



# ADITYA ENGINEERING COLLEGE

An Autonomous Institution

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## Department of Civil Engineering

### M.Tech (Structural Engineering) - AR19 - Course Articulation Matrix

Note: Correlation Levels are 1 or 2 or 3. Where 1- Slight(Low), 2 - Moderate(Medium), 3 - Substantial (High).

-	CO Statements	POs												PSOs		
<b>I SEM</b>																
Course Code	192ST1T01 THEORY OF ELASTICITY	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the theory of elasticity including strain / displacement and hooke's law relationships.	-	1		2	2	1		-	-	-	-	-	1	-	-
CO2	Apply fourier series for two dimensional problems for gravity loading	-	1		2	2	1		-	-	-	-	-	1	-	-
CO3	Develop general equations for two dimensional problems in polar coordinates	1	2	1	3	3	2	-	-	-	-	-	-	2	-	-
CO4	Determine principal stress and shear stress using general theorems	2	3	2	3	3	3	-	-	-	-	-	-	3	1	-
CO5	Develop solutions for torsional problems by energy method.	-	1		2	2	1	-	-	-	-	-	-	1	-	-
Course Code	192ST1T02 STRUCTURAL DYNAMICS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the response of structural systems to dynamic loads.	-	1		2	-	-	-	-	-	-	-	-	1	-	-
CO2	Demonstrate the behaviour and response of linear non SDOF and MDOF	-	1		2	-	-	-	-	-	-	-	-	1	-	-
CO3	Utilize the behaviour and response of MDOF structures with various dynamic loadings.	1	2	1	3	-	-	-	-	-	-	-	-	2	-	-
CO4	Apply the ability to find out suitable solution for continuous system	1	2	1	3	-	-	-	-	-	-	-	-	2	-	-
CO5	Design of multi story building using earthquake load.	2	3	2	-	-	-	-	-	-	-	-	-	1	-	-

-	CO Statements	POs												PSOs		
Course Code	192ST1T03 ADVANCED CONCRETE TECHNOLOGY	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain various concrete making materials	-	1	-	2	-	-	-	-	-	-	-	-	1	-	-
CO2	Apply the concepts of workability characteristics and durability testing on concrete.	1	2	1	3	-	-	-	-	-	-	-	-	2	-	-
CO3	Interpret various design principles and properties of high strength concrete.	-	1	-	2	-	-	-	-	-	-	-	-	1	-	-
CO4	Design special concrete and mix design using BIS Method – IS.10262 – 2019	1	2	1	3	-	-	-	-	-	-	-	-	2	-	-
CO5	Illustrate assembling and disassembling principles of formwork materials.	-	1	-	2	-	-	-	-	-	-	-	-	1	-	-
Course Code	192ST1E01 MATRIX ANALYSIS OF STRUCTURES (Professional Elective-1)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Apply the concepts of matrix methods to model trusses, beams, and frames	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Analyse structures using matrix methods by analytical methods and software tools with different degrees of freedom	2	3	2	-	-	-	1	-	-	-	-	-	3	1	-
CO3	Evaluate and compare behaviour of structural elements under different boundary conditions.	2	3	2	-	-	-	1	-	-	-	-	-	3	1	-
CO4	Analyse the continuous beams with or without settlement by flexibility approach.	2	3	2	-	-	-	1	-	-	-	-	-	3	1	-
Course Code	192ST1E02 ANALYTICAL & NUMERICAL METHODS FOR STRUCTURAL ENGINEERING (Professional Elective-1)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the fundamentals of the numerical study.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Implement the principles and techniques of elliptic's.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Obtain the principles and techniques of integral methods.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Adopt the principles and techniques for simply supported beams, columns and rectangular plates.	1	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO5	Calculate the slope and deflection of beams by using different methods.	2	3	2	-	-	-	-	-	-	-	-	-	3	1	-
Course Code	192ST1E03 DESIGN OF REINFORCED CONCRETE FOUNDATIONS (Professional Elective-1)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Design reinforcements for footings and column pedestals.	1	2	1	3	3	-	-	-	-	-	-	-	2	-	-

-	CO Statements	POs												PSOs		
CO2	Analyse different types of wall footings and strip footings for conventional buildings.	2	3	2		-	-	1	-		-	-	-	3	1	-
CO3	Understand the solutions of raft and mat foundations for soft surficial soils.	-	1		2	-	-	-	-		-	-	-	1	-	-
CO4	Design combined pile raft foundations for heavily loaded structures	-	2	1	3	3	-	-	-		-	-	-	2	-	-
CO5	Apply the concepts of under-reamed pile foundations in challenging soil conditions	-	2	1	3	3		1	-		-	-	-	2	-	-
<b>Course Code</b>	<b>192ST1E04 BRIDGE ENGINEERING (Professional Elective-2)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	Explain the basic concepts of bridges	-	1	-	1	-	-	-	-	-	-	-	-	1	-	-
CO2	Apply various concepts of super structure and substructure in design of bridges.	1	2	1	3	-	-		-	-	-	-	-	2	-	-
CO3	Design Culvert, R.C.C T Beam Bridge according to the given specifications	1	2	1	3	-	-	-	-	-	-	-	-	2	-	-
CO4	Design Plate girder bridges.	1	2	1	3	-	-	-	-	-	-	-	-	2	-	-
CO5	Design Abutments, Piers and Pipe Culverts.	1	2	1	3	-	-	-	-	-	-	-	-	2	-	-
<b>Course Code</b>	<b>192ST1E05 REPAIR AND REHABILITATION OF STRUCTURES (Professional Elective-2)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	Identify various mechanisms of degradation of concrete structures and Non destructive evaluation procedures	-	1		2	-	-	-	-	3	-	-	-	1	-	3
CO2	Develop and suggest repair strategies for deteriorated concrete structures including repairing with composites.	1	2	1	3	-	-	-	-	-	-	-	-	2	-	2
CO3	Explain the different FRP applications and bonding mechanisms in structures	2	3	2	-	-	-	-	-	-	-	-	-	3	1	3
CO4	Explain the properties and applications of different types of concretes	2	3	2	-	-	-	-	-	-	-	-	-	3	1	3
CO5	Identify the materials and properties of high performance and self consolidating concrete.	-	1	-	2	-	-	-	-	3	-	-	-	1	-	3
<b>Course Code</b>	<b>192ST1E06 ADVANCED REINFORCED CONCRETE DESIGN (Professional Elective-2)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	Understand and apply limit state method of design.	-	1	-	2	-		-	-	-	-	-	-	1	-	-
CO2	Analyze yield line criteria of different types of slabs.	2	3	2	-	-		1	-	-	-	-	-	3	1	-

-	CO Statements	POs												PSOs		
CO3	Design flat slabs and ribbed slabs.	2	3	2	-	-		1	-	-	-	-	-	3	1	-
CO4	Design flat slabs and ribbed slabs.	2	3	2	-	-		1	-	-	-	-	-	3	1	-
Course Code	<b>192ST1L01 ADVANCED CONCRETE TECHNOLOGY LABORATORY (Professional Elective-2)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	Determine various physical properties of Cement, Aggregates.	1	2	-	-	3	-	-	-	-	-	-	-	2	-	3
CO2	Determine Strain measurement	1	2	-	-	3	-	-	-	-	-	-	-	2	-	3
CO3	Demonstrate Non-destructive testing.	1	2	-	-	3	-	-	-	-	-	-	-	2	-	-
CO4	Determine various chemical properties of Concrete, Aggregate and Sand	1	2	-	-	3	-	-	-	-	-	-	-	2	-	-
Course Code	<b>192ST1L02 ADVANCED STRUCTURAL ENGINEERING LABORATORY (Professional Elective-2)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	Summarize the testing methods and equipments.	-	1	-	-	-	1		-	-	-	-	-	1	-	2
CO2	Evaluate the failures of reinforced concrete structures	1	2	1	-	-	2		-	-	-	-	-	2	-	3
CO3	Analyze the performance of slab elements	2	3	2	-	-	3	1	-	-	-	-	-	3	1	-
<b>II SEM</b>																
Course Code	<b>192ST2T04 FINITE ELEMENT METHODS IN STRUCTURAL ENGINEERING (Professional Elective-2)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO1	Summarize direct and formal methods for deriving finite element equations.	-	1		-	-	-	-	-	-	-	-	-	1	-	-
CO2	Solve truss elements using the finite element method.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Apply finite element methods for analysis of beam and frame elements.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Analyze plane stress, plane strain, axisymmetric problems element method.	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO5	Analyze isoparametric formulations.	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-

-	CO Statements	POs												PSOs		
Course Code	192ST2T05 THEORY OF PLATES AND SHELLS (Professional Elective-2)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Have a knowledge about various plate theories due to bending	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Gain the knowledge of Navier's solution, Levy's solution and solve for the rectangular and square plates		3		-	-	-	-	-	-	-	-	-	1	-	-
CO3	Analyse circular plates with various boundary conditions.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Focus on the finite difference method of solving shell problems	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Analyse cylindrical shells with the help of codal provisions.	2	3	2	-	-		1	-	-	-	-	-	3	1	-
CO6	Design of beams, Paraboloid shapes by beam and membrane theory	2	3	2				1						3	1	
Course Code	192ST2E07 STABILITY OF STRUCTURES ( Professional Elective-III )	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyse different types of structural instabilities.	1	2	1	-	-	-	-	-	-	-	-		2	-	-
CO2	Execute and work out the elastic buckling using various methodologies.	2	3	2	-	-	-	1	-	-	-	-		3	1	-
CO3	Examine the behaviour of beam columns using classical methods.	1	2	1	-	-	-	-	-	-	-	-		2	-	-
CO4	Workout the torsional buckling of open cross sections.	1	2	1	-	-	-	-	-	-	-	-		2	-	-
CO5	Obtain the simply supported beams due to lateral and flexural buckling.	1	2	1	-	-	-	-	-	-	-	-		2	-	-
Course Code	192ST2E08 ADVANCED STEEL DESIGN ( Professional Elective-III )	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Design of Bolted, Riveted and Welded connection between the steel members.	-	1		2	-	1	-	-	-	-	-	-	1	-	-
CO2	Plastic analysis of beams and frames with vertical and horizontal load.	-	1		2	-	1	-	-	-	-	-	-	1	-	-
CO3	Analysis of beams, columns and frames with moment, bracket and seat connections.	1	2	1	3	-	2	-	-	-	-	-	-	2	-	-
CO4	Design of industrial buildings subjected to wind loads.	2	3	2	-	-	3	-	-	-	-	-	-	3	1	-
CO5	Design of steel truss girder bridges subjected to gravity loads		1		2	-	1	-	-	-	-	-	-	1	-	-

-	CO Statements	POs												PSOs		
<b>Course Code</b>	<b>192ST2E09 ANALYSIS OF OFFSHORE STRUCTURES (Professional Elective-III)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	Perform concept development of offshore structure.		1	-	-	-	-	-	-	-	-	-	-	1	-	-
<b>CO2</b>	Understand the concept of waves using static and kinematic theories.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
<b>CO3</b>	Find the wave force on vertical cylinder.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
<b>CO4</b>	Observe the wave force by various theories.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
<b>CO5</b>	Perform static and dynamic analysis of fixed offshore structure	2	3	2	-	-	-	1	-	-	-	-	-	3	1	-
<b>Course Code</b>	<b>192ST2E10 EARTHQUAKE RESISTANT DESIGN OF BUILDINGS (Professional Elective-IV)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	To learn the fundamentals of seismology and basic earthquake mechanisms, tectonics types of ground motion, and propagation of	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-
<b>CO2</b>	Design of structural and non-structural elements with seismic design concepts.	2	3	2	-	-	-	1	-	-	-	-	-	3	1	-
<b>CO3</b>	Examine the frames and shear wall detailing under earthquake	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
<b>CO4</b>	Summarise cyclic loading behaviour of structural elements with various concepts.	1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
<b>CO5</b>	Understand the failures of earthquake and Retrofitting, restoration techniques for buildings.	-	1		-	-	-	-	-	-	-	-	-	1	-	-
<b>Course Code</b>	<b>192ST2E11 PRECAST AND PREFABRICATED STRUCTURES (Professional Elective-IV)</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	Explain the need for fabrication and types of prefabrication.	-	1	-	2	-	-	-	-	-	-	-	-	1	-	-
<b>CO2</b>	Apply the design of prefabricated load carrying members	-	1		2	-	-	-	-	-	-	-	-	1	-	-
<b>CO3</b>	Develop the effective sealing of joints for water proofing.	1	2	1	3	-	-	-	-	-	-	-	-	2	-	-
<b>CO4</b>	Determine the functions and design principles of production equipment and hoisting equipment	2	3	2	-	-	-	-	-	-	-	-	-	3	1	-
<b>CO5</b>	Develop the designing and detailing of precast unit for factory structures.	-	1		2	-	-	-	-	-	-	-	-	1	-	-

-	CO Statements	POs												PSOs		
Course Code	192ST2E12 EARTH RETAINING STRUCTURES (Professional Elective-IV)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the lateral earth pressure associated with different earth systems	-	1		-	-	-	-	-	-	-	-	-	1		-
CO2	Apply the design of retaining structures by using appropriate design methods and earth pressure diagrams.		1		-	-	-	-	-	-	-	-	-	1		-
CO3	Develop the location of sheet pile walls and design of anchorage system	1	2	1	-	-	-	-	-	-	-	-	-	2		-
CO4	Determine the functions and design principles of reinforced earth retaining structures.	1	2	1	-	-	-	-	-	-	-	-	-	2		-
CO5	Develop the stability aspects of braced cuts and coffer dams.	2	3	2	-	-	-	-	-	-	-	-	-	3	1	-
Course Code	192ST2L03 COMPUTER AIDED DESIGN LABORATORY (Professional Elective-IV)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Develop Computer Programs for Analysis and Design of various Structural Elements	2	3	2	-	-	3	1	-	-	-	-	-	3	1	-
CO2	Use different Structural Engineering software's to solve various civil Engineering programs.	2	3	2	-	-	3	1	-	-	-	-	-	3	1	-
CO3	Summarize the performance of structures for static and dynamic forces	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Course Code	192ST2L04 STRUCTURAL DESIGN LABORATORY (Professional Elective-IV)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Develop Computer Programs for Analysis and Design of various Structural Elements	2	3	2	-	-	3	1	-	-	-	-	-	3	1	-
CO2	Use different Structural Engineering software's to solve various civil Engineering programs	2	3	2	3	-	3	1	-	-	-	-	-	3	1	-
CO3	Describe the principles for the design of experiments.	-	1			-	-	-	-	-	-	-	-	1	-	-
Course Code	192ST3E13 DESIGN OF PRE-STRESSED CONCRETE MEMBERS (Professional Elective-V)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the principle, types and systems of prestressing and analyze the losses.	1	-	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Determine the deflections as per code references in pre-stressed concrete members	1	-	1	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Analyze the Composite construction of Pre-stressed members.	2	3	2	-	-	-	1	-	-	-	-	-	3	1	3
CO4	Design the pre-stressed concrete members of slabs, pipes and poles. Analyze the continuous beams and end blocks by different theorems	2	3	2	-	-	-	1	-	-	-	-	-	3	1	3





