Koneru Lakshmaiah Education Foundation
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DEPARTMENT OF CIVIL ENGINEERING

PROGRAM ARTICULATION MATRIX
Articulation Matrix – M. Tech Structural Engineering Program
Academic year 2022-23

Course Code	Course Title	Description of the Course Outcome	1	2	3	4	5	6
22CE5101	Advanced Mechanics of Solids	Interpret the theory of elasticity including strain/displacement and Hooke's law relationships in two dimensional planes	3		2	2	2	2
		Able to analyse the two-dimensional problems in polar coordinates	3	2		2	2	2
		Able to analyse the Three-dimensional problems in polar coordinates	3	2		2	2	2
		Able to analyse the Plasticity deformations of stress and strain.	3	2		2	2	2
22CE5102	Advanced Prestressed Concrete Design	Understand the concepts of prestressed concrete and analyze the prestressed concrete beams.	2		1	2	2	
		Analyze losses in prestressed concrete and deflection of the prestressed concrete members	2	3		2	2	
		Design reinforcement for Ultimate shear, torsion and bending of prestressed concrete members.	3		3	2		1
		Design end blocks as per IS 1343 recommendations.	3		3	2		
		Design of prestressed members, composite sections, continuous prestressed beams	3		3	2		

22CE5103	Advanced Concrete Technology	Understanding about Fly Ash, Ground Granulated Blast Furnace Slag, Silica Fume, Metakaolin, Red mud, Bentonite, Concrete Mix Design.	3	2	3	1	3	3
		Understanding about Nano Materials in Concrete, Water Proofing, Chemical Admixture in Concrete (Super Plasticizers, Retarders, & Accelerators), Fibers, Polymers	3	2	3	1	3	3
		Understanding about Mass Concreting, Roller Compacted Concreting, Pumped Concreting, Sprayed Concreting, Self-Compacted Concreting, Re-Cycled Aggregate Concreting	3	2	3	1	3	3
		Understanding about Corrosion of Reinforcing Steel, Chloride Ion Penetration, Carbonation, Service Life of RC Structures, Sulphate Attack, Alkali Silica Reaction, Acid Attack.	3	2	3	1	3	3
22CE5104	Structural Dynamics	Solve response of free and forced vibrations	2	2				
		Solve response to Arbitrary, Step and Pulse Excitations (SDOF)			2	2		
		Solve Earthquake Response of Linear Systems (SDOF)			2	2		
		Build Generalized Single Degree of Freedom Systems		2		2	1	
22CE5205	Theory of Plates and Shells	Derive the pure bending and curvature of plates	2	2		2		1
		Derive the differential equation for laterally loaded rectangular plates		3		2		2
		Derive the deformation of shells without bending	1					
		Understand the general theory of Cylindrical shells	2				2	
		Derive the pure bending and curvature of plates	2	2		2		1
22CE5206	Finite Element Analysis	Understand the Basic Finite Element Concepts	2	2		2		
		Analysis of Trusses, Beam Bending, Structural Frames and Column buckling using Finite Element Methods	2	2	1	2		
		Analysis of Higher order elements for one dimensional problems and Isometric quadrilateral elements and triangular elements	2	2		2		1
		Analyse the applications based on general two-dimensional boundary value problem	2	2		2		

		Demonstrate the ANSYS software to develop the models using Finite element method				2		2
22CE5207	Bridge Engineering	Introduction to different types of bridges and codal provisions for designing the bridge components.	1				1	
		Analysis and Design of slab Culvert.	2	3	1		2	
		Analysis and Design of T-Beam, sub-structure components and bearings	2				2	
		Understanding the designing of cable supported bridges.	2				2	
22CE5208	Earthquake Resistant Design of Structures	Understanding the designing of cable supported bridges.	1					
		Understand the system of base isolation in structures for resistance towards earthquakes and general detailing requirements of ductile structure.	1		2		1	
		Analyze a structure for earthquake forces onto the structure under static and dynamic behavior.		2	1			1
		Design the structure for earthquake forces on 2 –storey building		2				
22CE51A1	Pre-Engineered structures	Application of the prefabrication techniques and methodology	2					2
		Application of the knowledge of the construction methods Involved in these elements	2					2
		Analyse the prefabricated units	2					2
		Application of the concept of various joints for the connections	2		1			2
22CE51A2	Design of offshore structures	Analysis of Wave theories	2					2
		Analysis Forces of offshore structures	2					2
		Design of offshore structure & Analysis of offshore structures	2	3				2
		Design of offshore structures	2					2
22CE51B1	Design and detailing of RC Structures	Design of RC members	2	2	2	2	2	2
		Analysis, design and detailing of flat slab, grid slab	2	2	2	2	2	2

		Design and detailing of Elevated water tanks, cantilever and counterfort retaining walls	2	2	2	2	2	2
		Earthquake resistant design, Ductile detailing	2	2	2	2	2	2
22CE51B2	Repair and Rehabilitation of structures	Understand the Basic Parameters of Detoriation and Maintenance of Structures	1		1			
		Apply various tests on material for better improvement of retrofitting of structures	1	1			1	
		Understand the basic blended concrete materials	2	2	1			1
		Understand the retrofitting methodology and procedure	2	2				
22CE52C1	Fracture Mechanics	Understanding the basic concepts of Fracture and Linear Elastic Fracture Mechanics (LEFM)	1					1
		Understanding the concept of Crack Tip Plasticity	1		1			
		Understanding the concept Elastic Plastic Fracture Mechanics (EPFM)		2				
		Understanding the concept of Fatigue Crack Growth and practical problems of fracture mechanics		2	1			
22CE52C2	Design of Tall Structures	Understanding the design criteria of Tall structures	1		1			
		Understanding the Loadings On Tall Structures	2				2	
		Understanding the behaviour of Rigid-Frame Structures and Shear Wall Structures		2				
		Understanding the behaviour of Tubular Structures		2			1	
22CE52D1	Green Buildings	Understand Necessity and Role of Green Buildings & Regarding Indian Green Building Council; Grasp the construction practices of a Green Buildings.	1		2			
		Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Opportunities of Green Building, Green Building Features, Material and Resources, Green Building Design	1		2			
		Air Conditioning, Material Conservation	1		2			
		Indoor Environment Quality and Occupational Health	1		2			

22CE52D2	Stability of Structures	Introduction to buckling of columns	2		1		1	
		Analysis of lateral buckling of beams	2	3	1			
		Analysis of lateral buckling of plates and shells	2					1
		Understanding the Mathematical treatment of stability problems	2					
20 CE 5149	Seminar						2	2
20 IE 5250	Term Paper						2	2
20 IE 6050	Dissertation						2	2

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DEPARTMENT OF CIVIL ENGINEERING

PROGRAM ARTICULATION MATRIX
Articulation Matrix – M. Tech Construction Technology and Management
Academic year 2022-23

Course Code	Course Title	Description of the Course Outcome	1	2	3	4	5	6
22CE5121	Construction Planning Scheduling and Control	Understand the concepts of project management for practical application			2	1		
		Apply mathematical logic in the planning and scheduling of a project		1			3	
		Apply concepts to estimate the project cost by using tools			3		3	
		Apply concepts to maintain the construction documents in the project		2	1		1	
		Plan, schedule, and control large-scale programs and individual projects by using Primavera/MS Project Tool				3		1
22CE5122	Sustainable Construction Materials and Methods	Understand concepts of sustainable construction practices			2			2
		Understand basics of sustainable construction materials			2			2
		Design the product's process to achieve sustainability features	2		2			2
		Calculate Life Cycle Assessment of building			2		2	
		Investigate Sustainability aspects of the buildings by using LCA tools	2		1			2

22CE5123	Lean Construction Practices	Understand the elements of traditional construction management				2		
		Understand the integrated applications of various IT tools and case studies	2	2	2		1	
		Apply and analyse construction productivity measuring and improving techniques	3		3	3		1
		Implement lean principles in order to improve the customer value for sustainable project business			2	2		
		Apply and analyse the lean practices				2	2	
22CE5124	Building Information Modelling	Become familiar with the trends, concepts of Building Information Modelling	2			2		
		Learn about Project BIM Execution Planning				2		
		Design the BIM execution process by creating process maps		1		2	2	
		Develop BIM information exchanges			1	2	2	
		Developing BIM Model using Revit Software and submission of project report				2	2	
22CE5225	Mechanized Construction and Machinery	Understanding the basic concepts of Equipment Management and tools	2		3		1	
		Understand various construction equipment and study the efficient utilization of the same using scientific principles	2			1		
		Apply the knowledge for the selection of appropriate equipment	2					1
		Understand the operation of Earthwork and various functions of machinery used for Earth moving, compaction, etc.	2					
		Write field report on machinery operation, cost and productivity by using project management tools like primavera/Candy/SAP etc	2		1			
22CE5226	Project Formulation Appraisal	Understand the concept of project and Identification of best Project by understanding the different feasibility studies	1				1	

		Estimating the cash flows by considering the time value of money.	2				2	
		Identify the best project by analyzing facts related economic, commercial and financial aspects.	1		3			1
		Understand in detail about Private sector partnership in construction projects.	1					
22CE5227	Construction Laws and Regulations	Understand the concept of construction laws and regulations.	1		1			
		Study the current trend toward alternative project delivery systems via contractual arrangements such as design-build and construction management at risk		2			1	
		Investigate how to avoid the possibilities of construction disputes via alternative dispute resolution (ADR)		2				
		Understand the Labor regulations and review construction contracts and specifications		2				1
22CE5228	Quality Management and Safety Management Systems in Construction	Understand the concepts of quality management and the factors influencing construction quality	1		3	1	1	
		Understand quality planning and programs in construction industry	1					
		Acquire knowledge of quality management systems and ISO 9000 family of standards.	2			1		
		Understand and analyses quality circle (QC) concepts for possible implementation to solve construction productivity and quality problems	1	1			1	
		Understand and evaluate safety management principles in construction		2				
22CE51E1	Material Procurement Management	Understand the significance of material management	2		2			
		Integrate important materials functions to both products and services & use MRP, ERP,& PLM managing materials				3		1
		Apply various purchasing method and inventory controlling techniques into practice.				3		

		Use the Material Management tools like TALLY, ERP, SAP in materials planning, procurement, inventory, control, cost control etc.				3		
22CE51E2	Green Buildings	Understand Necessity and importance of Sustainable/ Green Buildings, Grasp the construction practices of a sustainable Buildings.					2	2
		Understanding the Green Building Rating Systems, Water & Energy efficiencies, Reduction in waste material during construction and Building Design	3	3	3			3
		Understanding Air Conditioning and HVAC system design, Salient features of CII Godrej Green Business Center					3	3
		Understanding Indoor Environment Quality and Occupational Health, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels,		3				
22CE51F1	Construction Personnel Management	Understand Overview of manpower planning and roles of HR		2	2			
		Understand Detail about the organizations and structure variance for organizations		2	2		2	
		Understand human relations and organizational behavior for working in an organization			2	2		
		Understand welfare measures and laws related to welfare measures and Detail overview of management and development methods	2	2		1		
22CE51F2		Understand the type of prefabricated elements and its importance			2		2	

	Pre-Engineering Construction and Technology	Understand the precast construction procedure			2		2	
		Understand the modular construction practices and its limitations and advantages			2	1	2	
		Apply knowledge in the choice of production setup and manufacturing methods			2	2	2	1
22CE52G1	Statistical Methods in Construction	Apply discrete and continuous probability distribution including requirements mean and variance and making decisions					2	
		Use the concepts of standard deviation, coefficient variance in different types samples and apply the tests			3		3	
		Perform the correlation analysis in various civil engineering projects					2	
		Apply simulation techniques for analysis and mitigation of construction project risks					3	
22CE52G2	Project Risk Management	Identify the stages involved in a project and analyze the obligatory services to be taken up while performing a construction activity	2		2			
		Cultivate an idea on effective resource utilization and identify factors affecting job productivity	2			1	2	
		Apply the professional skills acquired in managing a construction project.			2			1
		Gain the ability to attain an equilibrium among Innovation, Technology and Economic feasibility			2			
22CE52H1	Emerging Construction Technologies	Understand the modern construction techniques used in the sub structure construction			2		1	
		Understand the concepts used in the construction of special structures			2	1		
		Apply mechanism/technique for strengthening and repair methods for different cases.			2		2	

		Demonstrate knowledge and understanding of the principles and concepts relevant to super structure construction for buildings			2		2	
22CE52H2	Resource Management and Control in Construction	Understand overview of the resource planning and management of resources in construction			2	2		1
		Understand in detail about the labor management and optimization	2			2		
		Understand equipment management and effective utilization of the material resources	2			2	2	
		Understand detail about the allocation and levelling of resources with time management			2	2		
20IE5149	Seminar						2	2
20IE5250	Term Paper				3		2	2
20IE6050	Dissertation						2	2

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DEPARTMENT OF CIVIL ENGINEERING

PROGRAM ARTICULATION MATRIX
Articulation Matrix – M. Tech Geotechnical Engineering
Academic year 2022-23

Course Code	Course Title	Description of the Course Outcome	1	2	3	4	5	6
22CE5161	Advanced Soil Mechanics	Analyze effective stress for different field conditions.	2	2	1			1
		Calculate settlement of soils using one dimensional and three-dimensional consolidation theories.			2			
		Estimates shear strength of saturated and partially saturated soils.	2	2	2			
		Develop stress path diagrams for different load conditions.	2	2	2		1	
		Analyze soil properties by conducting various laboratory/ field tests.			3			
22CE5162	Sub-Surface Investigations	Analyze effective stress for different field conditions.	2	2	2			
		Calculate settlement of soils using one dimensional and three dimensional consolidation theories.	2	2	2			1
		Estimate shear strength of saturated and partially saturated soils.	2	2	2			
		Develop stress path diagrams for different load conditions.	2	2	2			
		Analyze the various sub-surface investigations by conducting various field or laboratory tests.	3	3		3	3	
22CE5163	Geo-Environmental Engineering	Consider possible susceptibility of soil properties to environmental effects.	2	2	2	2		
		Identify contaminant transport mechanisms in soils	2	2	2		1	1

		Estimate environmental influences on engineering properties of soil to be used in design.	2	3	2	2		2
		Apply environmental changes to soil stabilization and landfill engineering	2	2	2			2
		Analyze Geoenvironmental engineering characteristics by conducting various laboratory tests.	3	3	3	3		
22CE5164	Ground Improvement Techniques	Identify difficult ground conditions in engineering practice.	2	2	2			1
		Identify different ground improvement techniques.	2	2	2	1		
		Select Site specific method of improvement and its design	2	2	2		2	
		Promote wider use of techno – economical construction techniques such as Reinforced soil structures, Gabion walls, Crib walls and fabric form work.	2	2	2			3
		Analyze different ground improvement techniques by conducting various laboratory/ field tests or software tools			3	3		
22CE5265	Soil Dynamics & Geotechnical Earthquake Engineering	Understand the principles of soil dynamics, wave propagation and apply the base isolation techniques to design foundations	2	2	2			
		Understand the fundamentals of earthquake engineering, ground motion, evaluate the ground motion parameters and generate the artificial ground motion for any specific site	2	2	2		1	
		Understand the principles of seismic hazard principles and various methods of measuring the dynamic soil properties	2	2	2		2	
		Analyze the ground response analyses and evaluate the liquefaction potential for a given site	2	2	2			
		Generate the site-specific strong ground motion and perform the site specific ground response analysis and evaluate the liquefaction potential for a give site.	3			3	3	
22CE5266	Geosynthetics & Design of Retaining walls	Analyze the Geosynthetics and Different Types of Soil Retaining Structures Construction Aspects of Geosynthetic Reinforced Soil Retaining Walls Design Codes for Reinforced Soil Retaining Walls	3					3
		Analyze the Reinforced Soil Retaining Walls – simple geometry Design of reinforced soil retaining walls	3			1		3

		Analyze the Stability analysis of reinforced soil slopes.	3				2	3
		Apply and Analyze application of geosynthetics.	3					3
		Analyze the various geosynthetics characteristics by using laboratory testing.	2	2	2			3
22CE5267	Design of Earth & Earth Retaining Structures	Analyze Earth pressure theories for different field conditions.	2	2	2			
		Designing the earth retaining structures at different conditions.	2	2	2			1
		Designing the sheet piles and cofferdam.	2	2	2			
		Analyze and design the stability of slopes .	2	2	2			
		Analyze the various earth retaining characteristics by conducting filed/lab/ software tools or spread sheets.	3			3	3	
22CE5268	Advanced Foundation Engineering	Select different types of foundations based on site conditions.	2	2	2	2		
		Analyze the foundation in swelling soils	2	2	2	2		
		Analyze the spread footings and factors affecting it.	2	2	2	2	1	
		Analyze the rectangular, trapezoidal, and strap footings	2	2	2	2		
		Analyze Mat foundations and machine foundations			3	3		
22CE51M1	Soil structure interaction	Analyze the basic soil models.	2	2	2			
		Analyzing beam and winkler foundations	2	2	2			
		Estimate shear Beams on Elastic continuum	2	2	2			
		Analyzing path Pile on Winkler foundation.	2	2	2			
22CE51M2	Finite Element Methods	Derive stress deformation relationships for 1-D,2-D and 3-D Problems for use in FEM	2	2	2		2	
		Derive element stiffness matrices of elements by various approaches	2	2	2			
		Formulate stiffness matrices for two dimensional and axisymmetric problems	2	2	2			
		Derive FEM formulations for Settlement Analysis ,Seepage Analysis and Consolidation Analysis	2	2	2			
		Understand about the stability of slopes	2	2	2			

22CE51N1	Stability Analysis of Slopes	Analyzing the different types of soil and slopes conditions.	2	2	2			
		Analyzing the stability of slopes by using the contaminated soil filling.	2	2	2			3
		Analyzing the slopes using different geo synthetics materials by filling soil.	2	2	2			
22CE51N2	Design of Highways and Airfield pavements	Understand different types of pavements	2	2	2			
		Design flexible pavements as per codal provisions	2	2	2			
		Design rigid pavements as per codal provisions	2	2	2			
		Design joints, pavement overlay and analyze pavement condition in all weather conditions	2	2	2			
22CE52O1	Solid Waste Management and Landfills	Understand the types, classification and properties of solid waste and options available for disposal and classification and disposal of Hazardous waste	2	2	2			
		Understand engineered systems for solid waste management and conversion and recovery of materials and energy, Applying Modeling Technique using to solid waste Management	2	2	2			
		Understand Familiarize with landfills , site selection design and operation, collection of gas and lechate , treatment of lechate and CPCB and MOEF guidelines. Applying the design criteria to construction of landfills	2	2	2			
		Understand Familiarize with clay and geo synthetic lining systems types and function	2	2	2			
22CE52O2	Offshore Geotechnical engineering	Analyze index and engineering properties of marine clays.	2	2	2	2		
		Adopt suitable investigation method and sampling techniques for these marine deposits	2	2	2			
		Analyze loads on offshore structures and select appropriate foundation for these structures.	2	2	2	2		
		Implement required ground improvement technique for these structures	2	2	2			2
22CE51P1	RS & GIS Applications in Civil Engineering	Understanding and Applying the Basics of Remote Sensing	2	2	2			
		Understanding and analysing the Basic elements of image interpretation	2	2	2			

		Understanding and analysing about the GIS	2	2	2			
		Understanding and analysing about Land use /Land cover studies	2	2	2		1	
22CE52P2	Constitutive Modeling in Geo-techniques	Analysing the soil fundamental and modelling.	2	2	2			
		Determining the soil plasticity characteristics	2	2	2			
		Analyzing the soil Elastic and plastic characterizes	2	2	2			3
		Analyzing the clay model: critical state line, shear strength, stress-dilatancy, index properties, and prediction of conventional soil tests. Applications	2	2	2			
20 IE 5148	Seminar						2	2
20 IE 5250	Term Paper						2	2
20 IE 6050	Dissertation						2	2

Head of the Department