Outcomes (COs):

Course: Concrete Technology [CEC2104]															
Term: 3 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	3	2	1						2	2	2	2	
CO2	2	3	1	2	1						3	2	1	2	
CO3	1	2	1	1	1						2	2	1	2	
CO4	2	1	1	2	1						2	2	2	1	
CO5	1	2	1	3	1						3	1	1	2	
CO6	1	3	1	3	2						2	2	3	3	
Avg	2	2	1	2	1	0	0	0	0	0	2	2	2	2	0

CO1: Describe the manufacturing process of concrete
CO2: Determine fresh concrete and hard concrete properties as per procedures outline in Indian standards.
CO3: Perform concrete mix design as per Indian standards and ACI method.
CO4: Recognize various parameters influencing durability performance of RCC structure
CO5: Apply the knowledge gained on special concrete
CO6: Suggest various types of concrete under special circumstances



Course Outcomes (COs):

Course: Surveying Laboratory I [CEC2105]															
Term: 3 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	1											2	2	
CO2	1	1											2	2	
CO3	1	1											2	2	
CO4	1	1											2	2	
CO5	1	1											2	2	
CO6			2	2						1			2	2	
Avg	1	1	2	2	0	0	0	0	0	1	0	0	2	2	0

CO1: To identify the different instruments used for different taking different field measurements
CO2: to prepare a map using linear measurements using a chain or a tape, by eliminating obstacles mathematically and correcting for possible errors.
CO3: to differentiate different types of compasses, measure bearings of lines in the field, and to eliminate all possible errors in bearing measurements
CO4: To use plane table instrument on the field, to prepare a map of an area and to locate unknown points on the field with respect to known points.
CO5: To determine the reduced level through FS, IS and BS measurements of a dumpy level and to prepare a LS and CS profile of an area
CO6: to identify the different parts of a theodolite.



Course Outcomes (COs):

Course: Hydraulic and Hydraulic Machinery [CEC2211]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	3	1	1									2
CO2	3	3	2	2	1	1									2
CO3	3	3	2	2	1	1									2
CO4	3	3	2	2	1	1									2
CO5	3	3	2	2	2										2
CO6	3	3	2	2	2										2
Avg	3	3	2	2	1	1	0	0	0	0	0	0	0	0	2

CO1: Describe the concepts of flow measurements and the use of flow measurement devices.

CO2: Demonstrate various theories dealing with the flow phenomenon of fluid in an open channel.

CO3: Analyze the various gradually varied flow profiles in an open channel flow and solve problems related to it.

CO4: Describe the concepts behind the working of hydraulic machines and the force exerted by a jet on fixed target, moving target and curved vanes.

CO5: List down different types of pumps, describe their working principle and compute the work done, efficiency and performance characteristics.

CO6: Classify turbines in various categories, describe their working principle and compute the work done, efficiency and performance characteristics.



Course Outcomes (COs):

Course: Water and Wastewater Engineering [CEC2212]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	2			3	3								3
CO2	2	2	2	1		2	2							3	3
CO3	2	2	1			2	3							3	3
CO4	2	1	2		2	2	2							3	3
CO5	1	2	2		1	3	3							2	3
CO6	1	2	1		1	3	3							3	3
Avg	2	2	2	1	1	3	3	0	0	0	0	0	0	3	3

CO1: Forecast population for the design period, estimate quantity of water demand, possess knowledge on sources & intake structures
CO2: Characterize water quality and design treatment units
CO3: Design various advanced treatment units required for water treatment
CO4: Estimate wastewater flows & storm runoff, characterize quality of wastewater and design & provide appropriate primary treatment units for sewage
CO5: Design secondary treatment of sewage and possess knowledge on advanced treatment of wastewater
CO6: Choose the appropriate wastewater disposal methods and design various sludge handling and processing units



Course Outcomes (COs):

Course: Strength of Materials [CEC2213]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3		2	3						3	1		3	
CO2	3		1								2			3	
CO3	3	3	1	2	2						3		1	3	
CO4	3	3			3						3			3	
CO5	3	3		2	3						3			3	
CO6	3		1		1						2		1	3	
Avg	3	3	1	2	2	0	0	0	0	0	3	1	1	3	0

CO1: Explain the various energy principles and theorems for the applications of beams and frames.

CO2: Analyse the indeterminate structures

CO3: Solve axially loaded members for buckling under different boundary conditions.

CO4: Describe the various theories of failure for a material.

CO5: Determine the stresses in curved bars.

CO6: Demonstrate the development of stresses and strains in thick cylinders and thin spherical shells.



Course Outcomes (COs):

Course: Transportation Engineering I [CEC2214]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	1	1	1						1		2	2	
CO2	3	2	1	1	1								2	2	
CO3	3	2	1	1	1						1	1	2	2	
CO4	3	2	1	1	1						1		2	2	
CO5	3	2	1	1	1						1	1	2	2	
CO6	3	2	1	1	2						1	1	2	2	
Avg	3	2	1	1	1	0	0	0	0	0	1	1	2	2	0

CO1: To gain knowledge on highway planning
CO2: To understand geometric design of highways
CO3: To identify suitable materials for highway and perform mix design
CO4: Conceptualize the layout of hill roads, their construction and maintenance activity
CO5: To prepare the layout of airport
CO6: To gain knowledge on airport design

Course Outcomes (COs):

Course: Environmental Engineering Lab [CEC2215]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	1	1	1	1	1	1	1							3
CO2	1	1	1	1	1	1	1								3
CO3	1	1	1			1	1								3
CO4	1	1	1			1	1								3
CO5	1	1	1			1	1								3
CO6	1	1	1			1	1								3
Avg	1	1	1	1	1	1	1	1	0	0	0	0	0	0	3

CO1: At the end of the course, the student will be able to determine the suitability and characteristics of water for various purposes

CO2: At the end of the course, the student will be able to determine the different physical characteristics of water/wastewater

CO3: At the end of the course, the student will be able to determine the different chemical or inorganic characteristics of water/wastewater

CO4: At the end of the course, the student will be able to determine the different biological or organic characteristics of water/wastewater

CO5: At the end of the course, the student will be able to determine the different toxic/heavy metals present in the water/wastewater

CO6: At the end of the course, the student will be able to determine the bacterial count and types of microorganism present in the water/wastewater.



Course Outcomes (COs):

Course: Modern Construction Materials [CECX01]															
Term: 4 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	3	1	3							3	2	2	1
CO2	1	3	1	2	1							1	2	1	3
CO3	2	1	3	1	3							2	1	1	1
CO4	1	3	1	2	2							1	2	2	3
Avg	2	2	2	2	2	0	0	0	0	0	0	2	3	2	2

CO1: Select the materials such as metal structural materials for various applications in construction

CO2: Select the non structural materials for various applications in construction.

CO3: Explain the advantages of using smart and innovative material in construction

CO4: Explain the advantages and various applications of using intelligent material in construction

Course Outcomes (COs):

Course: Construction Equipment and Techniques [CECX02]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1										2	3		
CO2	2	1										2	3		
CO3	2	1										2	3		
CO4	2	3										2	3		
Avg	2	2	0	0	0	0	0	0	0	0	0	2	3	0	0

CO1: Describe the features of construction equipments
CO2: Explain the methods for stabilization of soil
CO3: identify suitable equipments according to the construction work
CO4: Describe the construction equipment safety measures`

Course Outcomes (COs):

Course: Principles of Architecture [CECX03]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1		1										1		
CO2	1	1	1												
CO3	1	1											1		
CO4	1	1											1	1	
Avg	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0

CO1: A thorough understanding on the definition of architecture; elements of architectures of form.

CO2: An exposure to the principles of architecture and applications of the same in buildings and spaces.

CO3: An understanding the meaning of character and style of buildings with examples.

CO4: Understanding of the role of landscape design in the shaping of outdoor environments

Course Outcomes (COs):

Course: Safety in Construction [CECX04]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	1	2										1		
CO2	1	1	2										1		
Avg	1	1	2	0	0	0	0	0	0	0	0	0	1	0	0

CO1: Define the roles and responsibilities of stakeholders in establishing safety in the project, the safety practices to be followed during various construction operations.

CO2: State the awareness about safety in site and analyse the safety policies followed by organization in construction site.

Course Outcomes (COs):

Course: Real Estate Laws [CECX05]															
Term: 4 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1								1							
CO2	1		2					2						1	
Avg	1	0	2	0	0	0	0	2	0	0	0	0	0	1	0

CO1: Identify career opportunities for students with the appropriate training in this specialty area.

CO2: Identify and explain important concepts in real estate law.



Course Outcomes (COs):

Course: Vaastu Sastra and Architectural Design [CECX06]

Term: 4 Semester

CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	1	3	1							2		1	
CO2	3	2	1	1	2							2		1	
Avg	3	2	1	2	2	0	0	0	0	0	0	2	0	1	0

CO1: Summarize the vaastu principles

CO2: Explain the open space planning and building design using vaastu and demonstrate the orientation of rooms based on vaastu



Course Outcomes (COs):

Course: Structural Analysis I [CEC3101]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3		2	2						1			3	
CO2	3	3		2	2				2		2	1	1	3	
CO3	3	3		2	2				2		2	1	1	3	
CO4	3	3		2	2				2		2	1	1	3	
CO5	3	3		2	2				1		1	1	1	3	
CO6	3	3		2	2				1		1	1	1	3	
Avg	3	3	0	2	2	0	0	0	2	0	2	1	1	3	0

CO1: Analyze the concepts such as degree of freedom, boundary conditions of various structures.

CO2: Solve a statically determinate beams, trusses and frames by using principle of virtual work method.

CO3: Plot the bending moment diagram and shear force diagram of indeterminate structures by using slope deflection method.

CO4: Construct the bending moment diagram and shear force diagram of indeterminate structures by using moment distribution method.

CO5: Evaluate and construct statically determinate and indeterminate structures from the influence lines

CO6: Generate influence line diagram for continuous beam using mullerbreslau's principle.



Course Outcomes (COs):

Course: Design of Reinforced Concrete Structures [CEC3102]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	3	1	1	1	1					2	3	2	
CO2	1	1	3	1	1	1	1					1	2	3	
CO3	1	1	3	1	1	1	1					1	2	3	
CO4	2	3	3	1	1	1	1					1	2	3	
CO5	2	2	3	1	1	1	1					1	2	3	
CO6	2	2	3	1	1	1	1					1	2	3	
Avg	2	2	3	1	1	1	1	0	0	0	0	1	2	3	0

CO1: Identify the composition, properties and sections used for steel structures and describe the design philosophy with an emphasis on limit state method.

CO2: Classify and design appropriate connections between structural members as per IS codal provisions.

CO3: Identify the different failure modes in tension members and select the most suitable section shape and size for the design of tension members.

CO4: Determine the lateral buckling length of compression members and design the column & column bases with suitable connection details.

CO5: Analyze and design the beams, builtup sections and plate girders in accordance to the Indian standards.

CO6: Estimate the wind pressure as per Indian standards, analyze and design the members of a steel roof truss under gravity and wind loads.



Course Outcomes (COs):

Course: Transportation Engineering II [CEC3103]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	1	1							1	1		1	1	
CO2	2		1		1									3	
CO3	1		1	1	1							1	2	2	
CO4	3		1		1					1		1	2	2	
CO5	1	3	1		1					1	1		2	2	
CO6	1		1							1					
Avg	2	2	1	1	1	0	0	0	0	1	1	1	2	2	0

CO1: To state the components of permanent way and calculate the tractive resistance of track

CO2: To design a railway tracks with cant and curves

CO3: To locate the signals and control measures at the railway network

CO4: To provide a layout of harbour

CO5: To prepare a traffic survey report

CO6: To apply suitable modern techniques to solve the given traffic problem



Course Outcomes (COs):

Course: Geotechnical Engineering I [CEC3104]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	1								1	2	3		
CO2	2	2	1								1	2	3		
CO3	3	1	1								1	1	2		
CO4	3	1	1								1	1	3		
CO5	3	1	1								1	1	3		
CO6	2	1	2								1	1	2	1	
Avg	3	1	1	0	0	0	0	0	0	0	1	1	3	1	0

CO1: To familiarize the students with geotechnical terminology and theoretical and experimental concepts commonly encountered in engineering practice.

CO2: To impart knowledge on the behavior of soil water and its stress behavior.

CO3: To provide knowledge on the stress distribution for different loading condition.

CO4: To understand concepts in compaction and consolidation of soil.

CO5: To enable the students to determine the shear strength of the soil.

CO6: To provide an understanding on slope stability and slope failure in soil.

Course Outcomes (COs):

Course: Disaster Management [GECX101]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1		2												1
CO2	1		2												1
CO3	1		2												1
CO4	1		2							2	2				1
CO5	1		2							2	2				1
CO6	1		2												1
Avg	1	0	2	0	0	0	0	0	0	2	2	0	0	0	1

CO1: Describe the origin, changes and management of environmental hazards.

CO2: Develop the knowledge on natural disasters.

CO3: Develop the knowledge on manmade disasters.

CO4: Discuss the different segments of disaster management.

CO5: Explain the concept of different disaster relief measures.

CO6: Achieve sufficient knowledge on the national policy on disaster management.

Course Outcomes (COs):

Course: Industrial Waste Water Treatment [CECX16]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	2	1		2	2			1		1			3
CO2	2	2	2	1		2	2			1		1			3
CO3	2	2	2	1		2	2					1			3
CO4	2	2	2	1		2	2			1		1			3
Avg	2	2	2	1	0	2	2	0	0	1	0	1	0	0	3

CO1: Identify the various industrial wastewater sources and will be able to list the statutory requirements
CO2: Perform the waste audit based on the pollution generated.
CO3: List the various wastewater treatment techniques and its applications.
CO4: Identify the wastewater treatment method based on different industrial effluent

Course Outcomes (COs):

Course: Hazardous Waste Management [CECX17]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	1	1												
CO2	1	1	1		1	2	3								2
CO3	1	1	3		1	2	3								2
CO4	1	1	3		1										2
Avg	2	2	2	0	1	2	3	0	0	0	0	0	0	0	2

CO1: Identify the various sources of hazardous waste and will be able to explain about its legal provision.

CO2: Describe about the different steps involved in waste collection and treatment process.

CO3: Specify the basic requirements needed for land disposal and its management techniques.

CO4: Assess the various treatment methods of hazardous waste and air pollutants and summarize the various remediation techniques based on case studies



Course Outcomes (COs):

Course: Durability properties of Concrete [CECX19]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	1	3	2	1						2	2	3	1	
CO2	1	2	2	2	1						2	2	3	1	
CO3	1	2	2	2	1						2	2	3	1	
CO4	1	1	2	2	1						2	2	3	1	
Avg	1	2	2	2	1	0	0	0	0	0	2	2	3	1	0

CO1: Assess all the physical and chemical mechanisms that affects the durability of concrete
CO2: Make a durable concrete with an emphasis on the approaches addressed by the standards.
CO3: Investigate the durability of concrete by conducting different tests.
CO4: Construct durable concrete structures and provide solution to repair and maintenance of concrete structures.



Course Outcomes (COs):

Course: Urban Design [CECX21]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3		2									2		1	1
CO2	2	3	1	3	2							2		2	1
CO3	1	2	3		3							2		1	1
CO4	1				1							2		1	1
Avg	2	3	2	3	2	0	0	0	0	0	0	2	0	1	1

CO1: To understand the scope and nature of urban design as a discipline

CO2: To introduce the components of a city and their interdependent roles

CO3: To learn to interpret the city in different ways and layers

CO4: To have a broad knowledge of various techniques to read a city

Course Outcomes (COs):

Course: Social Entrepreneurship [MSC3182]															
Term: 5 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1					1		2	1	3	3	3	1			
CO2							2	1	3	3	3	1			
CO3					1		2	1	3	3	3	1			
CO4							2	1	3	3	3	1			
CO5					1		2	1	3	3	3	1			
CO6					1		2	1	3	3	3	1			
Avg	0	0	0	0	1	0	2	1	3	3	3	1	0	0	0

CO1: Build an entrepreneurial mindset and reach out the customer to identify the problem using design thinking process

CO2: Craft solution to the problem through value proposition canvas and develop a business model using lean canvas

CO3: Provide product solution demo and deliver a minimum viable product

CO4: Work as a team and create brand strategy marketing for product/service

CO5: Prepare, make an outstanding sale pitch for startup.

CO6: Showcase the impact of social entrepreneurship on society and cases.

Course Outcomes (COs):

Course: Leadership and CEO Training [MSC3181]															
Term: 6 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1			1	1		2	1	3	3	3	3			
CO2		1		1	1	1	3	2	2	2	2	3			
CO3		1		1	1		2	1	3	2	3	3			
CO4		1		1	1	1	3	2	1	3	2	1			
CO5		1	2	1	1		3	2	3	3	3	3			
Avg	1	1	2	1	1	1	3	2	2	3	3	3	0	0	0

CO1: Explore through self-introspection one's own leadership style, their strength and weakness

CO2: Gain self-confidence to lead a team in the organization

CO3: Realize the role of leadership in making or breaking of an organization

CO4: Acquire the practice of self-introspection and development of leadership competencies thorough continuous efforts

CO5: Engage their own emotions as well as other resulting in successful relationship building with all stakeholders



Course Outcomes (COs):

Course: Structural Analysis II [CEC3211]															
Term: 6 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2	1	2	1	1					1		3	
CO2	3	2	2	2	1	2	1					1		3	
CO3	3	1	2	1			1					1		3	
CO4	3	2	1	1		1	1					1		3	
CO5	2	1	1	1			1		1	1		1		3	
CO6	3	2	1	1	2	1	1		1	1		1		3	
Avg	3	2	2	1	2	1	1	0	1	1	0	1	0	3	0

CO1: Determine the statically degree of indeterminacy and analyze the beams & frames by flexibility matrix method.

CO2: Compute the degree of freedom and apply stiffness matrix method to analyze indeterminate beams & frames.

CO3: Analyze the space trusses and beams curved in plan

CO4: Analyze the cables , suspension bridges and apply influence line analysis for three hinged stiffening girders

CO5: Use appropriate assumptions to establish plastic hinge analysis of beams & frames.

CO6: Apply the concept of finite element analysis and generate displacement functions for various elements.

Course Outcomes (COs):



Course: Geotechnical Engineering II [CEC3212]

Term: 6 Semester

CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	3	2	2							2	2	2	2	
CO2	3	3	2	2							2	2	2	2	
CO3	1	2	3								2	2	2	2	
CO4	2	2	2								2	2	2	2	
CO5	2	2	2								2	2	2	2	
CO6	2	2	1								2	2	2	2	
Avg	2	2	2	2	0	0	0	0	0	0	2	2	2	2	1

CO1: To recommend an appropriate site investigation programme for any construction

CO2: To explore the bearing capacity of soil for different types of shallow foundation.

CO3: To propose the size and depth of shallow foundation according to the contact pressure distribution.

CO4: To analyze the settlement for various types of foundation based on soil condition.

CO5: To examine the load carrying capacity & settlement of piles.

CO6: To determine the various types of earth pressure and stability of retaining structures.

Course Outcomes (COs):



Course: Design of Steel Structures [CEC3213]

Term: 6 Semester

CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2		1		1		1		2	1	1	3	2	
CO2	2	1	1			1		1		1		1	1	3	
CO3	1	1	1			1				1			1	3	
CO4	1	1	2		1					1			1	3	
CO5	2	3	3		1			2		1		1	1	3	
CO6	2	2	2	1	1			2		1			1	3	
Avg	2	2	2	1	1	1	0	2	0	1	1	1	1	3	0

CO1: Identify the composition, properties and sections used for steel structures and describe the design philosophy with an emphasis on limit state method.

CO2: Classify and design appropriate connections between structural members as per IS codal provisions.

CO3: Identify the different failure modes in tension members and select the most suitable section shape and size for the design of tension members.

CO4: Determine the lateral buckling length of compression members and design the column & column bases with suitable connection details.

CO5: Analyze and design the beams, builtup sections and plate girders in accordance to the Indian standards.

CO6: Estimate the wind pressure as per Indian standards, analyze and design the members of a steel roof truss under gravity and wind loads.

Course Outcomes (COs):



Course: Repair & Rehabilitation of structures [CECX32]

Term: 6 Semester

CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2		3		3						3	1	3		
CO2	2		3		3					3	3	1	3		
CO3	2		3		3						3	1	3		
CO4	2		3		3						3	1	3		
CO5	2		3		3						3	1	3		
CO6	2		3		3						3	1	3		
Avg	2	0	3	0	3	0	0	0	0	3	3	1	3	0	0

CO1: Predict the causes of distress affecting durability in structures.

CO2: Assess the damage in distressed structures

CO3: Choose the relevant materials for repair and rehabilitation

CO4: Identify the suitable techniques for repair and rehabilitation

CO5: Describe the processes used for repairing various cases such as leaky sunken slabs, water tank, fire damaged structure etc.

CO6: Suggest the suitable techniques that can be used for demolition of building

Course Outcomes (COs):



Course: Ground Improvement Techniques [CECX33]
Term: 6 Semester

CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1										1		2		
CO2	2		2								1		2		
CO3	2	2	2								2		3	1	
CO4	2	2	2								2		3		
CO5	2	2	2								2		3		
CO6	2	2	2								2		3		
Avg	2	2	2	0	0	0	0	0	0	0	2	0	3	1	0

CO1: To explain the properties of problematic soil and necessity of different ground modification techniques.

CO2: To identify suitable drainage methods available for dewatering of soil

CO3: To describe the improvement of soil by compaction, consolidation and preloading techniques suitable for specific site conditions.

CO4: To effectively utilise different earth reinforcement materials including geotextile for different field conditions.

CO5: To implement the grouting techniques in the field condition for soil stabilization

CO6: To assess the suitable chemicals and admixtures for stabilisation based on soil types.



Course Outcomes (COs):

Course: Housing, planning & management [CECX35]															
Term: 6 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	2	1	1							2	1	1	
CO2	3	3	2	1	2							2	1	1	
CO3	2	3	2	1	2							2	1	1	
CO4	3	3	2	2	2							3	1	1	
CO5	2	3	2	1	2							2	1	1	
CO6	3	3	2	1	2							2	1	1	
Avg	3	3	3	2	1	0	0	0	0	0	0	3	1	1	0

CO1: Explain the basic concepts about different types of housing and its policies
CO2: Describe the housing bye laws at different administrative levels, development and control regulations..
CO3: Analyze the various housing programmes.
CO4: Design different types of housing units.
CO5: Describe the various developmental regulations for housing
CO6: Analyze and appraise the housing projects.

Course Outcomes (COs):



Course: Building Services [CECX36]

Term: 6 Semester

CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	1	1		1										2
CO2	1	1	1		1										
CO3	1	1	1		2										
CO4	1	1	1		2										
CO5	1		2		2								2		
CO6	1		2		2										
Avg	1	1	1	0	2	0	0	0	0	0	0	0	2	0	2

CO1: Describe the various water supply system and municipal byelaws & regulations.

CO2: Explain the concept of acoustics properties required for buildings.

CO3: Describe the electrical installations and lighting requirements for building.

CO4: Explain the various techniques on ventilation and cooling, protection against fire caused by AC systems.

CO5: List and explain the various fire safety and NBC provisions in buildings.

CO6: Explain the concept of smart and intelligent buildings.

Course Outcomes (COs):

Course: Remote sensing [CECX39]															
Term: 6 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2		1	2								1	1	
CO2	1	2		1	2								1	1	
CO3	1	1		1	2								1	1	
CO4		1		1	2								1		
CO5	1	1		1	2								1		
CO6	1	2		1	2								1	2	
Avg	1	2	0	1	2	0	0	0	0	0	0	0	1	1	0

CO1: To describe the basic principles of remote sensing data, types of remote sensing and laws related to remote sensing.

CO2: To demonstrate the interactions of EMR with earth features and the features based on spectral signatures.

CO3: To explain the evaluation techniques for interpretation of the satellite images.

CO4: To describe the characteristic features of microwave remote sensing.

CO5: To describe the use of aerial photos for measurement of height determination.

CO6: To solve real world problems on agriculture, forestry, geology, water resources, urban and coastal studies using spatial analysis.



Course Outcomes (COs):

Course: Computer Modeling and Structural Design Laboratory [CEC3214]															
Term: 6 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3		3							1		3	
CO2	2	1	2	1	3							1		3	
CO3	2	1	2	1	2						1	1		3	
CO4			2		2							1		3	
CO5												1		3	
CO6			1									1	3	1	
Avg	2	2	2	1	3	0	0	0	0	0	1	1	3	3	0

CO1: Analyse and design the continuous beams subjected to various kinds of loadings
CO2: Analyse and design the plane frames with two bay five-storey structures
CO3: Analyse and design the space frames with single bay two-storey structures
CO4: Design the foundation for the space frame structures and staircase for single bay two-storey
CO5: Analyse and design the steel roof truss frame for industrial buildings
CO6: Prepare relevant structural drawings as per IS specifications using latest software



Course Outcomes (COs):

Course: Survey and Geotechnical Investigation Camp [CEC3215]															
Term: 6 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	2	1	1	1							2	2	2	
CO2	2	2	1	1	1							2	2	3	
CO3	2	2	1	1	1							2	2	3	
CO4	2	2	1	1	1							2	2	3	
CO5	2	2	1	1	1							2	2	2	
CO6	2	2	1	1	1							2	1	1	
Avg	2	2	1	1	1	0	0	0	0	0	0	2	2	2	0

CO1: Plan and execute a survey for topography modeling of terrain and create an elevation contour map and digital terrain model

CO2: Plan and execute the survey for the formation of a new road alignment by longitudinal sectioning and cross-sectioning profiles and compute the volumes of embankment and excavation

CO3: Plan and execute a survey for preparing a map of the given area and plot a map

CO4: Plan and execute a tacheometric survey to find the shortest distance between inaccessible points on the terrain

CO5: Compute the characteristics of a highway curve and setout the same by an appropriate method and also sketch out the excavation markings of a residential building and setout the same

CO6: To execute a soil investigation program, sketch the soil profile and compute the safe bearing capacity of the soil.



Course Outcomes (COs):

Course: Estimation and Costing of Infrastructure Projects [CEC4101]															
Term: 7 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	1	1								2	2		1	
CO2	3	2	1		2						2	2		2	
CO3	3	2	1		2						2	2	1	2	
CO4	3	2	1		2						2	2	1	2	
CO5	3		1		2						2	2	1	2	
CO6	3		1		2						2	2		2	
Avg	3	2	1	0	2	0	0	0	0	0	2	2	1	2	0

CO1: To make measurements of various quantities involved in the construction of building using central line method and long wall & short wall method

CO2: To categorize and estimate different items of work for buildings

CO3: To prepare estimate for septic tank, water supply and sanitary works

CO4: To generate estimation for road works, retaining wall and culverts

CO5: To prepare tender documents, rate analysis, schedule of rates ,specifications and contracts

CO6: To evaluate the value of building, fix rent and prepare report for construction of residential building



Course Outcomes (COs):

Course: Design of Hydraulic Structures [CEC4102]															
Term: 7 Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1		1	1			1						2	1	2	
CO2			1	1		1	2	1			1	1	1	2	
CO3	3	3	1			1							1	2	
CO4	3	3	1		1	1						2	1	2	
Avg	3	2	1	1	1	1	2	1	0	0	1	2	1	1	3

CO1: To design the various dams based on the hydraulic particulars.

CO2: To plan and design the regulating structures based on the discharge released.

CO3: To design the various canal drops or canal falls.

CO4: To design the aqueducts based on the site condition.



Course Outcomes (COs):

Course: Prestressed Concrete [CEC4103]																
Term: 7 Semester																
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CO1	3	1										1	3	2		
CO2	3	1	1										3	2		
CO3	3	1	1										3	2		
CO4	3	1	1										3	2		
CO5	3	1	1										3	2		
CO6	3	1											3	2		
Avg	3	1	1	0	0	0	0	0	0	0	0	0	1	3	2	0

- CO1: Describe the properties of constituents in prestressed concrete and apply the principles & procedures for analyzing the prestressed concrete structures.
- CO2: Evaluate the short and long term losses and deflection for PSC members
- CO3: Establish appropriate approaches to calculate the design strength for flexure & shear and apply the principles for the design of PSC members.
- CO4: Recognise the effects of transfer of prestress and design the anchorage reinforcement.
- CO5: Analyse and design the composite structural members
- CO6: Apply the principles and techniques for the design of circular prestressing and demonstrate the various structures such as poles, piles and pressure vessels.



Course Outcomes (COs):

Course: Construction Management for Infrastructure Projects [CEC4104]															
Term: 7 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	1	3		2	1	1	1	1	2	2	1	1	2	
CO2			2			1	1	1	2	1			1	3	
CO3	1	2	1	2	1	1	1	1	1	2	2	3		1	
CO4	1	3	2	1	2	1	3	2	1	2	2	1	1	2	
CO5	2	1	2	1	2	2	1	2	1	2	2	2	2	2	
CO6	1	1	2	1	1						2	1	1	1	
Avg	2	2	2	1	2	1	1	1	1	2	2	2	1	2	0

CO1: Identify the WBS and precedence relationships among activities and coding systems in the project.

CO2: Describe the CPM and pert analysis method of scheduling.

CO3: Select the material & equipment resources for optimization

CO4: Construct the crashing and time/cost trade off & effectively control the project.

CO5: Solve the cash flow problem and financial accounting systems on site.

CO6: Apply statistical quality control techniques and list the safety and quality control checklist on site.



Course Outcomes (COs):

Course: GIS and its applications [CEC4106]															
Term: 7 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1		2	3						2			2	
CO2	2	3		2	3						2			2	
CO3	2	3		2	3						2			2	
CO4	2	3	3	2	3						2			2	
Avg	2	3	3	2	3	0	0	0	0	0	2	1	0	2	0

CO1: List the different components of GIS and to identify different elements of a map.

CO2: Create raster, vector layers and to generate and create error free spatial data with its attributes.

CO3: Generate spatial queries and analysis and to identify the outputs achieved.

CO4: Solve real world problems on business development, electric utilities and mobile GIS through spatial analysis.

Course Outcomes (COs):

Course: Green Design and Sustainability [GECX201]															
Term: 7 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1											1	1	2	1	1
CO2			3						1	1	1	1		1	1
CO3			2		1				1	1	1	1			1
CO4	1		2		3	3	3		1	1		1	3	1	1
CO5	1		1		2	3	3		1	1		1	1	1	1
CO6			2		1							1	3	3	1
Avg	1	0	2	0	2	3	3	0	1	1	1	1	2	1	1

CO1: Explain the relationship between sustainability and the emergence of green building practices.

CO2: Address the economic, environmental, and social concerns.

CO3: Design a framework for achieving sustainability.

CO4: Explain about green building, materials used and efficiency of green building materials

CO5: Address the different energy conservation and efficiency techniques.

CO6: Design a green building.



Course Outcomes (COs):

Course: Bridge Engineering [CECX45]																
Term: 7 – Semester																
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CO1	2	1	1	3	3								2	3		
CO2	3	2	2	2	2								2	3		
CO3	2	3	1	3	1								2	3		
CO4	2	1	2	2	3								2	3		
CO5	3	2	3		3								2	3		
CO6	1	1	2	2	1								2	3		
Avg	2	2	2	2	2	0	0	0	0	0	0	0	2	2	3	0

CO1: Identify a suitable site, classify different types of bridges and calculate loadings as per the standards

CO2: Describe the load distribution as per IRC standards and design the slab bridge culvert

CO3: Recognize and design the various components in different types of reinforced concrete bridges

CO4: Explain the principles involved in the design of plate girder bridges as per IRC specifications.

CO5: Identify and apply the principles, techniques for the design of prestressed concrete bridges

CO6: Classify and describe the types of bearings, piers and abutments in bridges

Course Outcomes (COs):

Course: Environmental Impact Assessment [CECX52]															
Term: 7 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	1	1	1	2	2					1			2
CO2	2	2	1	1	1	2	2					1			2
CO3	2	2	1	1	1	2	2					1			2
CO4	2	2	1	1	1	2	2					1			2
CO5	2	2	1	1	1	2	2					1			2
CO6	2	2	1	1	1	2	2					1			2
Avg	2	2	1	1	1	2	2	0	0	0	0	1	0	0	2

CO1: Describe the concepts and methodologies of environmental impact assessment.

CO2: Explain the legislative and environmental clearance procedure and apply the prediction tools for EIA.

CO3: Assess the impacts of infrastructure projects on air, water, soil and environment.

CO4: Describe the public participation, procedure, resettlement and rehabilitation processes in EIA.

CO5: Prepare documentation of EIA and to develop environmental management plan for the same

CO6: Conduct environmental audit and life cycle assessment of products.

Course Outcomes (COs):

Course: Corrosion Control of Steel in Concrete [CECX58]															
Term: 7 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	1	2	1	2	2							2	2	2	
CO2	2	1	2	1	3							1	2	2	
CO3	1	2	1	2	3							3	2	2	
CO4	2	1	2	3	2							2	2	2	
Avg	2	2	2	2	3	0	0	0	0	0	0	2	2	2	0

CO1: Students will be able to identify the causes and mechanism of corrosion in reinforced concrete

CO2: Suggest passive measures to control the corrosion in reinforced concrete.

CO3: Suggest active measures to control the corrosion in steel reinforcement.

CO4: Assess the rate at which the reinforced concrete is being corroded

Course Outcomes (COs):

Course: Smart Cities [CECX62]															
Term: 7 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	1	2	1	1							2	2	2	3
CO2	3	3	1		2							2	2	2	3
CO3	1	2	3	3	3							2	2	2	3
CO4	1	1	2	1	1							2	2	2	3
CO5	2	3	1		1							2	2	2	3
CO6	2		1		3							2	2	2	3
Avg	2	2	2	2	2	0	0	0	0	0	0	2	2	2	3

CO1: apply smart technologies across the spectrum of infrastructure and governance
CO2: develop overall smart city strategy by using various dimensions of smart elements
CO3: design the smart cities with smart planning
CO4: enable students to understand capital formation and finance
CO5: understand the governance of smart cities
CO6: study the risk and feasibility of the smart cities through global case studies

Course Outcomes (COs):

Course: Advanced Entrepreneurship [GECX219]															
Term: 7 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1					1	2	2	1	3	3	3	2			
CO2					2	1	2	1	3	3	3	2			
CO3					1	1	2	1	3	3	3	2			
CO4						1	2	1	3	3	3	2			
CO5					1	1	2	1	3	3	3	2			
CO6					1	1	2	1	3	3	3	2			
Avg	0	0	0	0	1	1	2	1	3	3	3	2	0	0	0

CO1: Achieve sustainable growth by pivoting, refining business models, expand customer segments, and business planning for developing early customer traction into a repeatable business.

CO2: Develop strategies to grow revenues and markets.

CO3: Develop an ateam, brand strategy and create digital presence.

CO4: Develop brand and channel strategy for customer outreach

CO5: Leverage social media to reach new customers cost effectively.

CO6: Explore licensing and franchising for business expansion.

Course Outcomes (COs):

Course: Industrial Internship [CEC4105]															
Term: 7 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	2	1	2	1	2	2	1	1	1	3	3	3	3
Avg	2	1	2	1	2	1	2	2	1	1	1	3	3	3	3

CO1: At the end of the course, the students will be exposed to apply their knowledge in practical realworld problems and would be able to face the field works with more courage and confidence.

Course: PROJECT WORK [CEC4211]															
Term: 8 – Semester															
CO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	3	3	3	2	2	2	2	3	3	3	3	3
CO2	3	3	3	3	3	3	2	3	2	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	2	2	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	2	2	3	3	3	3	3
Avg	3	3	3	3	3	3	2	3	2	2	3	3	3	3	3

Course Outcomes (COs):

CO1: Apply their knowledge base in civil engineering

CO2: Utilize the creative ability and inference capability to solve real world problems

CO3: Apply the practical knowledge while solving real time problems

CO4: Prepare an appropriate documentation.