MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(Deemed University)

(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Department of Civil Engineering

Scheme of Evaluation

M. Tech. I Semester *(Structural Design)*

(for batch admitted in academic session 2025-26)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	72251101	DC	Advanced Steel Design	25	25	20	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	72251102	DC	Matrix Method of Structural Analysis	25	25	20	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
3.	72251103	DC	Advanced RC Design	25	25	20	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	722511XX	DE	**Departmental Elective (DE-1)**	25	25	20	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
5.	72251104	SPC	Structural Dynamics	25	25	20	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	72251105	DLC	**Structural Engineering Lab** [#]	-	-	-	-	70	30	100	-	-	4	2	Experiential	SO	-
7.	72251106	SLP	**Seminar/Presentation** [$]	-	-	-	-	70	30	100	-	-	4	2	Mentoring	SO	-
8.	72251110	NEC	**Classified Novel Engaging Course (Activity Based Learning)**	-	-	-	-	-	50	50	-	1	-	1	Interactive	SO	-
Total				**125**	**125**	**100**	**150**	**140**	**110**	**750**	**13**	**03**	**08**	**20**	-	-	-

MCQ: Multiple Choice Question **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

[$]Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-1		
S. No.	**Course Code**	**Course Name**
1.	72251107	Advanced Foundation Engineering
2.	72251108	Design of Composite Structure
3.	72251109	Advanced Concrete Technology

Mode of Learning					Mode of Examination					Total Credits
Theory		Lab		NEC	Theory			Lab	NEC	
Face to Face	Online	Mentoring	Experiential	Interactive	PP	MCQ	OB	SO	SO	
15		2	2	1	15			4	1	20
75%		10%	10%	5%	75%			20%	5%	Credits %

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Scheme of Evaluation

M. Tech. II Semester *(Structural Design)*

(for batch admitted in academic session 2025-26)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted								Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block		MOOCs									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation	Assignment	Exam		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional											
1.	72251201	DC	Design of Bridges	25	25	20	30	-	-	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	72251202	DC	Design of Prestressed Concrete Structure	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
3.	72251203	DC	Earthquake Resistant Design	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	722512XX	DE	**Departmental Elective*(DE-2)**	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
5.	72251204	SPC	Design of Tall Buildings	25	25	20	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
6.	72251205	DLC	**Design Lab #**	-	-	-	-	70	30	-	-	100	-	-	4	2	Experiential	SO	-
7.	72251206	SLP	**Seminar/Presentation$**	-	-	-	-	70	30	-	-	100	-	-	4	2	Mentoring	SO	-
8.	72251207	NEC	**Classified Novel Engaging Course (Activity Based Learning)** Fire Safety & Regulation in Building	-	-	-	-	-	50	-	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**80**	**120**	**140**	**110**	**25**	**75**	**750**	**12**	**04**	**08**	**20**	-	-	-

MCQ: Multiple Choice Question **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

*This course will run through SWAYAM / NPTEL /MOOC based learning platform (with credit transfer facility). The course can be related & relevant to other domain as well.

#During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

$Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-2* *(through SWAYAM / NPTEL /MOOC)*

S. No.	Course Code	Course Name
1.		Repair & Rehabilitation of Structures
2.		Finite Element Method
3.		Construction Method & Equipment Management

Mode of Learning					Mode of Examination					Total Credits
Theory		Lab		NEC	Theory			Lab	NEC	
Face to Face	Online	Mentoring	Experiential	Interactive	PP	MCQ	OB	SO	SO	
12	3	2	2	1	12	3		4	1	20
60%	15%	10%	10%	5%	60%	15%		20%	5%	Credits %

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Scheme of Evaluation

M. Tech. III Semester *(Structural Design)*

(for batch admitted in academic session 2025-26)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	72252101	DLC	**Preliminary Dissertation** *(Literature Review/ Problem Foundation/ Synopsis/survey paper, etc.)*	-	-	-	-	175	75	250	-	-	28	**14**	Interactive	SO	-
Total				-	-	-	-	**175**	**75**	**250**	-	-	**28**	**14**	-	-	-

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Scheme of Evaluation

M. Tech. IV Semester *(Structural Design)*

(for batch admitted in academic session 2025-26)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	72252201	DLC	Dissertation	-	-	-	-	350	150	500	-	-	32	16	Interactive	SO	-
Total				-	-	-	-	**350**	**150**	**500**	-	-	**32**	**16**	-	-	-

Course Code: 72251101

Course Name: Advanced Steel Design

L	T	P	Credit
3	0	0	3

Course Objectives:

To provide advanced knowledge and skills for the analysis and design of steel structures including bunkers, silos, chimneys, bridges, industrial buildings, and multi-storey buildings under various loading conditions.

SYLLABUS

Unit I:

Introduction to Design Philosophies, Design of Bunker and Silos.

Unit II:

Design of Chimney and transmission tower.

Unit III:

Design of elevated steel tanks and pressed steel tanks

Unit IV:

Design of industrial structures for gravity and wind load, Pre-engineered buildings

Unit V:

Plastic Design, Introduction to Stability Analysis,

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: Design the Bunker and Silos.

CO2: Design the Chimney and transmission tower.

CO3: Design the steel tanks.

CO4: Design the industrial structures.

CO5: Design for plastic and stability analysis.

Reference Books

1. Design of Steel Structures, B. C. Punmia, A. K. Jain and A. K. Jain, Laxmi Publication
2. Design of Steel Structure, Ramchandra and Virendra Gehlot, Scientific Publication
3. Design of Steel Structures, N. Subrhamanyan, Oxford.
4. Design of Steel Structure, S. K. Duggal, Tata Mc Graw Hill.
5. Design of Steel Structure, Shah and Gore, Structures Publishers, Pune

Course Code: 72251102

Course Name: Matrix Method of Structural Analysis

L	T	P	Credit
2	1	0	3

Course Objective:

To understand the concept of flexibility and stiffness method to analyze determinate and indeterminate structures.

SYLLABUS

Unit-I

Generalised Measurements, Degrees of freedom, Constrained Measurements, Behaviour of structures, Principle of superposition, Stiffness and flexibility matrices

Unit-II

Stiffness and flexibility matrices from strain energy, Betti's law and its applications to determinate and indeterminate structures, Transformation of element matrices to system matrices.

Unit-III

Flexibility method - Application to beams, frames and truss, Choice of redundant, internal forces due to thermal expansion and lack of fit.

Unit-IV

Displacement method – Application to beams, frames and truss, Internal forces due to thermal expansion and lack of fit.

Unit-V

Analysis of space frames using stiffness method.

Course Outcomes:

Upon completion of the course, a student willbe able to

CO1: Understand the concept of flexibility and stiffness matrices.

CO2: Analyse the structures using energy methods.

CO3: Analyse the structures using flexibility method.

CO4: Analyse the structures using stiffness method.

CO5: Analyse the grids and space frames.

Reference books

1. Matrix Analysis of Framed Structures, W. Weaver and J. M. Gere, C.B.S. Publication, New Delhi.
2. Structural Analysis: A Matrix Approach, G. Pandit and S. Gupta, Tata Mc Graw Hill Pub. Co. Ltd. New Delhi.
3. Matrix Computer Analysis of Structures, M. F. Rubenstein, Prentice Hall, New York
4. Computational Structural Mechanics, S. Rajasekaran, Prentice Hall of India, New Delhi

Course Code: 72251103
Course Name: Advanced RC Design

L	T	P	Credit
2	1	0	3

Course Objective:

To understand the design of flat slabs, redistribution of moments in beams, analysis of grid floors, design of ribbed slabs, columns and structural walls.

SYLLABUS

Unit-I

Flat Slabs: Direct Design Methods, Limitations of Direct Design Methods, Shear in flat slabs, Equivalent frame method.

Unit-II

Redistribution of Moments in Beams: Condition of moment redistribution, Single span beams, Two Span beams and design of sections.

Deep Beams: General features, Parameters influencing design, Flexural bending stresses, shear stresses in deep beams. Minimum thickness, design by IS-456, design as per British and American Practice, beam with holes.

Unit-III

Approximate Analysis of Grid Floors: Analysis by (i) Timoshenko's plate theory (ii) Stiffness method (iii) Equating joint deflection.

Design of Ribbed (voided) slabs: Specifications regarding the slabs, Analysis and design of the slabs for moment and shears.

Yield Line Theory: Assumptions, location of yield lines, methods of analysis, analysis of one way and two way slabs.

Unit-IV

Columns: Effective length, unbraced and braced columns, stability index, column subjected to combined axial load and bending.

Unit-V

Structural Walls: Braced and unbraced walls, slenderness of walls, design of walls for vertical and plane horizontal forces.

Shear Walls: Classification of shear walls, classification according to behaviour and design of rectangular and flanged shear walls.

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: Design the flat slab.

CO2: Design the deep beam and spandrel beam.

CO3: Design the ribbed slab.

CO4: Design the column.

CO5: Design the structural walls.

Reference Books

1. Advanced Reinforced Concrete Design, P. C. Varghese, PHI Learning.
2. Reinforced Concrete Limit State Design, A. K. Jain, Nem Chand & bros. Roorkee.
3. Advanced Reinforced Concrete Design, Krishna Raju, C.B.S. Publication, New Delhi
4. Reinforced Concrete Design, S. N. Sinha, Tata Mc Graw Hill Pub. Co. Ltd. New Delhi
5. Reinforced Concrete Design, S. U. Pillai and D. Menon, Mc Graw Hill.

Course Code: 72251104
Course Name: Structural Dynamics

L	T	P	Credit
3	0	0	3

Course Objective:

To understand the concepts of SDOF system, MDOF system, free vibration, damping, forced vibration, response spectrum, generalized SDOF system and continuous system.

SYLLABUS

Unit I

Single Degree of Freedom (SDOF) System, Equation of motion, Undamped free vibration, forced vibration under harmonic, impulse and general loading.

Unit-II

Multi-Degree of Freedom (MDOF) System, Dynamic equation of equilibrium, natural modes and their properties, eigen value and their numerical solution, free vibration response for undamped system and damped system.

Unit-III

Earthquake response of SDOF system, Earthquake excitation, Response history and construction of response spectra, Response spectrum characteristics, tripartite plot and design spectrum.

Unit-IV

Generalized SDOF system- Basic concept, mass-spring system, Lumped mass systems, systems with distributed mass and elasticity, Rayleigh's method, shape function.

Unit-V

Introduction to dynamic of continuous system, Equation of motion for axial and flexural vibration of beam, Free vibration analysis, Forced vibration analysis.

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: Apply the concept of SDOF system for free and forced vibration.

CO2: Apply the concept of MDOF system for free vibration.

CO3: Evaluate the earthquake response of SDOF system for earthquake excitation.

CO4: Evaluate the mass-spring system, lumped mass system and distributed mass system.

CO5: Analyze the dynamics of continuous systems.

Reference Books

1. Dynamics of Structures, A. K. Chopra, PHI Learning.
2. Dynamics of Structures, R. W. Clough and J. Penzien, McGraw Hill.
3. Elements of Earthquake Engineering, Jai Krishna, A. R. Chandershekhran and Brijesh Chandra, Standard Publisher
4. Dynamics of Structure with Earthquake Engineering, A. K. Jain, Pearson

Course Code: 72251107
Course Name: Advanced Foundation Engineering

L	T	P	Credit
3	0	0	3

Course Objective:

To provide in-depth knowledge and understanding of the behavior, analysis, and design of various foundation systems under complex loading and soil conditions, incorporating theoretical and practical aspects for safe and economical design.

SYLLABUS

Unit I: Soil Exploration and Subsurface Investigation

Planning of soil exploration programs, Methods of boring and sampling, In-situ tests: SPT, SCPT, DCPT, Pressuremeter, Dilatometer, Vane shear test, Geophysical methods: Seismic refraction, Electrical resistivity, Preparation of soil investigation reports

Unit II: Bearing Capacity and Settlement Analysis

Bearing capacity theories for shallow and deep foundations, General and local shear failure modes, Influence of water table and eccentric loading, Immediate, consolidation, and secondary settlement, Tolerable settlements and differential settlements

Unit III: Shallow Foundations

Types and selection criteria of spread and combined footings, Mat foundations, Raft foundations under different loading and soil conditions, Ground improvement techniques for shallow foundations.

Unit IV: Deep Foundations

Pile types, materials, and installation techniques, Static and dynamic analysis of single piles, Pile load tests and interpretation, Group effect and pile group design, Negative skin friction and pile driving considerations

Unit V: Special Foundation Problems

Foundations on expansive soils, Foundations on collapsible and reclaimed soils, Under-reamed piles and well foundations, Machine foundations: Dynamic loads and vibration isolation.

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: Plan and execute geotechnical investigations using appropriate in-situ and laboratory tests.

CO2: Evaluate the bearing capacity and settlement behavior of soil under various loading conditions.

CO3: Design the shallow foundations, including footings and rafts, based on geotechnical data and structural requirements.

CO4: Design the deep foundation including pile foundations and understand the group behavior and installation challenges.

CO5: Address special foundation problems in problematic soils and evaluate machine foundations under dynamic loading and vibration criteria.

Reference Books

1. Soil Mechanics and Foundation Engineering by V.N.S. Murthy, CBS Publishers
2. Foundation Engineering by P.C. Varghese, PHI Learning
3. Basic and Applied Soil Mechanics by Gopal Ranjan, ASR Rao, New Age International Publisher
4. Soil Mechanics and Foundation Engineering by K R Arora, Standard Publishers
5. Foundation Design: Principles and Practices by Donald P. Coduto, Pearson Publishers

Course Code: 72251108
Course Name: Design of Composite Structures

L	T	P	Credit
3	0	0	3

Course Objective:

To understand the method of analysis and design of shear connection, composite beams and slabs, composite columns, composite frames, composite shear wall, composite trusses and composite plate girders.

SYLLABUS

Unit I

Introduction, Design philosophy, Properties of materials, Method of analysis and design

Unit II

Design of shear connection, Methods of shear connection, Properties of shear connectors

Unit III

Design of simply supported composite slabs and beams, continuous beams and slabs, beams in frame

Unit IV

Design of composite columns and frames

Unit V

Design of Composite shear wall, composite trusses, composite plate girders

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: Understand the method of analysis and design.

CO2: Design the shear connection.

CO3: Design the simply supported and continuous composite slabs and beams.

CO4: Design the composite columns and frames.

CO5: Design the composite shear wall, trusses and plate girdres.

Reference Books

1. Composite Structures of Steel and Concrete, R. P. Johnson, Wiley Blackwell
2. Composite Steel-Concrete Structures, D. R. Panchal, Scholar Press

Course Code: 72251109
Course Name: Advanced Concrete Technology

L	T	P	Credit
3	0	0	3

Course Objective:

The primary objective of this course is to provide in-depth knowledge of the properties, behavior, and performance of concrete as a construction material. The course aims to enhance students understanding of advanced concepts in durability, and innovative concrete types along with the latest testing methods and quality control techniques.

SYLLABUS

Unit 1:

Concrete as a composite material; Materials science aspects of the properties and behavior of Cement Concrete: physical and chemical aspects of cement hydration, type and morphology of hydrates; Chemical and Mineral admixtures for concrete

Unit 2:

Properties of Fresh and hardened concrete and quality control in concrete construction, Rheological behaviour of fresh Concrete – Fresh and hardened concrete properties; elastic behavior, shrinkage, creep, behavior under various stress states.

Unit 3:

Durability of concrete: Permeability, chemical attack, acid attack, corrosion in concrete.

Unit 4:

Modern trends in concrete manufacture and placement techniques, Methods of transportation, placing and curing-extreme whether concreting, Special concreting methods – Vacuum dewatering of concrete-Under water concreting. High performance and High Strength concrete

Unit 5:

Self compacting concrete – Light weight concrete, Ultra high performance concrete, Heavy weight and mass concrete, Fiber reinforced concrete. Sustainability- Recycling of concrete.

Course Outcomes:

Upon completion of the course, a student willbe able to

CO1: Understand the concept of concrete materials.

CO2: Evaluate the properties of fresh and hard concrete.

CO3: Evaluate the durability of concrete.

CO4: Understand the modern trend of concrete.

CO5: Understand the special concrete.

Reference Books

1. Properties of Concrete, A. M. Nevile, Pearson.
2. Concrete: Microstructure, Properties and Materials, P. K. Mehta and P. J. M. Monteiro,

McGraw Hill.

3. Concrete Technology, A. R. Santhakumar, Oxford University Press.
4. Advanced Concrete Technology, Zongjin Li, John Wiley and Sons.

Course Code: 72251105
Course Name: Structural Engineering Lab

L	T	P	Credit
0	0	4	2

Course Objective:

To understand the mix design of concrete, impermeability, creep and non-destructive test of concrete, and determine the flexural strength and modulus of elasticity of concrete

List of Experiments:

1. Mix design of concrete
2. Impermeability test of concrete.
3. Creep test of concrete
4. Rebound Hammer Test
5. Ultra sonic pulse velocity test
6. Electrical Resistivity test
7. Measure crack width
8. Determine modulus of elasticity of concrete
9. Centre point loading test on beam
10. Third point loading test on beam

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: Design the mix design of concrete.

CO2: Determine the permeability and time dependent deformation of concrete.

CO3: Determine the strength of concrete using non destructive test.

CO4: Determine the flexural strength and modulus of elasticity of concrete.

Course Code: 72251106

Course Name: Seminar / Presentation

L	T	P	Credit
0	0	4	2

Course Objective:

To enhance students' understanding of Structural engineering & Design by encouraging the study of diverse literature, fostering lifelong learning, and developing the soft skills necessary for effective presentation.

Syllabus

Any relevant topic related to Structural engineering & Design from within or beyond the syllabus through Swayam / NPTEL/MOOC.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Analyze contemporary issues in Structural engineering & Design.

CO 2: Demonstrate good oral communication skills.

CO 3: Develop poster and power point presentations for effective communication.