

Koneru Lakshmaiah Education Foundation (Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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DEPARTMENT OF CIVIL ENGINEERING

PROGRAM ARTICULATION MATRIX

Articulation Matrix- B. Tech Civil Engineering

Academic year 2022-23

Sl No	Course Code	Course Title	СО	Description	1	2	3	4	5	6	7	8	9	10	11	12	1	2
			CO 1	Understand the concepts of grammar to improve communication, reading, and writing skills										1				
1	22UC1101	Integrated Professional	CO 2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.									1					
		English	CO 3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices									1					
			CO 4	Apply the concepts of writing to draft corporate letters, emails, and memos										1				
			CO 1	Demonstrating different interpersonal skills for employability								1						
2	22UC1202	English	CO 2	Distinguishing business essential skills									1					
2	22001202	Proficiency	CO 3	Classifying social media and corporate communication skills												1		
			CO 4	Applying analytical thinking skills												2		
			CO 1	Developing critical and analytical reading skills												1		
			CO 2	Discovering different interpersonal skills to develop people skills												1		

3	22UC2103	Essential Skills for Employability	CO 3	To enhance the problem-solving skills of the students through the concepts of Simple Equations, Ratio, Proportion & Variation, Percentages, Profit & Loss, Averages, Allegations, Simple & Compound Interest					1						
		, , ,	CO 4	Apply diagrammatic representation of the given data to find the possible outcomes in the topics of Deductions, Cubes, Venn Diagrams and Arrangements		1									
			CO 5	To apply deductive logic to solve questions in Connectives, Blood relations, Ranking and time sequence, Symbols and notations. Apply principles of reflection and rotation to solve picture puzzles.		1									
			CO 1	To distinguish product and process and quote them in speaking and writing activities										1	
			CO 2	To apply interpersonal skills										1	
4	22UC2204	Corporate Readiness Skills	CO 3	To enhance the problem-solving skills of the students through the concepts of Numbers, Time & Work, Time & Distance, Permutations & Combinations, Probability which will enable them to improve their problem solving abilities which in turn improve their programming skills.					1						
			CO 4	To apply known facts to find the unknowns in the topics Clocks, Calendars, Binary Logic. Identify the rule set by analyzing the given observations in the topics Series, Analogy, Odd Man, Coding-Decoding			1								
			CO 1	Realize and Understand the basic aspiration, harmony in the human being.				2							
5	22UC0010	Universal Human Values & Professional	CO 2	Envisage the roadmap to fulfill the basic aspiration of human beings.				2							
		Ethics	CO 3	Understanding the society and nature with the view of human values				2							
			CO 4	Understand the profession and his role in this existence.							2				
		Construction	CO 1	Apply the fundamentals of construction management to plan and control the progress of the project.	1								3	1	
6	22CE4102	Planning & Project	CO 2	Analyse the project progress through scheduling and identifying critical activities.				2					3	1	

		Management	CO 3	Analyse the resource allocation for the construction projects at optimal levels.			2				3	1	1
			CO 4	Apply the management techniques to provide quality and safety at construction sites.	1			2			3	1	2
			CO 1	To familiarize with various aspects of the culture and heritage of India through ages	1								
		Indian Heritage	CO 2	To acquaint with the contributions of Indians in the areas of languages and literature, religion and philosophy	1								
7	22UC0007	and Culture	CO 3	To understand the Social structure and the spread of Indian culture abroad	1								
			CO 4	To know the development of Science and Technology in India through ages and to appreciate the contributions of some of the great Indian scientists	1								
			CO 1	To understand Constitutional development after Independence								1	
8	22UC0008	Indian	CO 2	To learn the fundamental features of the Indian Constitution								1	
0	22000008	Constitution	CO 3	To get a brief idea of the powers and functions of Union and State Governments								1	
			CO 4	To understand the basics of working of Indian Judiciary and the Election Commission								1	
			CO 1	Understand the importance of Environmental education and conservation of natural resources				1					
		Ecology &	CO 2	Understand the importance of ecosystems and biodiversity								1	1
9	22UC0009	Environment	CO 3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process				2					
			CO 4	Understand the importance of Environmental education and conservation of natural resources				1					
11	22MT1101	Mathematics for Computing	CO 1	Model a system of equations for real world applications in engineering, physical and biological sciences, computer Science, finance, economics and solve them through matrix algebra	2								

			CO 2	Model basic and computational techniques on discrete structures like relations, orders, functions & FSM, Lattices, and propositional &predicate logic Model real world structures and their related	2									
			CO 3	Applications using advanced discrete structures like graphs and trees. Model the given Statistical data for real world	2									
			CO 4	Applications in Engineering science, Economics and Management.	2									
			CO 1	Apply differential and integral calculus to find maxima & minima of functions, evaluate the integrals and solve the differential equations.	2									
12	22MT2102	Mathematics for Engineers	CO 2	Demonstrate the Fourier series and Laplace transforms.	1									
		101 Eligilicers	CO 3	Describe probability, Random Variables	1									
			CO 4	Explain complex variables, analytic functions and introduction to stochastic process and Algebraic structures.	1									
			CO 1	Identify the basic concept of probability theory and types of random variables and also their applications in probability distributions.	2		1					3		3
		Probability,	CO 2	Apply discrete and Continuous probability distributions to analyse the various real-world situations.	2				1		1			
13	22MT2007	Statistics and Numerical Methods	CO 3	Illustrate the bivariate data using correlation and regression analysis and formulate the given phenomena as a linear programming problem and solve it by graphical method. and simplex methods.	2						3		3	
			CO 4	Demonstrate the Big- M method, dual simplex method and obtain the solutions of non-linear programming problems using Pivot, Wolfe's algorithms and separable programming technique	2					1				
14	22PH1010	Mechanics (SE 1)	CO 1	Apply the concept of forces, governing static equations and analyze planer system of forces.	2									

			CO 2	Use analytical techniques for analyzing forces in statically determinate structures.				3								
			CO 3	Understanding the concepts of planar and non- planar system of parallel forces and analyzing them. Estimate moment of inertia of lamina and material bodies	2										3	
			CO 4	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems											3	
			CO 1	Understand the importance of Design thinking process for contextualized problems		1				1						
15	22UC1203	Design Thinking and	CO 2	Analyse, define, and ideate for solutions			1				1					
13	22UC12U3	Innovation	CO 3	Develop and test the prototype made					2		2					
		miovation	CO 4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity					1			1				
			CO 1	Understands the deformation of materials in response to action of load, for identification of materials having specific engineering applications.	1											
			CO 2	Understands the motion of electrons in microscopic	2											
16	22PH1002	Engineering	CO 3	level	3											
10	221111002	Physics	CO 4	Understand the properties of light and engineering applications of lasers	2											
			CO 5	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects	3											
			CO 1	Describe some important design considerations in choosing a battery for a specific application.	1		2				3					
		Engineering	CO 2	Predict potential complications from combining various chemicals or metals in an engineering setting	2		3									
17	21CY1001	Chemistry (SE-2)	CO 3	Examine water quality and select appropriate purification technique for intended problem	3						2					
			CO 4	Explain the role of chemical kinetics in the formation and destruction of ozone in the atmosphere and predict the connection between molecular behavior and observable physical properties	3						2					

			CO 5	An ability to analyze & generate experimental skills	1							ĺ	
			CO 1	To discuss and interpret English language skills necessary for placements To demonstrate skills to get selected in interviews								1	
18	22UC3105	Problem Solving Skills- I	CO 3	and retain job To enhance the problem-solving skills of the students through the concepts of Menstruation, Quadratic Equations & Inequalities, Progressions, Logarithms, Data Interpretation, Data Sufficiency which will enable them to improve their problem-solving abilities which in turn improve their programming skills.				1					
			CO 4	To apply deductive logic to solve questions in Connectives, Blood relations, Ranking and time sequence, Symbols and notations. Apply principles of reflection and rotation to solve picture puzzles		1							
			CO 1	Analyze the business environment in order to identify business opportunities,							2		
19	22UC3206	Problem Solving Skills-	CO 2	Identify the elements of success of entrepreneurial ventures							1		
19	220C3200	II	CO 3	Consider the legal and financial conditions for starting a business venture							1		
			CO 4	Evaluate the effectiveness of different entrepreneurial strategies							2		
			CO 1	Design Basic and Complex Building Blocks for real world problems using structured programming paradigm.	2	2							
20	22SC1101	Computational Thinking for Structured	CO 2	Translate computational thinking into Logic Design for Solving real world problems.	2	2							
		Design	CO 3	Apply and Analyse CRUD operations on Basic Data Structures using Asymptotic Notations.	2	2							
			CO 4	Apply and Analyse CRUD operations on Linear Data Structures using Asymptotic Notations.			2						

				Apply the structured programming paradigm with logic building skills on Basic and Linear Data Structures for solving real world problems.	2	2		2					
			CO 1	Practice design thinking by developing artistic skills, Visualize and complete his/her innovative design by final drafting using 3D modeling			2						
21	22ME1103	Design Tools	CO 2	Understand the concept of web page, web browser, web server, and able to create Static webpages					2				
21	22ME1103	Workshop – I	CO 3	Understand the concept of report writing using a markup language Latex					2				
			CO 4	Understand the concept of data visualization and creating data visualization dashboards, Understand the basic concept of VR/AR.					2				
			CO 1	Practice the design ideology by artistic skill			1						
		Design Tools	CO 2	Visualize the design ideology by using VR technology				2					
22	22SC1209	Workshop – II	CO 3	Visualize the design ideology by incorporating VR technique					2				
			CO 4	Visualize and present his design idea by applying AR technique				2					
			CO 1	Apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	2		2						
			CO 2	Analyze and compare linear data structures and analyze different searching and hashing techniques	2		2						
23	22SC1202	Design of Data Structures	CO 3	Analyze and compare various non – linear data structures like Trees and Graphs	2		2						
			CO 4	Analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	2		2						
			CO 5	Execute lab experiments and develop a small project along with his/her team members.	2		2						

			CO 1	Understand the principles of drawing and use of drafting instruments and AutoCADD and Draw engineering curves, Geometrical Constructions	2				2		2		1		
			CO 2	Draw orthographic views for the given objects	2				2		2				
24	22CE1002	Engineering Graphics	CO 3	Draw Isometric views for the given orthographic views	2				2		2				
			CO 4	Draw the projections of points, lines, planes and solids	2			1	2		2				
			CO 5	Draw the total surface of solids by development of surfaces and the sections of Solids	2				2		2				
			CO 1	Understand the significance of engineering geology, geological processes that modify the surface of the earth	1					2					
			CO 2	Understand the basics of minerals and rocks, geological structures exhibited by rocks and their influence	1					2					
25	22CE2205	Geology	CO 3	Analyse the geological conditions to identify suitable site for civil engineering projects.	1					2					
			CO 4	Analyse the geological conditions to identify potential sites for groundwater, sites for dam and reservoir and tunnels	1			3		2					
			CO 5	Apply and analyse the geological conditions for suitability of the site for a major civil engineering project		2						3			
26	22CE2101	Solid	CO 1	Associate with the stress-strain diagrams and the relationship between the elastic constants, estimate temperature stresses in compound bars and find the stresses in thin walled pressure vessels	2	2							3	1	1
26	22CE2101	Mechanics	CO 2	Draw Shear force and Bending moment diagrams for statistically determinate beams	3	3								1	1
			CO 3	Calculate the Bending and shear stresses and draw the distribution diagrams for various cross sections.	3	3	_							1	1

			CO 4	Estimate the transformation of stress in a plane and draw Mohr's circle, estimate stresses due to torsion for circular shafts and find buckling load for centric and eccentric columns	3	3			1						1	1
			CO 1	Apply fluid properties to solve engineering problems	2	2										
		Fluid	CO 2	Analyze static, kinematic and dynamic states of fluids	3	2										
27	22CE2102	Mechanics & Hydraulics	CO 3	Analyze the flow through pipes and head losses	3	2										
		Hydraulics	CO 4	Perform dimensional analysis for model simulation	2	3										
				Demonstrate the flow through Notches, pipes and open channels	3	3										
			CO 1	Understand basic concepts of surveying	2		2								1	1
			CO 2	Understand how to operate instruments required for surveying	2	2									1	1
28	22CE2103	Surveying	CO 3	Applying the surveying equipments required based on the functionality and nature of work		3			3		3				1	1
			CO 4	Apply field data to prepare a plan required for a given civil engineering project		3			3	1	3		3		1	1
			CO 1	Find the deformation using energy theorems i.e. Castigliano's theorems, Betti's theorem and Maxwell's reciprocal theorem.	3	3								3	1	1
		Structural	CO 2	Students will be able to estimate the deflection of beams by various methods such as deflection curves, moment area method, conjugate beam method and unit load method	3	3									1	1
29	22CE2201	Analysis	CO 3	Able to analysis proper cantilevers and fixed beams for any type of landing using consistent deformation method and can analysis conjugate beam by Clapereyon's theorem of Three moments	3	3			1						1	1
			CO 4	Student will be able to analyze beams and frames for any type of loading using slope deflection method and moment deflection methods	3	3				3		1			1	1

			CO 1	Compare the properties of most common and advanced building materials	2	2	Ţ	1					2	2
30	22CE2203	Construction Materials &	CO 2	Understand the typical and potential applications of these materials such as concrete and its mix proportioning	2	2				1			2	2
		Concrete Technology	CO 3	Understand the relationship between material properties and structural form	2	2							2	2
			CO 4	Understand the importance of experimental verification of material properties.	2	2		2	1				2	2
			CO 1	To apply the concept of forecast population and design of water treatment units	1				2	2				
			CO 2	To apply the concept of Water distribution system by using Equivalent pipe method	1				2	2				
31	22CE2204	Environmental Engineering	CO 3	To apply concept of sewage quantity and design of sewerage system and septic tank design.	1				2	2				
			CO 4	To Understand the concept of Solid Waste Management methods and Noise pollution effects	1				2	2				
			CO 5	To apply the testing of water & wastewater, design of water, wastewater treatment plant.	1				3	3				
			CO 1	Understand different types of buildings, building components along with materials used for the construction of buildings.			2							
		Building Planning,	CO 2	Understand building bye-laws for planning and construction of buildings					2					
32	22CE2202	Drawing & Construction Management	CO 3	Understand different types of equipment used in construction projects and management of construction projects.					2			1		
			CO 4	Apply the techniques required for construction project management.	2									
			CO 5	Apply the principles and guidelines proposed by building regulatory bodies to develop the plan of a building.										

			CO 1	Describe soils and determine their physical characteristics such as grain size, water content, and void ratio, and their inter-relations, classify soils, determine compaction of soils, soil permeability and seepage analysis.	1	2										3	
		Geotechnical	CO 2	Understand & Apply the concept of effective stress principle, and porewater pressures and their distribution within a soil mass, determine the consolidation settlement, and determine soil strength parameters from soil tests for "drained" and "undrained" conditions.	3	3										3	
33	22CE2206	Engineering	CO 3	Determine the lateral earth pressure, stability of slopes and retaining walls, Understand the importance and methods of soil investigations and be able to plan a soil investigation	3	3										3	
			CO 4	Understand Terzaghi's shear failure criteria for soils and their limitations and determine the bearing capacity and settlement of structures founded on soils using shallow and pile foundations.	3	3										3	
				Analyze the index and engineering properties of soils from various laboratory tests and prepare the soil investigation report.			3	1	1			3	1			3	3
			CO 1	Design RC beams subjected to bending using Working Stress Method.	3	3	3						1		3	1	1
		Design Of	CO 2	Explain the concept of Limit State Design and apply it to beams	3	3	3				2					1	1
34	22CE3101	Reinforced Concrete	CO 3	Apply Limit state design for flanged sections subjected to shear, torsion and concept of bond	3	3	3							1		1	1
		Structures	CO 4	Design one-way, two-way and continuous slabs, Design columns and isolated footings subjected to axial load, Uni-axial and bi-axial bending	3	3	3									1	1
			CO 5	Analysis and Design of Structures using software such as ETABS/Staad Pro/CYPE CADD etc.	3												

			CO 1	Know Versatile with history - current trends of transportation and Carry engineering surveys and can decide the alignment						2	2				2	2
			CO 2	Analyze and design highway geometric elements		2	2								2	2
35	22CE3103	Transportation Engineering	CO 3	Analyze and design of flexible, rigid pavements, Pavement Drainage		2	2						1		2	2
		88	CO 4	Handle pavement construction activities and also conduct quality control at site and Evaluate pavement condition and can identify and suggest remedial measures, understand traffic Rules, Analyze and design of traffic infrastructure			2		2	2	2	3			2	2
			CO 1	Evaluate the different components of hydrological cycle	3			2			1					2
36	22CE3102	Water Resources	CO 2	Estimate the ground water yield and requirement of water for the crops	3	2					1					2
		Engineering	CO 3	Desgin the canal irrigation system based on discharge	3			3			1					2
			CO 4	Analyze stability and forces acting on Gravity dams and life of reservoir	3			2			1					2
			CO 1	Analyse and design bolted and welded connections	2	2	2								1	1
		Design Of	CO 2	Design single and compound beams as per IS code	2	2	2								1	1
37	22CE3201	Steel	CO 3	Design simple and built-up columns as per IS code	2	2	2								1	1
		Structures	CO 4	Design column base systems as per IS code, Calculate wind forces and design roof trusses	2	2	2					2			1	1
			CO 1	Applying the methods of approximate estimate and detailed estimate to the buildings.	1	2								2		
			CO 2	Applying the methods of detailed estimates to R.C.C works, Roads and Canals	1	2								2		
38	22CE3202	Quantity Surveying and	CO 3	Applying the specifications concept to for different items of work and performing rate analysis.	1	2								2		
		Estimation	CO 4	Applying tenders and contracts concept to a project and carry out building valuation.	1	2								2		
			CO 5	Applying estimation concept to buildings, road works, canal works by using a software package (M.S Excel)	1									3		

			CO 1	Analysis of Determinate Structures For Various Loads And Load Combinations	2	2			2						
39	22CE3211	Advanced Structural	CO 2	Analysis of Indeterminate Structures Using Matrix Methods	2	2			2						
		Aanalysis	CO 3	Analysis of Hinged Arches	2	2			2						
			CO 4	Analysis of Indeterminate Beams Using Plastic Analysis Method	2	2			2						
			CO 1	Apply the concepts of structural engineering		2					2				1
40	22CE4101	Comprehensive	CO 2	Apply the concepts of Geotechnical and Transportation Engineering		2					2				1
	22021101	Exam	CO 3	Apply the concepts of Water and Environmental Engineering		2					2				1
			CO 4	Apply the concepts of surveying and Traffic Engineering		2					2				1
			CO 1	Remember the fundamentals of the science of water cycle along with powerful tools that students can use to diagnose the health of the local water cycle as well as develop targeted action plans to restore the local natural water cycle and bring water prosperity	1		1					1		1	
41	21IE2040	Social Internship	CO 2	Remember the water sustainability and water resilience of village, city, residential facilities and households using multi-level water scorecards		1		1	1						
			CO 3	Apply the design thinking positive action plan for a village, campus, residential facility and community neighbourhood.					1	1		1			
			CO 4	Applying the water positive solutions within an urban watershed, a rural watershed, residential institutional and corporate community	2						2			1	
		Advanced	CO 1	Design different types of stair cases.	2	2	2							1	1
42	22CE3221	Design of	CO 2	Select appropriate foundation system.	2	2	2						1	1	1
		Reinforced	CO 3	Apply the design principles of retaining walls.	2	2	2							1	1

		Concrete Structures	CO 4	Differentiate types of rectangular water tanks and analyse as per IS code methods, select types of circular water tanks and analyse as per IS code methods	2	2	2						1	1
			CO 1	To introduce prestressing methods, principles and concepts	2	2							1	1
		D . 1	CO 2	To determine losses in prestress	2	2							1	1
43	22CE3231	Prestressed concrete	CO 3	To Analyse PSC Sections both at transfer of prestress and Service load conditions	2	2					1		1	1
			CO 4	To design prestressed concrete beams as per IS Code, to design end block of PSC beams.	2	2							1	1
			CO 1	Explain about various types of Bridges and IRC Specifications for road bridges									1	
4.4	22CE4141	Bridge	CO 2	Design deck Slab bridge and T-Beam Bridge as per IRC guidelines	3		2						1	
44	22CE4141	22CE4141 Engineering	CO 3	Design Abutment and Elastomeric Pad Bearings for bridges as per IRC guidelines	3		2						1	
			CO 4	Design Piers and Well Foundations for bridges as per IRC guidelines	3		2						1	
			CO 1	Analyze the prefabricated load carrying members.		2							2	
45	22CE4151	Precast and Prefabricated	CO 2	Analyze Behaviour of structural components and production technology of prefabrication.		2							2	
		structures	CO 3	Design joints in precast construction.			1						2	
			CO 4	Design and detail precast structures.			1						2	
			CO 1	Understand the concept of construction laws and regulations.					2	2				2
46	22CE2216	Projects& Contract	CO 2	Study the current trend toward alternative project delivery systems via contractual arrangements such as design-build and construction management at risk								2	3	
40		management	CO 3	Investigate how to avoid the possibilities of construction disputes via alternative dispute resolution (ADR)					3	3			3	
			CO 4	Understand the Labour regulations and applications on review construction contracts and specifications					3			3	3	

			CO 1	Understand the basics systems of man power and materials management										
47	22652226	Quality and	CO 2	Analyse the basics systems of machinery management		2	3							
47	22CE3226	Safety Management	CO 3	Understand and analyse the basics systems of safety management	1	2	3							
			CO 4	Understand and analyse the basics systems of quality management	1	2	3							
			CO 1	To understand theoretical knowledge of formwork and its materials	1					2				
			CO 2	To perceive the theoretical knowledge of formwork for walls, columns, slab, beam, and special structures	1					2				
48	22CE3236	Form Work	CO 3	To interpret the theoretical knowledge of formwork for bridge structures, flying deck, slip forms, shoring, and scaffolding.	1					2				
			CO 4	To interpret the theoretical knowledge of formwork for bridge structures, flying deck, slip forms, shoring, and scaffolding.	1					2				
			CO 1	Apply the fundamentals of financial management to prepare the cashflow statements.	1			2				3		
49	22CE4146	Construction	CO 2	Evaluate potential major project financial issues using capital budgeting techniques.	1			2				3		1
49	22CE4140	Economics	CO 3	Apply financial methodologies to efficiently evaluate and manage construction projects .	1			2				3		1
			CO 4	Apply the fundamentals of construction finances to enable decision making based on project type	1			2				3		1
			CO 1	Understand the construction basics of a Common building construction methods conventional	1	1							1	1
50	22CE4156	Sustainable Construction Technology	CO 2	Understand the modern construction methods basics of construction Modular Construction Precast concrete.	2	2							1	1
			CO 3	Understand the sustainable construction materials technologies and project management strategies	2	2							1	1

			CO 4	Understand the LEED for New Construction rating system	2	2				1		1	1
			CO 1	Analyze Bearing capacity of soils	3	3						3	
			CO 2	Estimate the load carrying capacity of piles	3	3						3	
51	22CE3212	Foundation engineering	CO 3	Analyze lateral stability of well foundation and settlement analysis	3	3						3	
			CO 4	Analyze stability of slopes and earth retaining structures in various civil engineering aspect	3	3						3	
			CO 1	Analyze the ground modification by vibro replacement, stone columns, preloading and prefabricated drains	3	1						1	
	22000	Ground	CO 2	Analyze the reinforced earth structures	3	1						2	
52	22CE3222	improvement techniques	CO 3	Analyze different properties of geotextiles, geogrids, geonets, geomembranes, geotubes.	3	2						3	
			CO 4	Analyze different grouting, deep mixing, PVDs, vacuum consolidation techniques.	2	1						2	
			CO 1	Knowledge about the different techniques of earth retaining structures and their suitability.	2	2						1	1
		.	CO 2	Understanding and design of retaining walls, braced cuts and sheet piles.	3	3						1	1
53	22CE3232	Design of earth retaining structures	CO 3	Knowledge of the grouts, their types, properties and application.	2	2						1	1
		5 .1. 10.1.1	CO 4	Introduction to reinforced earth and geo synthetics, their types, function and application, Ability to design and analyse the earth-reinforcements and coffer dams with their functions.	3	3						1	1
54	22CE4142	Geotechnical earthquake engineering	CO 1	Describe soils and determine their physical characteristics such as grain size, water content, and void ratio, and their inter-relations, classify soils, determine compaction of soils, soil permeability and seepage analysis.	1	2						3	

			CO 2	Understand & Apply the concept of effective stress principle, and porewater pressures and their distribution within a soil mass, determine the consolidation settlement, and determine soil strength parameters from soil tests for "drained" and "undrained" conditions.	3	3										3	
			CO 3	Determine the lateral earth pressure, stability of slopes and retaining walls, Understand the importance and methods of soil investigations and be able to plan a soil investigation	3	3										3	
			CO 4	Understand Terzaghi's shear failure criteria for soils and their limitations and determine the bearing capacity and settlement of structures founded on soils using shallow and pile foundations.	3	3										3	
			CO 5	Analyze the index and engineering properties of soils from various laboratory tests and prepare the soil investigation report.			3	1	1			3	1			3	3
			CO 1	Apply forensic engineering to demonstrate structural and geotechnical failures	2	2	2							2			
55	22CE4153	Forensics in Civil	CO 2	Understand reinforced concrete Structures and steel structure failures through case studies	2	2	2							2			
	22CE4133	Engineering	CO 3	Evaluate different geotechnical failures through case studies	2	2	2							2			
			CO 4	Analyze reasons for geo-environmental and fluid and hydraulic failures	2	2	2										
			CO 1	Understand the Objectives ITS		2	2			2						2	2
56	22CE3215	Intelligent transportation	CO 2	Understand the Importance of telecommunications in the ITS system		2	2			2			3		1	2	2
30	22CE3213	systems	CO 3	Understand Advanced Traffic Management Systems		2	2			2						2	2
			CO 4	Understand Integration of Automated Highway Systems			2			2				1		2	2
57	22CE3225	Pavement materials	CO 1	Characterize pavement materials and also carry the advance tests on bituminous mixtures	1			1								1	1
31	22CE3223	&design	CO 2	Thorough with stresses and strains of flexible and rigid pavements.	1	1									2	1	1

			CO 3	Thorough with analysis and design of flexible highway and airport pavements	1		1					2				1	1
			CO 4	Thorough with analysis and design of rigid highway and airport pavements	2		2									1	1
			CO 1	Apply the Concepts of Probability in traffic Engineering	3							3	3	2	2	2	2
		Traffic	CO 2	Know the Fundamental design concepts of Interchanges, Parking Facilities, Freeways			2									2	2
58	22CE3235	engineering and management	CO 3	Design Traffic Facilities include Un signalized Intersections (Rotary), Signalized Intersection (signal design)			3									2	2
			CO 4	Know the Accident Situation in India, road safety measures, Understand Detrimental Effects of traffic on the environment						3	3					2	2
			CO 1	Learn the concept of travel demand and supply and modes available for transportation						2	2		3	3		2	2
59	22CE4145	Urban transportation	CO 2	Understand the different types of Traffic Surveys used in planning					2						3	2	2
	22CL+1+3	systems planning.	CO 3	Identify and analyze trips as a part of transport planning				3	3							2	2
			CO 4	Plan Public Transport Systems, Utilize ITS in Transport Planning		2			2	2	2					2	2
			CO 1	Understand about the Classification of Railways, Permanent Way & its components, functions.						2		3				2	2
		Railway engineering	CO 2	Analyze track alignment, geometric elements, Horizontal and Vertical curves, super elevation, and Negative Super elevation.				2					2	2		2	2
60	22CE4155	airport planning and	CO 3	Understand about the various factors affecting Selection of site for Airport.						2					2	2	2
		design	CO 4	Geometric Design of Runway, Computation of Runway length, Correction for runway length, Understand the layout of port components and operation of navigational aids that involved in functions of ports.				2		2	2					2	2

			CO 1	Understand the concept of sustainability, Challenges for Sustainable Development and Clean Development Mechanism			2								
		G	CO 2	Understand the sources, impacts of solid waste, Global environmental issues and Water Act, Air Act.			2								
61	22CE3213	Sustainable engineering & technology	CO 3	Understand the Life Cycle Analysis, Procedures of EIA, green materials for building construction and Methods for increasing energy efficiency of buildings Sustainable cities			2								
			CO 4	Understand the Conventional and non-conventional of Energy sources and Sustainable Urbanization, industrialization and poverty reduction			2								
			CO 1	Knowledge of Environmental Technology	1					2	2				
		Environmental impact	CO 2	To attain assessment of Impacts of Development activities	1					2	2				
62	22CE3223	assessment and life cycle	CO 3	To attain Environmental Impact assessment on water and air	1					2	2				
		analyses	CO 4	To know the preparation of Environmental Audit Report	1					2	2				
			CO 1	Identify the Hazardous solid waste	2						3				
63	22CE3233	Solid Waste Management	CO 2	Understand the Functional Elements of Solid Waste Management											
03	22CE3233	and Landfills	CO 3	Applying a mathematical model of municipal solid waste Management	2				1		3				
			CO 4	Construct and operate sanitary landfill	2						3				
			CO 1	Understand the concept of river equilibrium											
			CO 2	Apply the concepts of sediment transport processes	3		1								
64	22CE3214	River engineering	CO 3	Apply the methods of river training works for river stabilization	3		1								
			CO 4	Application of physical river models and governing equations in river flow	3		1								
65	22CE3224	Urban water hydrology and	CO 1	Analysis urban hydrological data for storm water management		3		2			2				2
0.5	55 22CE3224 1	hydraulics	CO 2	Estimate the components of urban hydrological processes		2		2			2				2

			CO 3	Estimate runoff from highways, airports and urban areas		3		2		2					2
			CO 4	Plan and design of urban drainage systems for an urban area		3		2		2					2
			CO 1	Applying the modelling techniques used in Air Pollution	2				1	3					
66	22CE40A2	Environmental Pollution Control	CO 2	Applying the Mathematical modelling techniques used for control of water Pollution	2				1	3					
		Methods	CO 3	Understanding the waste treatment unit processes											
			CO 4	Applying a mathematical model of municipal solid waste Management	2				1	3					
			CO 1	Understand the importance types, sources and disposal methods of Solid waste.	2		2			2					
67	22CE40A3	Solid and Hazardous waste	CO 2	Summarize the importance of conversion and recycling of waste	2					2					
		management	CO 3	Associate about types, Sources of Hazardous waste	2					2					
			CO 4	Discuss the disposal and treatment methods of Hazardous waste	2		2			2					
			CO 1	Understanding the Basics concepts of Remote Sensing	1										
68	22CE40A4	Remote Sensing and	CO 2	Understanding the Basic elements of image interpretation	1										
		GIS	CO 3	Understanding the concepts of GIS	1			2							
			CO 4	Understanding about the Land use /Land cover studies	1							3			
			CO 1	Understand the types of disasters, related hazards and the causes for disasters		2	2								
69	22CF40A5	Disaster	CO 2	The resilience and mitigation measures for various disasters by proper planning with respect to the kind of disaster that occurs		2	2								
	7776147101451	Management	CO 3	Understand the disaster risk, reduction and the various organizations involved with related to disasters.		2					2				
			CO 4	Understand the disaster vulnerability with the help of case studies			2				2				