Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

FACULTY OF ENGINEERING AND TECHNOLOGY

PROGRAM:

M.TECH STRUCTURAL ENGINEERING

SCHEME & SYLLABUS

BOOKLET

BATCH 2025-2027

INDEX

Disclaimer: The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

Student Details

Name of Student:

Name of Program:

Semester: Year: Batch:

Faculty of:

Your Dreams Our Goal

POORNIMA UNIVERSITY

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Vision

Our vision is to create knowledge based society with scientific temper, team spirit and dignity of labour to face global competitive challenges.

Mission

Our mission is to evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

Quality Policy

To provide quality education through faculty development, updating of facilities and continual improvement for meeting norms laid down by the government, keeping the stakeholders satisfied. Poornima University has forged industrial alliances with Top MNC's worldwide which assures high educational standards, up to- date and forward-thinking curricula, and professional relevance. At Poornima University you will have a distinct advantage through exposure to the corporate standard environment through industry sponsored infrastructure and expert faculty. The University involves global industry leaders in many ways.

Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skills and traditional systems of learning processes.

About Program and Program Outcomes (PO):

Title of the Program: Masters of Technology

Nature of the Program: M.Tech is a full time two-year program.

Program Outcomes (POs):

Graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

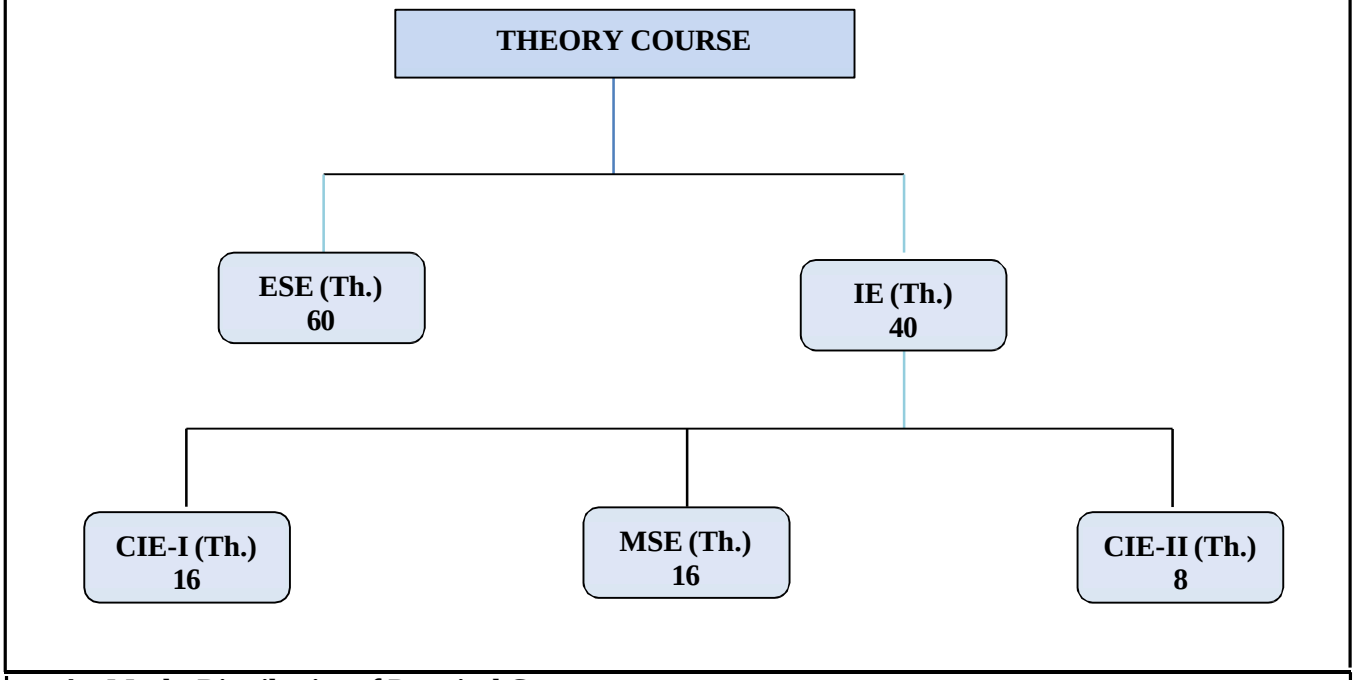
PSO1: Capability to manage large infrastructure projects ensuring safe and cost-effective execution of projects having knowledge of fast track construction and project management.

PSO2: Ability to use building software packages to calculate safe loads and stresses for designing structural members to ensure safety and serviceability.

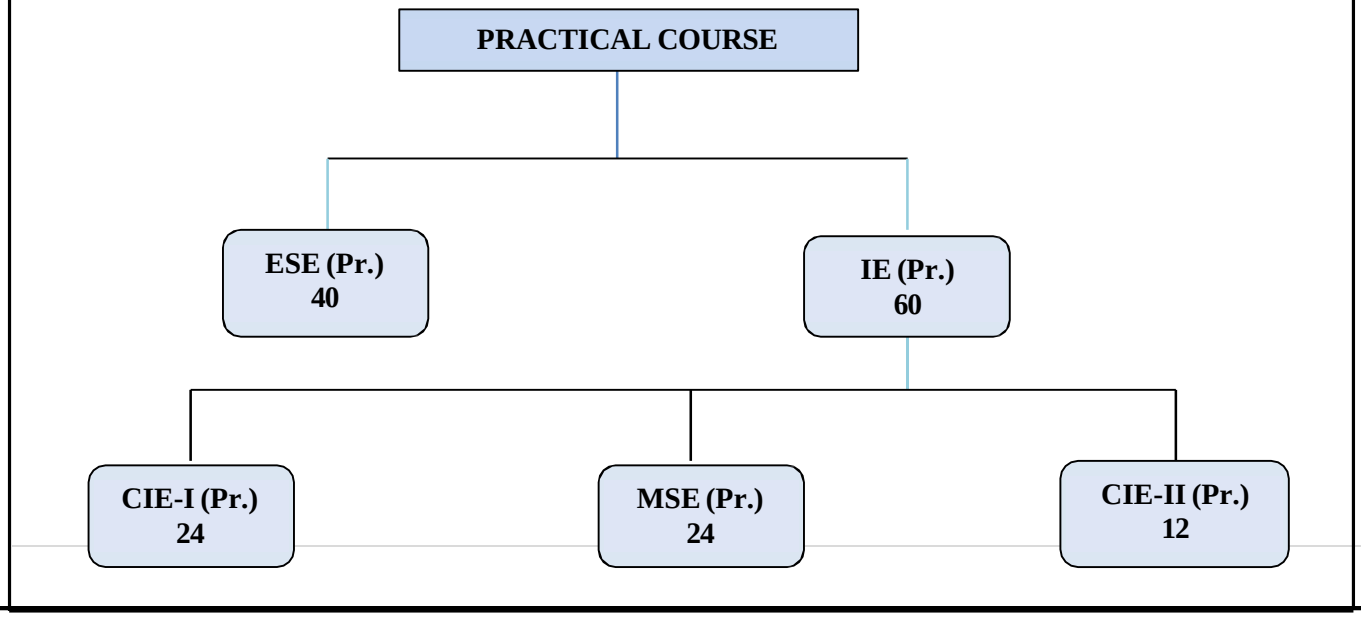
PSO3: Ability to provide innovative solutions for traffic safety and efficiency through intelligent transportation systems, and mitigate the environmental impact of construction by adopting green building concepts.

Examination System :

Marks Distribution of Theory Course:



A. **Marks Distribution of Practical Course :**



Th.: Theory, Pr.: Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

CO Wise Marks Distribution:

Exam Entity	Theory Subject		Practical/ Studio Subject	
	Maximum Marks	CO to be Covered	CO to be Covered	Maximum Marks
CIE-I	16 (8 + 8)	1 & 2	1 & 2	24 (12 + 12)
MSE	16 (8 + 8)	3 & 4	3 & 4	24 (12 + 12)
CIE-II (Activity/ Assignment)	8 (8)	5	5	12 (12)
ESE	60	-	-	40
TOTAL	100	-	-	100

Minimum Passing Percentage in All Exams:

S. No.	Program Name	Minimum Passing Percentage in		
		IE Component	ESE Component	Total Component
1	Course Work for PhD Registration	-	-	50%
2	B. Arch., FIRE Dept. (BBA, B. Com., MBA)	-	45%	50%
3	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	40%	40%
4	B. Tech., B. Des., BVA, BCA, B.Sc., BBA, B.Com., B.A. & any other program	-	35%	35%

SGPA Calculation

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course in the semester

CGPA Calculation

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course of all the semesters up to which CGPA is computed

Grading Table:

Table-A
Applicable for B.Arch., FIRE Courses
(BBA, B.Com, MBA), & PhD. Course Work

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Fail	F	0	x <50
Absent	Ab	0	Absent

Table-B
Applicable for All Courses except Table-A

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Average	C	5	40≤ x <50
Pass*	P	4	35≤ x <40
Fail	F	0	x <35
Absent	Ab	0	Absent

*** Not applicable for master programs**

CGPA to percentage conversion rule:

Equivalent % of Marks in the Program = *CGPA* *10

Award of Class

CGPA	Percentage	Equivalent Division
7.50 ≤ CGPA	75% or more	First Division with Distinction
6.00 ≤ CGPA < 7.50	60% ≤ x <75%	First Division
5.00 ≤ CGPA < 6.00	50% ≤ x <60%	Second Division
4.00 ≤ CGPA < 5.00	40% ≤ x < 50%	Pass Class

Guidelines for Massive Open Online Courses (MOOCs)

(Session 2025-27)

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme is can be chosen from SWAYAM-NPTEL.

1. Introduction of MOOCs: SWAYAM-NPTEL

About SWAYAM-NPTEL

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

Some highlights:

- Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management subjects
- YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers
- More than 56000 hours of video content, transcribed and subtitled
- Most accessed library of peer-reviewed educational content in the world
- Translation of more than 12000 hrs of English transcripts in regional Indian languages

NPTEL Online Certification:

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.

Some statistics regarding the open online courses since March 2014 till Dec 2021

Completed courses: 3496;

Enrollments across courses: 1.58 CRORE +

Number of exam registrations: 15.1 LAKH +

All the statistics pertaining to completed courses are available at https://beta.nptel.ac.in/courses.

All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

2. MOOCs at Poornima University:

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

(a) MOOCs as Credit Courses

(For this document, only those MOOCs will be considered which are available only on NPTEL platforms)

- Credit and Non-credit SWAYAM-NPTEL MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.
- As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards): Open Elective (for batches entered till 2022) courses were available at University level in offline mode till 2022-23 for which relevant booklets were published. From session 2023-24, Multidisciplinary Courses are introduces in lieu of open elective courses as per NEP 2020. These courses carries 02 credits. These category/type of courses (similar/different) are available as MOOC courses on SWAYAM-NPTEL platform which are being introduced from session 2023-24 onwards for all the students. The respective Deans / HODs shall provide all the information to all the students pertaining to MOOCs as per details given below:
    1. Deans / HODs shall prepare a list of up to 10 appropriate MOOC courses (From NPTEL Only) of Minimum 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
    2. After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits (only 02) of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.
    3. The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean and provide the academic support to students as per requirement.

(b) Important points related to MOOCs at Poornima University

- Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.
- No attendance will be taken for MOOC courses.
- The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no internal exam (IE component) will be conducted by the department as well as by the Examination Cell.
- The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.
- The center of examination for MOOCs will be finalized by SWAYAM-NPTEL. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- NPTEL will award a certificate to all the students passing the examination.
- The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.

- An ESE Exam of each said MOOC course will also be conducted by the University as per University norms.
- The award of marks/grading will be computed as given below:

Award of marks/grading	Remarks
1. 20% weightage taken from MOOC Certificate +80% weightage taken from ESE Exam of Poornima University **OR** 2. 100% of weightage taken from MOOC Certificate Note: The Higher Marks/Grades of the above two will be considered	The Certificate of MOOC to be Submitted as per date notified by COE, Poornima University

- Any student who would not be able to clear/pass the said course, will be required to appear as a back exam candidate of the University as per PU norms. Students who have not passed the MOOC exam are required to register and participate in the next semester for either the same subject or a similar subject (Ensuring at least 60% of the syllabus matches with the back subject and also approved by respective Dean) offered through NPTEL.
- The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.
- The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.
- There will be no provision of re-evaluation of MOOC.

NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.

Attached Items:

Ability Enhancement Courses	Annexure-1
Value Added Course Booklet	Annexure-2

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Structural Engineering** **Duration: 2 Years** **Total Credits: 81**								
	<u>Teaching Scheme for Batch 2025-27</u>								
	Semester-I								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MSTCCV1101	Advanced Structural Analysis	3	-	-	-	40	60	100	3
MSTCCV1102	Structural Dynamics	3	-	-	-	40	60	100	3
MSTCCV1103	Sustainable Materials and Construction	3	-	-		40	60	100	3
A.2	**Practical**								
MSTCCV1201	Structure Lab-I	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MSTECV1101	Concrete Construction Technology	3	-	-	-	40	60	100	3
MSTECV1102	Computational Methods			-	-	40	60	100	
MSTECV1103	Design of Precast and Composite Structures			-	-	40	60	100	
MSTECV1104	Bridge Engineering			-	-	40	60	100	
MSTECV1105	Design of Pre-Stressed Concrete Structures	3	-	-	-	40	60	100	3
MSTECV1106	Foundation design and Construction					40	60	100	
MSTECV1107	Repair and Rehabilitation of Structures			-	-	40	60	100	
MSTECV1108	Soil Structure Interaction			-	-	40	60	100	
MSTECV1109	Advanced Solid Mechanics			-	-	40	60	100	
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
MULEBX1109	Research Methodology	3	-	-	-	40	60	100	3
D		**Ability Enhancement Courses (AEC)**							
MUACHM1201	Communication Skill - I	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE1201	Skill Enhancement Technical Course	-	-	4	-	60	40	100	2
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MSTCCV1401	Seminar-I	-	-	4	-	60	40	100	2
Total		18	0	12					**24**
Total Teaching Hours		**30**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Structural Engineering** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	Semester-II								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MSTCCV2101	Advanced Steel Structures	3	-	-		40	60	100	3
MSTCCV2102	Design of Advanced Concrete Structure	3	-	-		40	60	100	3
MSTCCV2103	Theory of Elasticity and Elastic Stability	3	-	-		40	60	100	3
A.2	**Practical**								
MSTCCV2201	Structure Lab-II	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MSTECV2101	Finite Element Method	3	-	-	-	40	60	100	3
MSTECV2102	Structural Optimization			-	-	40	60	100	
MSTECV2103	Plates and Shells			-	-	40	60	100	
MSTECV2104	Stability Analysis of Structure								
MSTECV2105	Tall Structures	3	-	-	-	40	60	100	3
MSTECV2106	Earthquake Resistant Design of Structures			-	-	40	60	100	
MSTECV2107	Design Concept of Substructure			-	-	40	60	100	
MSTECV2108	Industrial Structures								
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
	MOOC Course - I	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
MUACHM2207	Communication Skill - II	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE2201	Skill Enhancement Technical Course-II			4		60	40	100	2
MULCCV2202	Review/Research Paper-I			2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MSTCCV2401	Seminar-II	-	-	2	-	60	40	100	1
Total		18	0	12					**24**
Total Teaching Hours		**30**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Structural Engineering** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	Semester-III								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
A.2	**Practical**								
MSTCCV3401	Review/Research Paper-II	0	0	2		60	40	100	1
MSTCCV3402	Industrial Technical Seminar	0	0	4		60	40	100	2
B.		**Minor Stream Courses/ Department Electives/*Open Elective***							
B.1	**Theory**								
C		**Multidisciplinary Courses**							
	MOOC Course - II	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
G		**Summer Internship / Research Project / Dissertation**							
MSTCCV3403	Internship	-	-	12	-	40	60	100	6
MSTCCV3404	Dissertation Part - I	-	-	12	-	60	40	100	6
Total		3	0	30					**18**
Total Teaching Hours		**33**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Structural Engineering** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	Semester-IV								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
-	-	-	-	-	-	-	-	-	-
A.2	**Practical**								
-	-	-	-	-	-	-	-	-	-
B.		**Minor Stream Courses/ Department Electives/*Core Elective***							
B.1	**Theory**								
-	-	-	-	-	-	-	-	-	-
B.2	**Practical**								
-	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
-	-	-	-	-	-	-	-	-	-
D		**Ability Enhancement Courses (AEC)**							
-	-	-							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MSTCCV4401	Dissertation Part - II	-	-	30	-	250	250	500	15
Total		0	0	30					**15**
Total Teaching Hours		**30**							

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Structural Engineering** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	Semester-I								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MSTCCV1101	Advanced Structural Analysis	3	-	-	-	40	60	100	3
MSTCCV1102	Structural Dynamics	3	-	-	-	40	60	100	3
MSTCCV1103	Sustainable Materials and Construction	3	-	-		40	60	100	3
A.2	**Practical**								
MSTCCV1201	Structure Lab-I	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MSTECV1101	Concrete Construction Technology	3	-	-	-	40	60	100	3
MSTECV1102	Computational Methods			-	-	40	60	100	
MSTECV1103	Design of Precast and Composite Structures			-	-	40	60	100	
MSTECV1104	Bridge Engineering			-	-	40	60	100	
MSTECV1105	Design of Pre-Stressed Concrete Structures	3	-	-	-	40	60	100	3
MSTECV1106	Foundation design and Construction					40	60	100	
MSTECV1107	Repair and Rehabilitation of Structures			-	-	40	60	100	
MSTECV1108	Soil Structure Interaction			-	-	40	60	100	
MSTECV1109	Advanced Solid Mechanics			-	-	40	60	100	
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
MULEBX1109	Research Methodology	3	-	-	-	40	60	100	3
D		**Ability Enhancement Courses (AEC)**							
MUACHM1201	Communication Skill - I	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE1201	Skill Enhancement Technical Course	-	-	4	-	60	40	100	2
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MSTCCV1401	Seminar-I	-	-	4	-	60	40	100	2
Total		18	0	12					**24**
Total Teaching Hours		**30**							

Major (Core Courses)

M. Tech. Structural Engineering Syllabus- FirstSemester

Code: MSTCCV1101	Advanced Structural Analysis	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This course is concerned with the conception, analysis of structural components or assemblies to resist loads arising from internal and external forces. It covers the calculation of deflection, shear force and bending moment by flexibility and stiffness method. Structural analysis incorporates the fields of applied mechanics, materials science and applied mathematics to compute a structure's deformations, internal forces, stresses, support reactions, accelerations, and stability. It makes the students capable to analyse the structure's fitness for use which will help the student in designing structures.

COURSE OUTCOME

The student would be able

CO1 To understand and distinguish the behavior of member on the basis of degree of freedom.

CO2 To assess the bending moment, shear force an deflection by flexibility method.

CO3 To evaluate the concept of local and global coordinates.

CO4 To interpret the moment and shear force through energy methods.

CO5 To understand the fundamentals plastic analysis.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Stiffness Method (Systems Approach)	11
2.	Flexibility Method (Systems Approach)	7
3.	Introduction to Element Approach	11
4.	Structural Stability Analysis	7
5.	Plastic Analysis	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Stiffness Method (Systems Approach)** Basis of stiffness method, Degrees of freedom, Force-displacement relationships, Nodal stiffness.
2.	**Flexibility Method (Systems Approach)** Flexibility coefficients, Basis of the method, Application to various types of structures.
3.	**Introduction to Element Approach** Member stiffness matrix, Local or Member co-ordinate system, Global or Structural co-ordinate system, Rotation of axes etc., Structure stiffness matrix
4.	**Structural S t a b i l i t y Analysis** Elastic Instability, Introduction to stability problem, Energy methods, buckling of axiallyloaded members for different end conditions, Concept of effective length, approximate techniques, Stability analysis of beam-column and frames

5.	**Plastic Analysis** Concept of Limit load analysis, Upper and lower bonds, Plastic analysis of beams and multi-storey frames using mechanism method.

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1.	Matrix Analysis of Framed Structures	Gere, G. M. and Weaver, Jr. W, CBS Publishers (1987).
2.	Structural Analysis: A Classical and Matrix Approach	Mc. Cormac, J. C. & Nelson, J. K., John Wiley and Sons1997).
3.	Matrix Analysis of Structures	Pandit & Gupta, Tata McGraw Hill Publications
4.	Elastic Stability of Structural Elements	Iyengar, N.G.R., Macmillan India Ltd (1980)
Important Web links		
1. https://nptel.ac.in/courses/105/106/105106050/ 2. https://www.youtube.com/playlist?list=PLEE5D02698EAAF2C0 3. http://web.iitd.ac.in/~sbhalla/flexibility.pdf 4. https://www.slideshare.net/280632796/ch-1-structural-analysis-stiffness-method 5. https://www.aboutcivil.org/plastic-analysis-definition-principles.html		

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	3	-	1	-	-	-	-	1	-
CO2	1	3	-	2	1	-	-	-	-	-	-	-
CO3	1	-	-	3	1	-	-	-	-	-	1	-
CO4	1	1	3	-	-	-	1	-	-	-	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	3	1	-
CO2	-	2	2	-	3
CO3	1	1	-	3	2
CO4	1	3	-	2	-
CO5	1	3	-	2	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTCCV1102	Structural Dynamics	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This course aims to equip students with knowledge in structural dynamics, with particular emphasis onthe building and bridge structures. Topics include single-degree-of-freedom (SDOF) systems, response to harmonic loading, response to impulsive transient Loading, numerical integration, element stiffness, mass and damping matrices, multi-degree-of-freedom (MDOF) systems, classical and non- classical damping, distributed parameter systems, eignevalue problems, modal analysis and system identification

COURSE OUTCOME

The student would be able

CO1 Recognize physical phenomenon in the context of structural vibration.

CO2 Identify and define key concepts related to structural dynamics, such as natural frequencies, mode shapes, damping and vibration characteristics of structures.

CO3 Formulate the equation of motion for dynamics analysis of structures.

CO4 Demonstrate an understanding the multi degree freedom analysis of the structural dynamics theories.

CO5 Develop competence in using computer programming skill to perform modelling and dynamic analysis of structural systems.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Theory of vibrations**	10
2.	**Introduction to Structural Dynamics**	7
3.	**Single Degree of Freedom Systems**	11
4.	**Multi Degree of Freedom Systems**	7
5.	**Practical Vibration Analysis: Continuous Systems: Introduction**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Theory of vibrations** Introduction Elements of vibratory system, Degrees of Freedom, Continuous System, Lumped mass idealization, Oscillatory motion, Simple Harmonic motion, Vectoral representation of S.H.M., Free vibrations of single degree of freedom system, undamped and damped vibrations, critical damping, Logarithmic decrement, Forced vibration of SDOF systems, Harmonic excitation, Dynamic magnification factor, Phase angle.
2.	**Introduction to Structural Dynamics** Fundamental objectives of dynamic analysis, Types of prescribed loading, Methods of discretization, Formulation of equations of motion by different methods, direct equilibration using Newton‟s law of motion / D‟ Alembert‟s principle, Principle of virtual.

3.	**Single Degree of Freedom Systems** Formulation and solution of the equation of motion, Free Vibration response, Response to Harmonic, Periodic, Impulsive and general dynamic loadings, Duhamel integral. Selection of the degrees of Freedom, Evaluation of structural Property matrices, Formulation of the MDOFequations of motion,
4.	**Multi Degree of Freedom Systems** Undamped free vibrations, Solutions of Eigen value problem for natural frequencies and mode shapes, Analysis of Dynamic Response, Normal co-ordinates, uncoupled equations of motion, orthogonal properties of normal Modes, Mode superposition procedure.
5.	**Practical Vibration Analysis: Continuous Systems: Introduction** Introduction, Stodola method, Fundamental mode analysis, Analysis of second and higher modes, Holzer method, Basic procedure. Flexural vibrations of beams, Elementary case, Derivation of Governing differential equation of motion, Analysis of undamped free vibrations of beams in flexure, Natural frequencies and mode- shapes of simple beams with different end conditions, Principles of Application of continuous beams. Introduction, Excitation by rigid base translation, Lumped Mass approach, SDOF and MDOF systems.

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1	Dynamics of Structures	Clough &Penzien, McGraw Hill, New york
2	Structural Dynamics	Mario Paz, C.B.S Publishers, New Delhi.
3	Dynamics of Structures	Anil K. Chopra, Pearson Education (Singapore), Delhi
4	Code of practice for Earthquake resistant design of Structures	I.S: 1893 - 2002 (version) Part-1
Internal Web Links:		
https://nptel.ac.in/courses/105/101/105101006/ https://nptel.ac.in/courses/101/105/101105081/ https://www.reliableplant.com/vibration-analysis-31569 https://www.youtube.com/watch?v=mP79BkYccFU https://www.youtube.com/watch?v=uSqDK5tlj_c		

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	-	2	1	-	-	-	-	1
CO2	1	1	2	1	1	-	1	-	-	-	-	-
CO3	1	1	3	1	1	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	1	-	1	1	1	-
CO5	1	1	3	-	1	1	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	-	-	1
CO2	1	3	-	2	1
CO3	3	1	1	1	-
CO4	3	2	2	-	-
CO5	3	2	-	-	2

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTCCV1103 Sustainable Materials and Construction 3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES: This course provides an in-depth understanding of sustainable construction practices with a focus on eco-friendly materials, life cycle concepts, and circular economy in civil engineering. It covers material reuse, recycling technologies, low-carbon systems, green building techniques, and environmental codes and standards, preparing students to design and implement sustainable infrastructure solutions.

A. COURSE OUTCOME

After completion of this course, student will be able to:

CO No.	Description
CO1	Understand the principles of sustainable development and construction, and explain the role of sustainable products, materials, and systems.
CO2	Analyze the use of recycled/reused materials and technologies, and evaluate material resource efficiency and waste recovery techniques.
CO3	Apply life cycle design concepts and assess sustainability using life cycle costing and performance improvement techniques.
CO4	Examine climate-adaptive construction strategies and evaluate the impact of repair, maintenance, and service life on sustainable performance.
CO5	Demonstrate knowledge of green buildings and rating systems, and select suitable materials and methods for sustainable construction.

B. DETAILED SYLLABUS

Unit 1	**Fundamentals of Sustainability in Construction** • Introduction to Sustainable Development and Sustainable Construction • Concept of Sustainable Products, Materials, and Infrastructure Systems • Circularity Concept in Civil Engineering • Challenges and Opportunities in Sustainable Use and Construction • Relevant Codes and Policies for Sustainable Construction
Unit 2	**Sustainable Construction Materials and Technologies** • Reuse and Recycle of Construction Materials and Technologies • Construction and Demolition Waste Utilization • Waste to Resource Approaches in Construction • Construction Waste Recovery Techniques • Sustainable Material Properties and Characterization • Material Resource Efficiency
Unit 3	**Design Principles for Sustainability** • Design for Life Cycle Concept • Whole System Design Concept • Low Carbon and Low Embodied Energy Materials and Systems • Service Life Concept in Material Design • Impact of Repair and Maintenance on Life Cycle
Unit 4	**Life Cycle Assessment and Performance** • Life Cycle Costing in Construction • Life Cycle Performance Improvement Techniques • Climate Change Adaptive Strategies for Materials and Construction • Sustainability Index for Construction Materials and Techniques
Unit 5	**Green Buildings and Future Trends** • Introduction to Green Buildings and Rating Systems (LEED, GRIHA, IGBC, etc.) • Green Building Materials and Construction Techniques • Construction Techniques for Sustainable Materials and Systems • Emerging Trends in Sustainable Construction

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Sustainable Construction: Green Building Design and Delivery	Charles J. Kibert
2.	Construction Materials, Methods and Techniques: Building for a Sustainable Future	William P. Spence, Eva Kultermann
3.	Sustainable Materials: With Both Eyes Open	Julian Allwood, Jonathan Cullen
4.	Handbook of Recycled Concrete and Demolition Waste	Fernando Pacheco-Torgal, Volodymyr Tam

S. No	Important web links
1.	Bureau of Energy Efficiency – Green Building Guidelines (India)
2.	Indian Green Building Council (IGBC)
3	U.S. Green Building Council – LEED Rating System
4	Construction and Demolition Waste Management Rules – MoEFCC

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	1	3	2	1	1	1	2
CO2	2	3	3	2	3	2	3	1	2	2	1	2
CO3	2	2	3	3	3	2	3	1	1	1	2	3
CO4	2	2	2	2	2	3	3	2	1	1	2	3
CO5	2	1	2	1	2	2	3	2	2	2	2	3

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	2	3	2	1	2
CO3	3	3	3	2	2
CO4	2	2	3	2	3
CO5	2	2	2	3	3

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTCCV1201	Structural Lab – I	1 Credit [LTP: 0-0-2]

A. DETAILED SYLLABUS

List of Experiments
Design as per syllabus of theory

Department Elective-I&II

Code: MSTECV1101	Concrete Construction Technology	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This course will provide the students with state-of-the art knowledge on durable and sustainable cement and concrete, on the various mineral additions and chemical admixtures to enhance the workability, strength, durability and sustainability of concrete, and will empower them in the decision-making process regarding the various concrete products, construction procedures and performance test methods that will improve the durability and sustainability of concrete civil infrastructure.

COURSE OUTCOME

The student would be able

CO1 Identify Quality Control tests on concrete making materials.

CO2 Understand the behavior of fresh and hardened concrete.

CO3 Design concrete mixes as per IS and ACI codes.

CO4 Understand the durability requirements of concrete.

CO5 Understand the need for special concretes

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Introduction of hydration effect	**11**
2.	Admixtures	**7**
3.	Properties of Concrete	**10**
4.	Special Concrete	**7**
5.	Test on Concrete	**7**

B. DETAILED SYLLABUS

Unit	Unit Details
Unit 1	**Introduction of hydration effect** Importance of Bogue‟s compounds, structure of a hydrated cement paste, volume of hydrated product, porosity of paste and concrete, transition zone, elastic modulus, factors affecting strength and elasticity of concrete, rheology of concrete in terms of Bingham‟s parameter. Microstructure of concrete: deterioration mechanisms, assessment and control of corrosion in concrete structures. Introduction to special concretes.
Unit 2	**Admixtures** Chemical admixtures- mechanism of chemical admixture, plasticizers and super plasticizers and their effect on concrete, marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, air-entraining admixtures. Mineral admixture- fly ash, silica fume, gcbs, and their effect on concrete. Concrete mix design – design of concrete mix by BIS method using is10262 provisions in revised is10262-2004. Concrete mix design using various admixtures.

Unit 3	**Properties of Concrete** Durability of concrete - introduction, permeability of concrete, chemical attack, acid attack, efflorescence, corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali aggregate reaction, is456-2000 requirement for durability. RMC concrete - manufacture, transporting, placing, precautions, methods of concreting- pumping, under water concreting, shot Crete, high volume fly ash concrete concept, properties, typical mix self-compacting concrete concept, materials, tests, properties, application and typical mix.
Unit 4	**Special Concrete** Fiber reinforced & light weight concrete - types and properties, behavior of FRC and LWC in compression, tension including pre-cracking stage and post-cracking stages,behavior in flexure and shear, ferro cement - materials, techniques of manufacture, properties and application.
Unit 5	**Test on Concrete** Test on hardened concrete-effect of end condition of specimen, capping, h/d ratio, rate of loading, moisture condition. Compression, tension and flexure tests. NDT tests concepts-rebound hammer, pulse velocity methods.

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1.	Properties of Concrete	Nevelli, A. M.,Prentice Hall of India (1995).
2.	Concrete Technology	Santhakumar A.R (2006), World Rights Publisher
3.	Special Structural Concretes	Siddique, R., Galgotia Publications (2000).
4.	Concrete Technology	Gambhir, M. L., Tata-McGraw Hill, 3rd Edition
5.	Waste Materials and By-products in Concrete	Siddique, R.,Springer (2008)
6.	High Performance Concrete	Power T.C.- E and FN, London
7.	Properties of Fresh Concrete	Power T.C.- E and FN, London

Important Web Links:

1. https://nptel.ac.in/courses/105/106/105106176/
2. https://nptel.ac.in/content/syllabus_pdf/105106176.pdf
3. https://www.researchgate.net/project/Online-NPTEL-Course-on-Advanced-Concrete-Technology
4. https://www.youtube.com/watch?v=SdWh05agJtg
5. https://www.youtube.com/watch?v=Qulc_ofmz5M

A. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3		-	1	-	-	-	-	-	-	-
CO2	1	3	1	-	2	-	-	-	-	-	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	-
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	2	2	1	-	-	-	-	-	-	-	-

B. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	3	-	1
CO2	3	2	-	1	-
CO3	2	1	3	1	-
CO4	1	2	2	-	2
CO5	1	1	-	3	2

Note: On the basis of mapping of COs with POs, this course is related to Employability

Code: MSTECV1102	Computational Methods	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This course will provide to the students the various computational techniques by using Eigen equation,interpolation, optimization and iterative method to solve the complex structural problem.

COURSE OUTCOME

The student would be able

CO1 To develop mathematical models of lower-level engineering problems

CO2 To analyze, quantify and minimize errors, concept of significant digits and how errors are related to correct number of significant digits.

CO3 To understand the fundamental matrix algebra concepts

CO4 To understand the curve fit (interpolation and regression) discrete date for the analysis of structural

CO5 To identify the numerically integrate continuous and discrete functions.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction	11
2.	Interpolation	7
3.	Integration	10
4.	Optimization	7
5.	Iterative method	7

B. DETAILEDSYLLABUS

Unit	Unit Details
Unit 1	**Introduction** Solution of equations and eigen value problems: error analysis; the roots of nonlinear equations, solutions of large system of linear equations and eigen value problem of a matrix; Pascal‟s triangle for one and two dimensions, divided differences; Newton‟s forward and backward difference formulas; differentiation using interpolation formulae; numerical integration by trapezoidal and Simpson‟s rules; Romberg‟s method; two and three point Gaussian quadrature formulae.
Unit 2	**Interpolation** Interpolation and approximation: solution of equation; fixed point iteration: x=g(x) method; Newton's method; solution of linear system by Gaussian elimination and gauss- Jordon method;
Unit 3	**Integration** Numerical differentiation and integration: advanced numerical linear algebra; direct and iterative methods for linear systems; decompositions and SVD factorizations; stability and accuracy of numerical algorithms; nonlinear ordinary differential equations & partial differential equations;
Unit 4	**Optimization** Nonlinear optimization, ffts, and wavelet analysis. Note: problem sets will involve use of mat lab® or any other programming language.

Unit 5	**Iterative method** Iterative method-gauss seidel method, inverse of a matrix by gauss Jordon method; Eigen value of matrix by power method and by Jacobi method for symmetric matrix.

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Numerical Methods for Scientific & Engineering Computation.	M.K. Jain , S.R. K. Lyengar and R.K.Jain, New Age International
2.	Computer Oriented Numerical Methods	R.S. Salaria, Khanna Publications.
3.	Higher Engineering Mathematics	B.V. Ramana, Tata Mc Hill
4.	Advance Engineering Mathematics	Ervin Kreszig, Wiley EastenEdd.
5.	AppliedNumericalMethodswith MATLAB	Steven C Chapra, TMH.
6.	IntroductoryMethodsofNumericalAnalysis	S.S. Shastry,
7.	Numerical Mathematical Analysis	James B. Scarborogh

Important Web Links:

1. https://nptel.ac.in/courses/103/106/103106074/
2. https://nptel.ac.in/courses/122/102/122102009/
3. http://www.nptelvideos.in/2012/11/computational-techniques.html
4. https://www.classcentral.com/course/swayam-matlab-programming-for-numerical-computation-5303
5. https://iemcse.files.wordpress.com/2017/08/lp1-11.pdf

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	3	-	2	-	-	-	-	-	-	1
CO2	2	-	3	-	1	-	-	-	-	-	-	2
CO3	2	-	2	-	2	-	-	-	-	-	-	2
CO4	1	-	2	-	2	-	-	-	-	-	-	2
CO5	1	-	-	-	-	1	-	-	-	-	-	-

E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	-	-	1	-
CO2	2	-	2	3	-
CO3	1	3	-	2	1
CO4	3	1	1	1	-
CO5	2	2	3	-	-

Note: On the basis of mapping of COs with POs, this course is related to Entrepreneur

Code: MSTECV1103	Design of Precast & Composite Structure	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES: This course will provide to the students the details of the precast and the composite structure design. Various codal provision also explained for the designing of the stricture.

COURSE OUTCOME:

CO1 To understand the basic philosophy of the precast elements.
CO2 To design the precast beam by the use of IS code.
CO3 To analyze and design the precast column and wall by the use of IS code.
CO4 To develop the structural integrity.
CO5 To design and analyze the precast steel structure member.

A. Outline of the course

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction**	**9**
2.	**Design of beam**	**9**
3.	**Design of column**	**10**
4.	**Structural Integrity**	**7**
5.	**Design of Steel member**	**7**

B. DETAILED SYLLABUS

Unit	Unit Details
Unit 1	**Introduction** Concepts, components, Structural Systems and Design of precast concrete floors Need and types of precast construction, Modular coordination, Precast elements- Floor, Beams, Columns and walls. Structural Systems and connections. Design of precast Concrete Floor: Theoretical and Design Examples of Hollow core slabs, Precast Concrete Planks floor with composite toppings with and without props.
Unit 2	**Design of beam** Design of precast reinforced and pre stressed Concrete beams. Theoretical and Design Examples of ITB – Full section precast Semi Precast. Propped and unpropped conditions. Design of RC Nibs.
Unit 3	**Design of column** Design of precast concrete columns and walls, Design of braced and unbraced columns with corbels subjected to pattern and full loading. Design of Corbels Design of RC walls subjected to Vertical, Horizontal loads and moments, Design of vertical ties and horizontal joints.
Unit 4	**Structural Integrity** Design of Precast Connections and Structural Integrity, Beam bearing, Beam half Joint, Steel Inserts, Socket Connection, Structural integrity Avoidance of progressive collapse, Design of Structural Ties.
Unit 5	**Design of Steel member** Design of Steel Concrete Composite Floors and Beams, Composite Floors: Profiled Sheeting with concrete topping. Design method, Bending and Shear Resistance of Composite Slabs, Serviceability Criteria, Design Example

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Prestressed Concrete	Krishna Raju, Tata McGraw Hill Publishing Co,2000
2.	Fundamentals of Prestressed Concrete	Sinha .N.C. and. Roy. S.K, "", S. Chand and Co.,1998
3.	Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings	Johnson R.P., Vol. I, Blackwell ScientificPublications, 2004
4.	Composite Steel and Concrete Structural Members, Fundamental behavior	Oehlers D.J. and Bradford M.A., Pergamon press,Oxford, 1995
5.	Steel Designers Manual	Owens. G.W and Knowles. P, Steel Concrete
Important Website Link:		
1. https://nptel.ac.in/courses/105/106/105106117/		
2. https://nptel.ac.in/courses/105/106/105106118/		
3. https://nptel.ac.in/content/syllabus_pdf/105106118.pdf		
4. https://www.youtube.com/watch?v=4KYPltsNAWs		
5. https://www.youtube.com/watch?v=b9WQhnYq81s		

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	-	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-
CO3	2	-	2	3	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	2	-	-	-	-	-	-
CO5	2	2	1	-	1	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	1	-	-
CO2	3	3	-	-	-
CO3	3	2	1	-	-
CO4	2	-	1	-	-
CO5	2	2	-	3	-

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTECV1104	Advanced Bridge Design	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This course will provide to the students the details of the component of the bridge, various Indian standard code for bridge and the design of sub structure and super structure of the beam.

COURSE OUTCOME:

The student would be able

CO1: Discuss the IRC standard live loads and design the deck slab type bridges.
CO2: Analyze the box culverts for the given loading and detail the box culverts.
CO3: Design and detail of T-Beam bridges.
CO4: Discuss the bridge foundations and prepare the bar bending schedule.
CO5: Design and check the stability of piers and abutments.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction**	9
2.	**Loads on the bridge**	9
3.	**Design of structural element**	9
4.	**Foundation design**	8
5.	**Dynamic analysis of the structure**	7

B. DETAILED SYLLABUS

Unit	Unit Details
Unit 1	**Introduction:** General: Bridge System, Considerations in alignment, Planning, Economic consideration, Aesthetics and selection of type of bridge (Review).
Unit 2	**Loads on the bridge:** Loading Standards and Super Structure Analysis: Standards followed in U.K., U.S.A. and Europe.: Bridge deck analysis using different methods, Load distribution theories – Carbon specifications for loading, Geometrical proportioning etc. of road, rail-cum-road bridges, Indian Road Congress (IRC) and Indian Railway Loading standards and their comparison with loading, Hendry-Jaegar, Morris-Little (Orthotropic platetheories) methods, Stiffness method, Finite difference method, Folded Plate method, Finite strip method and Finite Element method (General treatment), Limit analysis, Design of bridge decks.
Unit 3	**Design of structural element:** Connections and Substructure Analysis and Design: Design of different connections, Bearings and joints. Piers, Abutments, Wing walls and other appurtenant structures.
Unit 4	**Foundation design:** Foundations and Construction & Maintenance: Well foundations and pile foundation, Design and construction and field problems. Erection of bridge super structure, Maintenance, Rating and Strengthening of existing bridges.
Unit 5	**Dynamic analysis of the structure:** Dynamics Behavior: Behavior of bridges under dynamic loads, Discussion of code provisions for design of bridges for wind and earthquake forces. Long Span Bridges: General discussion of suspension and cable stayed bridges

C. RECOMMENDED STUDYMATERIAL:

S.	Title of the Book	Author
1.	Bridge Analysis Simplified	Bakht, B. and Jaeger, L.G, McGraw Hill Book Company
2.	Bridge Deck Analysis	Cusens, A.R. and Parma, R.P., John Wiley & Sons Ltd.

Important Web Links:

1. https://nptel.ac.in/courses/105/105/105105165/
2. https://swayam.gov.in/nd1_noc19_ce23/preview
3. https://www.youtube.com/playlist?list=PLYX9X4ZldqpYMaPURxSbY1i8vgfVsZfmQ
4. https://www.youtube.com/playlist?list=PLZzO5hTp04ec6uwdZ_Iem0kO_8ob1MtVt
5. https://www.slideshare.net/soniafaisal/bridge-engineering

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	3	1	-	-	-	-	-	-	-
CO2	2	-	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	1
CO4	3	-	-	-	-	1	-	-	-	-	-	-
CO5	2	-	1	-	2	-	-	-	-	-	-	-

E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	-	-	2	3
CO2	2	-	-	1	3
CO3	2	-	-	1	3
CO4	3	-	-	2	1
CO5	3	-	-	2	1

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Code: MSTECV1105	Pre-stressed Structures	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

This course will provide to the students the perform analysis and design of pre-stressed concrete members andconnections. Student will be able to identify and interpret the appropriate relevant industry.

COURSE OUTCOME

The student would be able to

CO1 Understand the general mechanical behavior of pre-stressed concrete

CO2 able to analyze and design pre-stressed concrete flexural members

CO3 Able to identify and apply the applicable industry design codes relevant to the design of pre-stressed concrete members.

CO4 will be familiar with professional and ethical issues and the importance of lifelong learning in structural engineering

CO5 will be able to perform an industry relevant design project in a team setting.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction**	9
2.	**Pre-stressing**	9
3.	**Inderminate structure**	9
4.	**Loess in Prestres concrete**	8
5.	**Codal Provision**	7

B. DETAILED SYLLABUS

Unit	Unit Details
Unit 1	**Introduction:** Basic philosophy of pre-stressing: Various techniques of pre-stressing with and without pre-stressing cables, different systems of pre-stressing, materials and design concepts.
Unit 2	**Pre-stressing:** Pre-stressing of concrete structures, Analysis and design of beams, Design of end blocks, Ultimate strength in flexure and shear,
Unit 3	**Indeterminate structure:** Statically indeterminate structures, Tension members, tanks, compression members, partial pre-stressing, composite construction, precast pre-stressed elements.
Unit 4	**Loess in Pre-stress concrete:** Materials, pre-stressing systems, losses in pre-stress. Analysis and design of simple and continuous beams by working stress and limit-state methods.
Unit 5	**Codal Provision:** Deflection and cracking consideration. Anchorage and bond. End block stresses.

C. RECOMMENDED STUDYMATERIAL:

S. No.	Title of the Book	Author
1.	Design of Reinforced Concrete Structure‟	P. Dayaratnam, „Oxford and IBH,
2.	Design of pre-stress concrete structures	T.Y. Lin and Burn, John Wiley, New York
Important Web Links:		
1. https://nptel.ac.in/courses/105/106/105106117/ 2. https://nptel.ac.in/content/syllabus_pdf/105106118.pdf 3. https://crescent.education/wp-content/uploads/2018/08/Prestressed-Concrete.pdf 4. https://www.civilsutras.com/nptel-lectures-on-prestressed-concrete-structures/ 5. https://www.youtube.com/watch?v=4KYPltsNAWs		

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	-	-	-	1	-	-	-	-	1
CO2	2	1	2	-	1	-	-	-	-	-	-	2
CO3	-	3	-	2	-	-	-	-	-	1	-	-
CO4	1	1	-	2	1	-	-	-	-	1	-	-
CO5	-	1	-	2	1	-	-	-	-	1	-	1

E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	1	2	2
CO2	1	2	1	2	1
CO3	2	3	-	1	-
CO4	1	1	2	2	-
CO5	-	-	-	2	3

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Code: MSTECV1106	Advanced Foundation Design	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

To provide an overview to students about the essential features of foundation design, different aspects of foundation engineering ranging from soil exploration to the design of different types of foundation, including the ground improvement measures to be taken for poor soil conditions have been covered in this course.

COURSE OUTCOMES

CO1 Understand various aspects of foundation engineering including soil exploration.
CO2 Design of various foundation components, retaining walls etc.
CO3 Estimate safe bearing pressure of different type of soils and rocks.
CO4 Design different foundation components.
CO5 To be able to apply the consolidation theory in the design of RE application

A. OUTLINES OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction**	9
2.	**Design Criteria for Foundation Design**	10
3.	**Factors for Selection of Type of Foundation**	8
4.	**Design Principles**	8
5.	**Consolidation theory**	7

B. DETAILEDSYLLABUS

Unit	Unit Details
Unit 1	**Introduction:** Terminology involved in Foundation Analysis and Design, Gross bearing capacity, ultimate bearing capacity, net-ultimate bearing capacity, safe bearing capacity, net safe bearing capacity, safe bearing pressure, allowable bearing pressure.
Unit 2	**Design Criteria for Foundation Design:** Location and depth criteria, shear failure criteria (safe bearing capacity criteria), settlement criteria (safe bearing pressure criteria).
Unit 3	**Factors for Selection of Type of Foundation**. Critical study of conventional methods of foundation design, analysis of settlement of soil and foundations, Foundations of in expensive and swelling soils, raft foundations, well foundations, pile foundations
Unit 4	**Design Principles:** Theory of vibrations, liquefaction of soils, coffer dams, types and design principles, underpinning of foundations, design of bridge abutment
Unit 5	**Consolidation theory:** Three-dimensional consolidation and theory of sand drains, reinforced earth and its applications.

C. RECOMMENDED STUDYMATERIAL:

S. No	Title	Author
1.	Foundation Engineering	Kasmalkar, J.B. (1997). PuneVidyarthi Graha Prakashan-1786, Pune-411030.
2.	Principles of foundation Engineering, 4th edition, PWS	Das, Braja M. (1999). Publishing, Pacific Grov. Calif.
3.	Analysis and Design of Foundation and	Sham Sher Prakets, et al.
4.	Vibration of Soils & Foundations	Richant Hall & Woods.
5.	Soil Mechanics & Foundation Engineering.	B.C. Punmia
Important Web Links:		
1. https://nptel.ac.in/courses/105/108/105108069/		
2. https://nptel.ac.in/content/syllabus_pdf/105108069.pdf		
3. https://nptel.ac.in/courses/105/105/105105176/		
4. https://freevideolectures.com/course/3269/advanced-foundation-engineering		
5. http://www.digimat.in/nptel/courses/video/105105039/L10.html		

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	-	1	-	1	-	-	-	-	1
CO2	1	-	3	-	1	-	-	-	-	-	-	-
CO3	1	-	3	-	1	-	-	-	-	-	-	1
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	1	1	3	-	1	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	-	3	2	-
CO2	1	-	2	3	1
CO3	1	-	2	2	-
CO4	2	-	3	-	-
CO5	2	-	1	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTECV1107	Repair & Rehabilitation of Structures	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES:

To provide an overview to students about the essential features of foundation design, different aspects of foundation engineering ranging from soil exploration to the design of different types of foundation, including the ground improvement measures to be taken for poor soil conditions have been covered in this course.

COURSE OUTCOME:

CO1 To learn various distress and damages to concrete and masonry structures.
CO2 To understand the importance of maintenance of structures.
CO3 To study the various types and properties of repair materials.
CO4 To learn the importance and methods of substrate preparation.
CO5 To learn various repair techniques of damaged structures, corroded structures.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction**	9
2.	**Properties**	10
3.	**Repair and Maintenance**	8
4.	**Materials for repair**	8
5.	**Repair Techniques**	7

B. DETAILEDSYLLABUS

Unit	Unit details
Unit 1	**Introduction:** General: Introduction, Cause of deterioration of concrete structures, Diagnostic methods & analysis, preliminary investigations, experimental investigations using NDT, load testing, corrosion mapping, core drilling and other instrumental methods, Quality assurance for concrete construction, as built concrete properties strength, permeability, thermal properties and cracking.
Unit 2	**Properties:** Influence on Serviceability and Durability: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and catholic protection.
Unit 3	**Repair and Maintenance:** Maintenance and Repair Strategies: Definitions: Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance, Preventive measures on various aspects. Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration, testing techniques
Unit 4	**Materials for repair:** Materials for Repair: Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete. Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete ,mortar and dry pack, vacuum concrete ,Gunite and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.
Unit 5	**Repair Techniques:** Examples of Repair to Structures: Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, fire, leakage, marine exposure, engineered demolition techniques for dilapidated structures - case studies

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1	Earthquake resistant design of structures	Pankaj Agarwal and Manish Shrikhande
2	Handbook on Repairs and Rehabilitation of RCC	CPWD, Government of India
3	Appraisal and Repair of Reinforced concrete	R.Holland
4	Repair and Strengthening of Concrete structures	FIP guide
Important Web Links:		
1. https://nptel.ac.in/courses/105/106/105106202/		
2. https://nptel.ac.in/courses/105/102/105102176/		
3. https://swayam.gov.in/nd1_noc20_ce26/preview		
4. http://fmcet.in/CIVIL/CE2071_uw.pdf		
5. https://www.youtube.com/watch?v=fikRPFpbgVo		

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	-	1	-	1	-	-	-	-	1
CO2	1	1	1	-	2	-	-	-	-	-	-	-
CO3	1	-	2	-	2	-	-	-	-	-	-	1
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	1	2	-	1	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	-	3	2	-
CO2	1	-	2	3	1
CO3	1	-	2	2	-
CO4	2	-	3	-	-
CO5	2	-	1	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTECV1108	Soil Structure Interaction	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES

To acquire knowledge for computing stress and settlement at any point in the semi-infinite elastic soil medium, anisotropic medium and evaluation of stability of foundations, slopes, cuts and retaining structures both for the conditions of undrained and drained loading through theorems of plastic collapses.

COURSE OUTCOME:

The student would be able to:

CO1 Ability to select suitable soils for various geotechnical applications based on the factors governing the Engineering behavior of soils.

CO2 Students are able to select the shear strength and compressibility parameters to design different structures for different conditions of loading, drainage and failure criteria.

CO3 Capable to estimate the stresses in soil medium of any type due to foundation load, settlement of foundation and to evaluate bound and true collapse loads of soil structures.

CO4 To impart knowledge on the various factors governing the Engineering behaviour of soils and the suitability of soils for various Geotechnical Engineering applications.

CO5 To characterize stress-strain behaviour of soils, the failure criteria and to evaluate the shear strength and compressibility parameters of soils.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for theUnit (Hours)
1	**Introduction**	9
2.	**Elastic Foundation**	10
3.	**Analysis of elastic and plastic plate**	8
4.	**Pile foundation**	9
5.	**Laterally loaded pile**	8

B. DETAILEDSYLLABUS

Unit	Unit details
Unit 1	**Introduction:** Soil foundation Interaction: Introduction to soil foundation interaction problems, soil behavior, foundation behavior, interface behavior, scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, two parameter elasticmodel, Elastic Plastic behavior, Time dependent behavior.
Unit 2	**Elastic Foundation:** Beam on Elastic foundation-soil models: Infinite beam, two parameters, Isotropic elastic half space, analysis of beams of finite length, classification of finite beams in relation to their stiffness.
Unit 3	**Analysis of elastic and plastic plate:** Plate on Elastic medium: Infinite plate, Winkler, two parameters, isotropic elastic medium, thin and thick plates, Analysis of finite plates:rectangular and circular plates, Numerical analysis of finite plates, simple solutions.
Unit 4	**Pile foundation:** Elastic analysis of piles: Elastic analysis of single pile, theoretical solutions for settlement and load distributions, Analysis of pile group, interaction analysis, loads distribution in groups with rigid cap
Unit 5	**Laterally loaded pile:** Laterally loaded pile: Load deflection prediction for laterally loaded piles, sub-grade reaction and elastic analysis, interaction analysis, pile raft system, solution through influence charts.

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Elastic analysis of soil foundationinteraction	By Selva durai, A.P.S
2.	Pile Foundation Analysis and Design	By Poulos, H.G. & Davis E.H
3.	Structure Soil Interaction	State of Art Report, Institution
Important Web Links:		
1. https://nptel.ac.in/courses/105/105/105105200/		
2. https://www.youtube.com/watch?v=GKmW9j3qWfA		
3. https://www.youtube.com/watch?v=Ng2tH7CX-WU		
4. https://swayam.gov.in/nd1_noc20_ce22		
5. https://freevideolectures.com/course/3354/port-and-harbour-structures/13		

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	-	1	1	1	-	-	-	-	1
CO2	1	1	2	-	1	-	-	-	-	-	-	-
CO3	1	-	2	-	2	-	-	-	-	-	-	1
CO4	2	-	3	-	1	-	-	-	-	-	-	-
CO5	2	1	2	-	1	-	-	-	-	-	-	1

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	-	3	2	-
CO2	2	-	1	3	1
CO3	1	-	3	1	-
CO4	1	-	2	-	2
CO5	2	-	1	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTECV1109	Advanced Solid Mechanics	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES

To solve advanced solid mechanics problems using classical methods To apply commercial software onselect, applied solid mechanics problems

COURSE OUTCOME

The student would be able to

CO1 To understand the theory of elasticity including strain/displacement and Hooke's lawrelationships.

CO2 To analyze solid mechanics problems using classical methods and energy methods.

CO3 To solve torsion problems in bars and thin walled members.

CO4 To solve for stresses and deflections of beams under unsymmetrical loading.

CO5 To locate the shear center of thin wall beams;

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	MECHANICAL PROPERTIES OF MATERIALS	9
2.	STRESS IN MATERIAL	10
3.	UNSYMMETRICAL BENDING	9
4.	STRESS IN CURVED MEMBER	9
5.	FUNDAMENTALS OF VIBRATION	7

B. DETAILED SYLLABUS

Unit	Unit Details
Unit 1	**MECHANICAL PROPERTIES OF MATERIALS** Stress-Strain Diagrams- Elastic and Plastic Deformation–Brittle and Ductile Failures of Materials- Mechanical Tests like Surface Hardness, Fatigue, Creep etc.
Unit 2	**STRESS IN MATERIAL** Principal stresses in a 3D field. - Computation -Mohr's Circle - Lame's Ellipsoid. Theories of failure - Criteria for Failure - Different failure theories for ductile and brittle materials. Equivalent bending and twisting moments.
Unit 3	**UNSYMMETRICAL BENDING** Properties of unsymmetrical sections- Circle of inertia- Dyadic circle-Momental ellipse- Stresses and deflection due to unsymmetrical bending - Concept and relevance of Z polygon. Shear Centre -

	Concept and significance.
Unit 4	**STRESS IN CURVED MEMBER** Shear flow for thin walled open sections- Location of shear center for singly symmetric sections. Stresses in curved flexural members-Winkler Bach Formula - Crane hooks - rings and links.
Unit 5	**FUNDAMENTALS OF VIBRATION** Free vibration of single degree of freedom systems - Undamped and damped free vibration with different types of damping.-Resonance-Harmonic response of single degree of freedom systems with and without damping.

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1.	Advanced Mechanics of Solids	Srinath, L. S., Tata McGraw Hill,1980
2.	Solid Mechanics	Kazimi, S.M.A., Tata McGraw Hill, 1976
3.	Strength of Materials Part II	B.C., Punmia, Standard Publishers and Distributors, 1991.
4.	Engineering Mechanics	Shames I.H., Prentice Hall of India,1996
Important Web Links:		
1. https://nptel.ac.in/content/storage2/courses/105106049/pdf-assignments/main.pdf		
2. https://nptel.ac.in/courses/105/106/105106049/		
3. https://www.brown.edu/Departments/Engineering/Labs/Gudurulab/ENGN1750/Lecture%20Notes/Intro_Lecture_090513%20[Compatibility%20Mode].pdf		
4. https://edurev.in/courses/9617_Advanced-Solid-Mechanics-Notes--Videos--MCQs--PPTs		
5. http://dl.booktolearn.com/ebooks2/engineering/mechanical/9781783323616_Advanced_Mechanics_of_Solids_925c.pdf		

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	1	-	-	-	-	-	-	-
CO2	3	1	2	1	-	-	-	-	-	-	-	-
CO3	1	-	3	2	1	-	-	-	-	-	-	-
CO4	-	2	-	2	3	-	-	-	-	-	-	-
CO5	2	-	2	3	-	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	2	-	2
CO2	1	3	-	2	1
CO3	2	1	3	1	-
CO4	-	2	-	3	2
CO5	2	-	2	-	3

Note: On the basis of mapping of COs with POs, this course is related to Employability / SkillDevelopment.

Code: MULEBX1109	Research Methodology	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES

To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling

COURSE OUTCOME

The student will be able to:
CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.
CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables.
CO3 To be able to distinguish between categorical and continuous measures.
CO4 To be able to design a good quantitative purpose statement and good quantitative researchquestions and hypotheses.
CO5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**General**	9
2.	**Connections**	10
3.	**Towers**	8
4.	**Plastic Analysis**	9
5.	**Industrial Building**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Overview of Research Methodology** Introduction, Mathematical tools for analysis, Research problems in management, Types ofresearch, Research Process, Data Collection & Presentation: Introduction, Primary data, Secondary data, Data Presentation
2.	**Review of Basic Statistical Measures & Basic Multivariate Analysis** Introduction, Measures of Central Tendencies, Measures of Variation, Measures of Skewness. Basic Multivariate Analysis: Introduction, Correlation analysis, Forecasting, Linear regression & Timeseries
3.	**Design and Analysis of Experiments** Introduction, Analysis of Variance, Completely Randomized design, Randomized complete blockdesign, Latin square design, Duncan‟s multiple Range Test, Functional design, second factorial experiment, Expected Mean Square.
4.	**Algorithmic Research &Simulation** Introduction, Algorithmic Research Problems, Types, Types of Solution Procedures, Steps of development, Steps of Algorithmic Research, Design of Experiments, Meta Heuristics for Combinational Problems Simulation: Introduction, Need for simulation, Types, Simulation Languages, case study.
5.	**Report Writing and Presentation** Introduction, Types of report, Guidelines for review draft, Report format, Typing Instructions, Oral Presentations

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Research Methodology	R. Panneerselvam, PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari
3.	Research Methodology: A Step by Step Guide for Beginners	Ranjit Kumar

Important Web Links

1. https://libguides.wits.ac.za/c.php?g=693518&p=4914913
2. https://www.scribbr.com/dissertation/methodology/
3. https://www.open.edu/openlearn/money-management/understanding-different-research-perspectives/content-section-8
4. https://www.researchgate.net/publication/270956555_CHAPTER_3_-_RESEARCH_METHODOLOGY_Data_collection_method_and_Research_tools
5. https://www.youtube.com/watch?v=ze5bS-DNERk

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	-	-	-
CO2	-	2	3	-	2	-	-	-	-	-	-	-
CO3	2	1	3	-	1	-	-	-	-	-	-	-
CO4	2	3	-	2	-	-	-	-	-	-	-	-
CO5	1	1	2	3	-	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	1
CO2	2	-	3	2	-
CO3	1	-	3	1	2
CO4	-	2	2	-	3
CO5	2	1	-	3	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / SkillDevelopment.

Code: MAUCHM1201	Communication Skill - I	1 Credits [LTP: 0-0-2]

COURSE OUTCOME

- CO1: To present themselves in an effective manner and know about their short-term and long-term goals.
- CO2: To works in a team by managing time properly and focus on personal grooming,etiquettes and body language.
- CO3:To demonstrate their abilities by improving skills of LSRW (Listening /Speaking/Reading/Writing).
- CO4: To present different viewpoints or ways of thinking about a situation, expand theirabilities to resolve situations and get experience within the given context
- CO5: To enhance their employability skills by working on the presentation of Résumé and giving impactful performance during Group Discussion.

A. DETAILED SYLLABUS

1.	Self-Introduction & knowing your environment
2.	Goal Setting & Planning
3.	Etiquettes (Personal, Social, Professional & Corporate) etiquettes
4.	Personal Grooming and Body language
5.	Time Management & Team Work
6.	Negotiation and conflict management
7.	Oral Communication &Writing Skills: Extempore & Paper Presentations.
8.	Resume Writing
9.	Group Discussion
10.	Interview Skills

Code: MSTCCV1401	SEMINAR-I	2 Credits [LTP:0-0-4]

A. SYLLABUS

Unit	Contents
	Students will be grouped in two to three, will have to decide final thesis area, download research papers from IEEE, ACM, Elsevier, Springer etc. Summarizing paper – Reading abstracts and finding ideas, conclusion, Advantages of Their approach, the drawbacks of the papers. Generalize results froma research paper to related research problems. Comparing the approach - Identify weaknesses and strengths in recent research articles in the subject. Practice sessions on how to read, analyze and summarize research papers. Students in group will have to deliver seminar, prepare a report and a review paper based on analysis.

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Structural Engineering** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	Semester-II								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
MSTCCV2101	Advanced Steel Structures	3	-	-		40	60	100	3
MSTCCV2102	Design of Advanced Concrete Structure	3	-	-		40	60	100	3
MSTCCV2103	Theory of Elasticity and Elastic Stability	3	-	-		40	60	100	3
A.2	**Practical**								
MSTCCV2201	Structure Lab-II	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives I and II**							
B.1	**Theory**								
MSTECV2101	Finite Element Method	3	-	-	-	40	60	100	3
MSTECV2102	Structural Optimization			-	-	40	60	100	
MSTECV2103	Plates and Shells			-	-	40	60	100	
MSTECV2104	Stability Analysis of Structure								
MSTECV2105	Tall Structures	3	-	-	-	40	60	100	3
MSTECV2106	Earthquake Resistant Design of Structures			-	-	40	60	100	
MSTECV2107	Design Concept of Substructure			-	-	40	60	100	
MSTECV2108	Industrial Structures								
B.2	**Practical**								
	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
	MOOC Course - I	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
MUACHM2207	Communication Skill - II	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
MULCSE2201	Skill Enhancement Technical Course-II			4		60	40	100	2
MULCCV2202	Review/Research Paper-I			2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MSTCCV2401	Seminar-II	-	-	2	-	60	40	100	1
Total		18	0	12					**24**
Total Teaching Hours		**30**							

PO's and PSO's are as follows

PO No.	PO's
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Considerations.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO No.	**PSO's**
1	A civil engineering graduate is efficient in fundamentals of civil engineering, mathematical & scientific reasoning and are able to plan, design the building structure, roads, sewage and water supply networks & other component of infrastructure system considering environmental, safety & health aspects.
2	A civil engineer is able to use modern tools, techniques, software's to solve complex engineering problems.
3	A civil Engineer able to prepare BOQ & cost estimation & able to execute the projects in lined with set project goals.
4	A civil engineer is able to compile detailed project report & give technical specifications to provide required quality of work.
5	A civil engineer is able to access the quality of material used for construction & able to find out deviations & able to suggest preventative and corrective measures for sustainable development.

Code: MSTCCV2101	Advanced Steel Structure	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES

To acquire knowledge for computing plastic analysis and various different type of strength to analyze the steel structure. The collapsing mechanism and design of industrial building is also an important parameter to understand the steel structure design.

COURSE OUTCOME

The student will be able to:

CO1 To be able to understand the biaxial loading system on the structure.

CO2 To analyze various types of statically determinate and indeterminate structures.

CO3 To design the various type of connection system.

CO4 To understand the mechanisms to provide stability to the structures.

CO5 To analyze and design the industrial building.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	General	9
2.	Connections	10
3.	Towers	8
4.	Plastic Analysis	9
5.	Industrial Building	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**General** Beams subjected to biaxial bending - Built-up Purlins - Various types and design - Design of Wind girders-Beam-columns - With various support conditions-Design of foundations-with lateral forces
2.	**Connections** Bearing type joints- unstiffened and stiffened seat connections resisting connection of brackets-bolted and welded-semi-rigid connections
3.	**Towers** Basic structural configurations - free standing and guyed towers towers-wind loads-foundation design-design criteria for different configurations and transmission line towers.
4.	**Plastic Analysis** Elastic Instability, Introduction to stability problem, Energy methods, buckling of axially loaded members for different end conditions, Concept of effective length, approximate techniques, Stability analysis of beam-column and frames
5.	**Industrial Building** Industrial buildings-braced and unbraced - Gable frames with gantry industrial frames-Fire resistant design-Fatigue resistant design

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Design of Steel Structures	Duggal.S.K, McGraw Hill New Delhi, 2010
2.	Design of Steel Structures	Arya. S and Ajmani. J.L Nem Chand & Bros, Roorkee
3.	Design of Steel Structures	Dayaratnam P. S. Chand Limited, New Delhi. 2008
4.	Structural Design in Steel	John E. Lothers, "", Prentice Hall, 1999

Important Web Links:

1. https://nptel.ac.in/courses/105/106/105106113/
2. https://nptel.ac.in/courses/105/106/105106112/
3. https://www.youtube.com/watch?v=mtRR-5fzKo8
4. https://www.digimat.in/nptel/courses/video/105105162/L01.html
5. http://www.digimat.in/nptel/courses/video/105105162/L60.html

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	-	1	-	1	-	-	-	-	-
CO2	1	1	1	-	2	-	-	-	1	-	-	1
CO3	2	-	-	3	1	-	-	-	-	1	-	-
CO4	-	2	-	2	-	-	-	-	-	-	-	-
CO5	1	-	1	2	-	-	-	-	-	-	-	2

E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	3	-	-
CO2	1	2	1	1	1
CO3	2	-	3	-	-
CO4	2	3	-	1	-
CO5	-	-	-	2	3

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTCCV2102	Design of Advanced Concrete Structure	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES

To acquire knowledge for computing design, mix and various different type of concrete to analyze the strength.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Discuss the concrete ingredients and its influence at gaining strength.
CO2: Design of concrete mix and grade as per IS codes.
CO3: Summaries the concepts of conventional concrete and its differences with other concretes like no fines, light weight etc.
CO4: Describe the application and use of fiber reinforced concrete.
CO5: Design and develop the self-compacting and high performance concrete.

D. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**General**	**9**
2.	**Manufacturing and properties of cement.**	**10**
3.	**Design of Cement**	**8**
4.	**Design of FRC**	**9**
5.	**Design of High performance concrete**	**8**

E. DETAILED SYLLABUS

Unit	Unit Details
1.	**General** Properties of cement, fine aggregate and coarse aggregates, Additives and Admixtures in Concrete, Rheology of Concrete.
2.	**Manufacturing and properties of cement.** Manufacturing and methods of concreting, Properties of fresh and hardened concrete, mix design by I.S. method
3.	**Design of Cement** Design and manufacture of normal concrete, Light weight concrete – Cellular concrete – No fines concrete – Aerated & foamed concrete
4.	**Design of FRC** Design and manufacture of fiber reinforced concrete – Polymer concrete – Fly ash concrete
5.	**Design of High performance concrete** Design and manufacture of Self compacting concrete – High performance concrete – Very high strength concrete – High density concrete

F. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Design of Advance Concrete Structures.	Duggal.S.K, McGraw Hill New Delhi, 2010
2.	Design of Advance Concrete Structures.	Neville, A.M. and Brookes, J.J., "Concrete Technology", 2nd Edition, Pearson Education, 2010.
3.	Concrete Technology	Gambhir, M.L., "Concrete Technology", 2nd Edition,Tata McGraw Hill Publishers, New Delhi, 2009.
4.	Design of Concrete Mixes	Krishna Raju. N, "Design of Concrete Mixes", 2nd Edition, CBS Publishers and Distributors, 2009.
Important Web Links:		
1. https://archive.nptel.ac.in/courses/105/106/105106176/		
2. https://www.youtube.com/watch?v=RSnNrQUTEnY&ab_channel=NPTEL-NOCIITM		
3. https://onlinecourses.nptel.ac.in/noc19_ce44/preview		

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	3	-	3	-	2	-	-	-	-	-
CO2	1	3	3	-	2	-	-	-	2	-	-	1
CO3	2	-	-	3	2	-	-	-	-	1	-	-
CO4	-	2	-	2	-	-	-	-	-	-	-	-
CO5	1	-	2	2	-	-	-	-	-	-	-	2

E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	-	-
CO2	1	2	1	1	1
CO3	2	-	3	-	-
CO4	2	3	-	2	-
CO5	-	-	-	2	3

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTCCV2103	Theory of Elasticity and Elastic Stability	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES

Theory of Elasticity and Elastic Stability is a key branch of Mechanics of Deformable Bodies, essential for analyzing stress and deformation beyond the scope of basic Strength of Materials. This course equips structural engineering students with advanced methods to assess stress distribution and deformation in elastic solids under various loads. It also emphasizes core principles of structural stability.

Course Outcomes: At the end of the course, the student will be able to:

CO No.	Description
CO1	To analyze the stresses and strains for two dimensional elements in Cartesian and polar coordinate systems.
CO2	To understand how to apply the compatibility conditions and equations of equilibrium.
CO3	To solve elementary problems of elasticity in three-dimensional Coordinate system.
CO4	To understand the basic concept of elastic stability and buckling.
CO5	To analyze buckling behavior of conventional structural components.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Theory of Elasticity- I	**9**
2.	Theory of Elasticity - II	**10**
3.	Theory of Elasticity III	**8**
4.	Elastic Stability	**9**
5.	Elastic Buckling of Bars and Frames	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Theory of Elasticity- I** • Introduction: Elasticity, Notations for forces and stresses, • components of stresses, components of strain, Hooke's law • Plane stress and plane strain analysis: stress at a point, strain at a point • Differential equations of equilibrium, boundary conditions, Strain Displacement Relations • Compatibility equations
2.	**Theory of Elasticity – II** • Two dimensional problems in rectangular coordinates: – Airy's Stress function, Biharmonic Equation, solution by polynomials • Saint-Venant's principle, bending of a cantilever loaded at the end, bending of a uniformly loaded simply supported beam. • Two dimensional problems in polar coordinates: - equations of equilibrium in polar coordinates • Bending of curved bars by a concentrated force • Rotating circular disc • Stress concentration around circular holes
3.	**Theory of Elasticity III** • Analysis of Three-Dimensional Problems: General Theorems, Differential equation of equilibrium, conditions of compatibility • Equations of equilibrium in terms of displacements, principle of super position, uniqueness of solution, Reciprocal theorem • Elementary problems of elasticity in three dimensions: Twist of Circular shafts • Pure bending of Prismatic bars, plates • Torsion of prismatic bars, Membrane analogy

4.	**Elastic Stability** • Concepts of elastic stability, different forms of structural instability • BEAM-COLUMNS: differential equation for beam columns. Analysis of beam columns with different load cases and support conditions.
5.	**Elastic Buckling of Bars and Frames** • COLUMNS: Euler's buckling load, Governing differential equation, standard cases of columns with different boundary conditions, elastically restrained columns, eccentrically loaded columns. Energy methods for buckling problems • Buckling of single span frames • Buckling of Continuous beams

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Theory of Elasticity'	Timoshenko, S., and Goodier, T.N., McGraw-Hill Book Co.Inc
2.	Theory of Elastic Stability'	Timoshenko, S, McGraw Hill Book Co.Inc
3.	Applied Elasticity'	Wang, McGraw Hill Book Co.Inc
4.	Advanced Mechanics of Solids'	L S Srinath, Tata McGraw Hill

Important Web Links:

https://onlinecourses.nptel.ac.in/noc22_ce91/preview

https://archive.nptel.ac.in/courses/105/105/105105177/

http://www.digimat.in/nptel/courses/video/105105177/L01.html

D.COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	3	-	1	1	-	-	1	-	1
CO2	2	2	-	1	1	-	1	-	-	1	1	1
CO3	1	1	-	1	1	-	1	-	-	1	-	-
CO4	1	1	1	2	-	-	-	-	-	1	1	-
CO5	1	1	1	2	1	1	1	-	-	1	1	-

E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	-	2	3
CO2	2	2	-	2	2
CO3	3	2	1	3	2
CO4	2	1	-	2	1
CO5	3	2	1	3	2

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTCCV2201	Structural Lab-II	2 Credits [LTP:0-0-2]

A. DETAILED SYLLABUS

List of Experiments
Design as per syllabus of theory

Department Elective Courses

Code: MSTECV2101	Finite Element Methods	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES

To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, `research process, research designs and sampling.

COURSE OUTCOME

The student will be able to:
CO1 To Implement numerical methods to solve mechanics of solids problems.
CO2 To Formulate and Solve axially loaded bar Problems.
CO3 To Formulate and analyze truss and beam problems.
CO4 To Implement the formulation techniques to solve two-dimensional problems using triangle and quadrilateral elements.
CO5 To Formulate and solve Axi-symmetric and heat transfer problems.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction**	**9**
2.	**Stress-strain concept**	**10**
3.	**Stiffness matrix**	**8**
4.	**Coordinates System**	**9**
5.	**Isoparametric function**	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction** Concepts of FEM –steps involved –merits &demerits –energy principles–Discretization – Rayleigh – Ritz method of functional approximation
2.	**Stress-strain concept** Stress equations-strain displacement relationships in matrix form-plane stress, plane strain and Axi-symmetric bodies of revolution with axis-symmetric loading
3.	**Stiffness matrix** Stiffness Matrix for Beam and bar elements shape functions for ID elements –static condensation of global stiffness matrix-solution –Initial strain And temperature effects.
4.	**Coordinates System** Different types of elements for plane stress and plane strain analysis –Displacement models – generalized coordinates-shape functions-convergent and compatibility requirements –Geometric Invariance –Natural coordinate system area and volume coordinates-Generation of element stiffness and nodal load matrices–static condensation
5.	**Isoparametric function** Concept, Different isoparametric elements for 2d analysis-Formulation of 4-noded and 8- node disoparametric quadrilateral elements –Lagrangian elements-serendipity elements. Bodies of revolution-axisymmetric modeling –strain Displacement relationship- formulation of axisymmetric elements. Different 3-D elements, 3D strain–displacement relationship- formulation of hexahedral

	and isoparametric solid element

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1.	Finite element analysis in Engineering Design	S. Rajasekharan, S.ChandPublications, New Delhi
2.	Finite element analysis	S.S. Bhavakatti-New age international publishers
3.	Finite Elements Methods in Engineering	Tirupati. R. Chandrnpatla and Ashok D. Belegundu – Pearson Education Publications
4.	Finite Element analysis – Theory & Programming by	C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers Finite Elements Methods in Engineering by Tirupati.R. Chandrnpatla, Universities Press India Ltd.Hyderabad
5.	Finite element method and its application	Desai, 2012, Pearson Pubilications
6.	Finite element analysis and procedures in engineering	H.V. Lakshminaryana, 3rd edition, universities press, Hyderabad

Important Web Links:

1. https://interestingengineering.com/what-is-finite-element-analysis-and-how-does-it-work
2. https://www.simscale.com/docs/content/simwiki/fea/whatisfea.html
3. https://www.simscale.com/blog/2016/10/what-is-finite-element-method/
4. https://www.youtube.com/watch?v=0kFjOz05d2k
5. https://www.youtube.com/watch?v=boSLQYhDXoE

A. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	1	-	-	-	-	-	-	1
CO2	1	2	2	-	1	-	1	-	-	-	-	-
CO3	1	1	2	-	1	-	-	-	1	-	-	1
CO4	1	-	2	-	2	-	-	1	-	-	-	1
CO5	1	1	2	-	1	-	-	-	1	-	-	1

B. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	2	3	-	1
CO2	3	1	-	2	-
CO3	1	3	-	1	1
CO4	2	-	1	-	3
CO5	3	2	1	-	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / Skill Development

Code: MSTECV2102	Structural Optimization	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES

To familiarize students to Formulate engineering design problems for load carrying structures as optimization

COURSE OUTCOME

The student will be able to:

CO1 To understand the basics of optimization.
CO2 To assign the various techniques to optimize the structural problem.
CO3 To develop various programming methods for structural optimization.
CO4 To Implement the developed theorem for optimization.
CO5 To Formulate strategies for structural complex problems.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**General**	**9**
2.	**Optimization Techniques**	**9**
3.	**Programming methods**	**9**
4.	**Theoram's**	**9**
5.	**Strategies and their properties**	**8**

B. DETAILEDSYLLABUS

Unit	Unit details
1	**General** Introduction, Basic concepts of minimum weight, minimum cost design, Objective function, constraints, classical methods.
2	**Optimization Techniques** Optimization Techniques and Algorithms, Linear, Integer, Quadratic, Dynamic and Geometric programming methods for optimal design of structural elements.
3	**Programming methods** Computer Search Methods, Linear programming methods for plastic design of frames, Computer search methods for univariate and multivariate Minimization
4	**Theoram's** Optimization Theorems, Optimization by structural theorems, Maxwell, Mitchell and Heyman's theorems for trusses and frames, Fully stressed design with deflection constraints, optimality criterion methods.
5	**Strategies and their properties** Game Theory, Strategies and their properties - pure and mixed strategies, two person zero games, Minimax, Maximin, saddle point, value of game - Rule of Dominance- Graphical solution.

C. Recommended Study Materials

S. No	Title of the Book	Author
1	Operation Research	Richard Bronson, Schaum's Outline series, MacGraw Hill Book Co, Singapore, 1983
2	Introduction to Optimization in Practice	Pun John Wiley Eastern Limited, New Delhi,1997
3	Probabilistic Approaches to	John Wiley Eastern Limited, New Delhi, 1997
4	Optimization methods for	Fox, R.C, Wesley, 1997
5	Optimization Theory and	Rao, S.S., Limited, New Delhi, 2004
6	Optimum structural Design	Spunt, Civil Engineering and Engineering mechanics Services, Prentice hall, New Jersey
Important Web links:		
http://www.solid.lth.se/research/structural-optimization/ https://www.frontiersin.org/research-topics/10265/structural-design-optimization https://link.springer.com/chapter/10.1007/978-3-0348-8553-9_1 https://www.sciencedirect.com/topics/engineering/structural-topology-optimization https://www.google.co.in/search?source=univ&tbm=isch&q=structural+optimization&sa=X&ved=2ahUKEwi7q-bezdDpAhUOxTgGHRDNDL8QsAR6BAgHEAE		

D.COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

E.COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / SkillDevelopment

Code: MSTECV2104	Stability Analysis of Structure	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES

This course provides to the student the techniques to stable the various determinate and inderminate structure. The software methodology also used to analyze the structure.

COURSE OUTCOME

The student will be able to:

CO1 To impart the principles of elastic structural analysis and behavior of indeterminate structures.
CO2 To impart knowledge about various methods involved in the analysis of indeterminate structures.
CO3 To apply these methods for analyzing the indeterminate structures to evaluate the response of structures.
CO4 To enable the student get a feeling of how real-life structures behave.
CO5 To make the student familiar with latest computational techniques and software used for structural analysis.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**General**	9
2.	**Buckling**	9
3.	**Deflection**	9
4.	**Lateral buckling and torsion**	9
5.	**Strain energy**	8

B. DETAILEDSYLLABUS

Unit	Unit Details
1	**General** Beam – column – Differential equation. Beam column subjected to (i) lateral concentrated load, (ii) several concentrated loads, (iii) continuous lateral load. Application of trigonometric series, Euler‟s formulation using fourth order differential equation for pined–pined ,fixed– fixed, fixed–Free and fixed–pinned column.
2	**Buckling** Buckling of frames and continuous beams. Elastic Energy method: Approximate calculation of critical loads for a cantilever. Exact critical load for hinged – hinged column using energy approach. Buckling of bar on elastic foundation. Buckling of cantilever column under distributed loads. Determination of Critical loads by successive approximation. Bars with varying cross section. Effect of shear force on critical load. Column subjected to non-conservative follower and pulsating forces.

3	**Deflection** Small deflections of laterally loaded plates Stability analysis by finite element approach – deviation of shape function for a two nodded Bernoulli – Euler beam element (lateral and translation of) –element stiffness and element geometric stiffness matrices – assembled stiffness and geometric stiffness matrices for a discredited column with different boundary condition – calculation of critical loads for a discredited (two elements) column (both ends built in). Buckling of pin jointed frames (maximum of two active DOF) – symmetrical single bay portal frame.
4	**Lateral buckling and torsion** Lateral buckling of beams – differential equation –pure bending – cantilever beam with tip load – simply supported beam of I section subjected to central concentrated load. Pure Torsion of thin – walled bars of open cross section. Non-uniform Torsion of thin –Walled bars of open cross section
5	**Strain energy** Expression for strain energy in plate bending with in plate forces (linear and non – linear). Buckling of simply supported rectangular plate–unaxial load and biaxial load.Bucklingofuniformlycompressedrectangularplatesimplysupportedalong two opposite sides perpendicular to the direction of compression and having various edge condition along the other two sides

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1	Stability Theory of Structures	Ashwini Kumar, Allied publishers Ltd., New Delhi, 2003
2	Principles of Structures	Chajes, A., Prentice Hall, 1974
3	Stability Analysis and Design	Gambhir, Springer, New York, 2004
4	Fundamentals of Structural	Simitser.G.J and Hodges D.H, Elsevier Ltd., 2006
5	Theory of Elastic Stability	Timoshenko, S.P, and Gere, J.M, McGraw HillBook Company, 1963
Important Web Links:		
1. https://theconstructor.org/structural-engg/basic-concepts-stability-structure/1887/		
2. https://ascelibrary.org/doi/full/10.1061/%28ASCE%29ST.1943-541X.0001434		
3. http://civil.northwestern.edu/people/bazant/PDFs/Papers/S36.pdf		
4. https://www.ajol.info/index.php/jfas/article/view/168721		
5. https://www.youtube.com/watch?v=Oj8hIdXukkE		

D. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	1	-	-	-	-	-	-
CO2	3	2	3	-	1	-	-	-	-	-	-	-
CO3	2	2	3	1	1	-	-	-	-	-	-	-
CO4	1	3	-	2	2	1	-	-	-	-	-	-
CO5	1	1	2	3	1	-	-	-	-	-	-	-

E. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	-	-	2
CO2	-	3	2	-	1
CO3	2	3	-	1	-
CO4	1	3	-	2	-
CO5	-	3	2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Employability / SkillDevelopment

Code: MSTECV2105	Tall Structures	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES

The objective of this course is to develop thorough understanding of structural systems of Tall Structures. Italso aims to expose students to analysis and design of high rise structures using software.

COURSE OUTCOME

The student will be able to:

CO1 To apply all types loads on tall buildings according IS code.

CO2 To analyze and design tall buildings.

CO3 To understand behavior of various structural systems under different loading conditions.

CO4 To design towers, chimneys and shear walls.

CO5 To check stability of tall structures against buckling, Torsion.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	General	9
2.	Loads	10
3.	Analysis of tall building	8
4.	Design of tall building	9
5.	Design philosophy	8

B. DETAILED SYLLABUS

Unit	Unit details
1	**General** Principles of Planning of Tall Buildings, Technological Planning, Mechanical systems, Fire rating, Local considerations, Structures elements, Types of structural systems for tall buildings, Shear Walls and their arrangement
2	**Loads** Loads on Tall Buildings, Gravity loads, Live loads, Wind loads and seismic loading, Code Provisions, Discussion of relevant codes of practices and loading standards.
3	**Analysis of tall building** Analysis of Tall Buildings (With and Without Shear Walls) Approximate analysis for gravity loads, Lateral loads, Analysis of tube-in-tube constructional and 3-Dimensional analysis of shear core buildings, Stability, Stiffness and fatigue, Factor of safety and load factor
4	**Design of tall building** Design of Tall Buildings, Procedures of elastic design, Ultimate strength design.
5	**Design philosophy** Limit state design of super structure, Limit state design of super structures including structural connections, soil structure interaction.

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Tall Building Structures: Analysis and Design	Smith, Byran Stafford and Coull, Alex, John Wiley and Sons (1991).
2.	Analysis and Design of Tall	Taranath, B. S., Tata McGraw Hill Limited (1988).
3.	Symposium on Tall Buildings with particular reference to Shear	Held at University of Southampton (1996).
Important Web links:		
1. https://smallbusiness.chron.com/tall-vs-flat-organizational-structure-283.html		
2. https://smallbusiness.chron.com/tall-organizational-structure-3835.html		
3. https://www.upcounsel.com/tall-organizational-structure-definition		
4. https://bizfluent.com/info-7759895-tall-organizational-structure.html		
5. https://www.google.co.in/search?source=univ&tbm=isch&q=tall+structure&sa=X&ved=2ahUKEwiGlNGo6NDpAhVabn0KHWgqBDwQsAR6BAgJEAE		

A. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

B. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / SkillDevelopment

Code: MSTECV2106	Earthquake Resistant Design of Structures	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES

The objective of this course is to provide a coherent development to the students for the courses in sector of earthquake engineering. This course also provides to present the foundations of many basicengineering concepts related earthquake Engineering

COURSE OUTCOME

The student will be able to:

CO1 To provide a coherent development to the students for the courses in sector of earthquake .

CO2 To present the foundations of many basic engineering concepts related earthquake Engineering

CO3 To give an experience in the implementation of engineering concepts which are applied in field of earthquake engineering conditions.

CO4 To provide a coherent development to the students for the courses in sector of earthquake engineering.

CO5 To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**General**	9
2.	**Elastic vibrations**	10
3.	**Analysis methods**	9
4.	**Graphical analysis**	8
5.	**Design philosophy**	8

B. DETAILEDSYLLABUS

Unit	Unit details
1	**General** Earthquake – causes of earthquake – earthquakes and seismic waves – scale and intensity of earthquakes–seismic activity, seismometer-strong motion accelerograph / field observation of ground motion analysis of earthquakes waves– earthquake motion –amplification of characteristics of surface layers – earthquake motion onthe ground surface
2	**Elastic vibrations** Elasticvibrationofsimplestructures– modelingofstructuresandequationsofmotion –free-vibrationsof simple structures – steady state forced vibrations – Non steady state forced vibrations – response spectrum representations; Relation between the nature of the ground motion and structural damage.
3.	**Analysis methods** Methods of analysis – selection of analysis – equivalent lateral force procedure seismic base shear – seismic design co-efficient - vertical distribution of seismic forces and horizontal shear – twisting moment - Over turning moment – vertical seismic load and orthogonal effects lateral deflection – P– soil structure Interaction

4.	**Graphical analysis** Graphs study, earthquake records for design – factors affecting Accelerogram characteristics - artificial Accelerogram–zoningmap, Model analysis –Inelastic –time history analysis Evaluation of the results
5.	**Design philosophy** Introduction – monolithic reinforced – concrete structures – precast concrete structures –Pre-stressed concrete structures – steel structures – composite – structures, masonry structures – Timber structures, Selection of materials and types of construction, form of superstructure – framing systems and seismic units – devices for reducing. Earthquake loads

C. ECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1.	Dynamics of structures	R.W.Clough ‟. Mc Graw – Hill, 2nd edition, 1992
2.	Design of earthquake resistant structures	Minoru Wakabayashi
3.	Structural Dynamics for Earthquake Engineering	A.K.Chopra,”, PearsonPubilications
4.	Fundamentals of Earthquake Engineering	N.M Newmark and E.Rosenblueth, ‟prentice hall,1971
5.	Earthquake design practice for buildings	David Key,.” Thomas telford,London,1988
6.	Earthquake Engg	R.L. Wegel,; Prentice Hall 12nd edition 1989
7.	Design of Multi –storied Buildings for Earthquake ground motions	J.A. Blume, N.M. Newmark, L.H. Corning., ‟, Portland Cement Association, Chicago,1961
8.	Earthquake Resistant Design	Pankaj Agarwal
Important Web Links:		
1. https://theconstructor.org/earthquake/earthquake-resistant-techniques/5607/		
2. https://en.wikipedia.org/wiki/Earthquake-resistant_structures		
3. https://sjce.ac.in/wp-content/uploads/2018/01/05-Earthquake-Resistant-Design.pdf		
4. https://cdn.ymaws.com/www.nibs.org/resource/resmgr/BSSC/FEMA_P-749.pdf		
5. https://www.bigrentz.com/blog/earthquake-proof-buildings		

C. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

D. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / SkillDevelopment

Code: MSTECV2107	Design Concept of Sub-structures	3 Credits [LTP: 3-0-0]

COURSE OVERVIEW AND OBJECTIVES

The objective of this course is to provide a coherent development to the students for the courses in sector of earthquake engineering. This course also provides to present the foundations of many basicengineering concepts related earthquake Engineering

COURSE OUTCOME

The student will be able to:

CO1 To provide a coherent development to the students for the courses in sector of earthquake.

CO2 To present the foundations of many basic engineering concepts related earthquake Engineering.

CO3 To give an experience in the implementation of engineering concepts which are applied in field of earthquake engineering conditions.

CO4 To provide a coherent development to the students for the courses in sector of earthquake engineering.

CO5 To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**General**	**9**
2.	**Important parameter**	**10**
3.	**Raft foundation**	**9**
4.	**Deep foundation**	**9**
5.	**Caissons foundation**	**7**

B. DETAILED SYLLABUS

Unit	Unit details
1	**General** Introduction, Site investigation, In-situ testing of soils, Subsoil exploration, Classification of Foundations systems. General requirement of foundations, Selection of foundations, Computations of Loads, Design concepts.
2	**Important parameter** Concept of soil shear strength parameters, Settlement analysis of footings, Shallow foundations in clay, Shallow foundation in sand & C-Φ soils, Footings on layered soils and sloping ground, Design for Eccentric or Moment Loads.
3	**Raft foundation** Types of rafts, bearing capacity & settlements of raft foundation, Rigid methods, Flexible methods, soil structure interaction, different methods of modelling the soil. Combined footings (rectangular &trapezoidal), strap footings & wall footings, Raft –super structure interaction effects & general concepts of structural design, Basement slabs

4	**Deep foundation** Deep Foundations: Load Transfer in Deep Foundations, Types of Deep Foundations, Ultimate bearing capacity of different types of piles in different soil conditions, Laterally loaded piles, tension piles & batter piles, Pile groups: Bearing capacity, settlement, uplift capacity, load distribution between piles, Proportioning and design concepts of piles.
5	**Caissons foundation** Types of caissons, Analysis of well foundations, Design principles, Well construction and sinking. Foundations for tower structures: Introduction, Forces on tower foundations, Selection of foundation type, Stability and design considerations, Ring foundations -general concepts.

C. RECOMMENDED STUDY MATERIAL:

S. No	Title of the Book	Author
1.	Foundation Analysis and Design	Bowles .J.E, McGraw Hill Publishing co., New York,1986
2.	Analysis and Design of substructures	Swamy Saran, Oxford and IBH Publishing Co. Pvt. Ltd., 2006
3.	Foundation Design and Construction	Tomlinson. M. J, Longman, Sixth Edition, New Delhi, 1995
4.	Design of Reinforced Concrete Foundations	PHI learning private limited, New Delhi – 2009
Important web links		
1. https://theconstructor.org/building/superstructure-substructure-building-construction/1651/		
2. https://link.springer.com/chapter/10.1007/978-81-322-2319-1_8		
3. https://www.designingbuildings.co.uk/wiki/Substructure		
4. https://www.rbkc.gov.uk/idoxWAM/doc/Other-1455352.pdf?extension=.pdf&id=1455352&location=volume2&contentType=application/pdf&pageCount=1		
5. http://www.iricen.gov.in/iricen/Bridge_Manuals/FoundationSubstructureCode.pdf		

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	1	1	1	-	-	-	-	1
CO2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	-	1	1	-	2	2	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	2	2	-	-	-	-	-	-

A. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3		-	-	2
CO2	-	-	2	2	2
CO3	2		2	-	1
CO4	2		-	2	-
CO5	-		2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Code: MSTECV2108	Industrial Structures	3 Credits [LTP:3-0-0]

COURSE OVERVIEW AND OBJECTIVES

The objective of this course is to provide a coherent development to design Steel Gantry Girders,Portal & Gable Frames, Bunkers, Silos, Chimneys and water tank Engineering

COURSE OUTCOME

The student will be able to:

CO1 To provide a coherent development to the students for the courses in sector of earthquake.

CO2 To present the foundations of many basic engineering concepts related earthquake Engineering.

CO3 To give an experience in the implementation of engineering concepts which are applied in fieldof earthquake engineering conditions.

CO4 To provide a coherent development to the students for the courses in sector of earthquake engineering.

CO5 To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

A. OUTLINE OF COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**General**	9
2.	**Important parameter**	10
3.	**Raft foundation**	9
4.	**Deep foundation**	9
5.	**Caissons foundation**	7

B. DETAILED SYLLABUS

Unit	Unit details
1	**General** Review of Plastic Design: Concept of minimum weight design, Design of Industrial Buildings: General, Framing, Crane girders & columns, Analysis of trussed bents, Design of industrial frame.
2	**Storage Structure** Design of Storage Structures: Design of containers like bunkers, silos. Design of Space Structures: Transmission towers, Steel domes, Pre-cast building components.
3	**Light gauge section** Design using Light Gauge Sections: Structural use of pressed sections and light gauge sections, Aluminum as a material of construction for industrial structures and design of such structures, Tubular structures and Sandwich plate construction.

4	**Aluminium structure** Aluminum structures: Introduction, Permissible stresses, Tension members, Compression members, Design of beams, Local buckling of compression elements, Riveted and bolted construction, Design of chimneys, Load analysis, Design of steel supporting chimney, Chimney foundation
5	**Design Philosophy** Construction Practices: Shop practice in steel construction, Fabrication erection and production.

C. RECOMMENDED STUDYMATERIAL:

S. No	Title of the Book	Author
1.	Design of Steel Structures	Ajmani, A. L. and Arya, A. S., Nem Chand and Brothers (2000).
2.	Planning of Industrial Structure	Dunham, C.W., s, John Wiley and Sons (2001).
3.	Steel Designer‟s Manual	Gary, W, Prentice Hall (2008).
4.	Structural Pre-cast Concrete	Glower, F Oxford Publishers (2008).

Important Web Links:

1. https://link.springer.com/chapter/10.1057/9781137340313_2
2. https://nptel.ac.in/courses/112/107/112107292/
3. https://nptel.ac.in/courses/112/107/112107143/
4. https://nptel.ac.in/courses/108/105/108105062/
5. https://nptel.ac.in/content/syllabus_pdf/105105162.pdf

E. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	1	1	1	-	-	-	-	1
CO2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	-	1	1	-	2	2	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	2	2	-	-	-	-	-	-

A. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3		-	-	2
CO2	-	-	2	2	2
CO3	2		2	-	1
CO4	2		-	2	-
CO5	-		2	-	2

Note: On the basis of mapping of COs with POs, this course is related to Skill Development

Code: MUACHM2207	Communication Skill - II	1 Credits [LTP:0-0-2]

COURSE OUTCOMES

Students will be able:

- CO1: To present themselves in an effective manner and know about their short-term and long-term goals.
- CO2 To works in a team by managing time properly and focus on personal grooming, etiquettes and body language.
- CO3 To demonstrate their abilities by improving skills of LSRW (Listening /Speaking/Reading/Writing).
- CO4 To present different viewpoints or ways of thinking about a situation , expand their abilitiesto resolve situations and get experience within the given context
- CO5to enhance their employability skills by working on the presentation of Résumé and giving impactful performance during Group Discussion.

DETAILED SYLLABUS

Unit	Unit Details
1	Self-Awareness, Self Esteem & Confidence
2	The Corporate Fit-Dressing and Grooming, Etiquette: Social etiquette, business etiquette – civic sense – social norms
3	Effective Management Skills Time & Stress Management: Act in time on commitment
4	Personal Grooming and Body language
5	**Time Management &Conflict Management**
6	**Planning & Prioritizing, Emotional Intelligence: Managing Emotions**
7	Oral Communication &Writing Skills: Extempore & Paper Presentations.
8	**Selling Self/Job Hunting Writing resume / Curriculum vitae**
9	Mock GD – Goal setting - Career planning
10	Mock interview or Interview skills

A. COs AND POs MAPPING

COs and LOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	3	1	-	1	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	-	-	1
CO4	3	1	2	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	1	-	-	-	-	-	-	1

B. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-
CO2	3	-	-	2	-
CO3	3	-	-	2	-
CO4	3	-	-	2	1
CO5	3	1	-	-	1

Note: On the basis of mapping of COs with POs, this course is related to Employability / SkillDevelopment.

Code: MULCCV2202	Review/Research Paper	1 Credits [LTP: 0-0-2]

A. COURSE OVERVIEW AND OBJECTIVES

To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling

COURSE OUTCOME

The student will be able to:

CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.

CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables.

CO3 To be able to distinguish between categorical and continuous measures.

CO4 To be able to design a good quantitative purpose statement and good quantitative research questions and hypotheses.

CO5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

A. DETAILED SYLLABUS

Unit	Contents
1.	**Foundations of Research**
	Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory.
2.	**Problem Identification & Formulation**
	Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis
3.	**Research Design**
	Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses.
4.	**Qualitative and Quantitative**
	Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.
5.	**Data Analysis**
	Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis.
6.	**Interpretation of Data and Paper Writing**
	Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals.
7.	**Use of Encyclopedias, Research Guides, Handbook**
	Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline
8.	**Use of tools / techniques for Research**
	Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley,

B. RECOMMENDED STUDY MATERIAL:

S.No	Title of the Book	Author
1.	Research Methodology	R. Panneerselvam, PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari
3.	Research Methodology: A Step by Step Guide for Beginners	Ranjit Kumar

Code: MSTCCV2401	SEMINAR-II	1 Credits [LTP:0-0-2]

A. DETAILED SYLLABUS

Unit	Contents
	Students grouped in two to three during Semester I, will now continue to download further the research papers in the area, analyze, allocate individually, the set of papers, **Literature survey** Overview- What is literature survey, Functions of literature survey, maintaining a notebook, developing a Bibliography Methods of data collection – Observation, survey, contact methods, experimental, determining sample design Searching for publications – Publication databases,search engines and patent databases, Find some/all of the references for a given paper, including thosethat are not on the web Online tools-google, Cite Seer, ACM Digital Library, IEEE, The on-line Computer Science bibliography, Survey papers, Finding material not on the web, Searching patents. **Publishing a paper** How to write scientific paper Structure of a conference and journal paper, how (and How Not) to write a Good Systems Paper: Abstract writing, chapter writing, discussion, conclusion, references, bibliography, and In-class discussion of technical writing examples, Poster papers, review papers, how to organize thesis Project report, How to write a research proposal? How research is funded? Research ethics – Legal issues, copyright, and plagiarism General advice about writing technical papers in English Tips for writing correct English Practice sessions on above will beconducted. Students will have to deliver seminar, prepare a report and a review paper based on analysis individually.

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Structural Engineering** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	Semester-III								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
A.2	**Practical**								
MSTCCV3401	Review/Research Paper-II	0	0	2		60	40	100	1
MSTCCV3402	Industrial Technical Seminar	0	0	4		60	40	100	2
B.		**Minor Stream Courses/ Department Electives/*Open Elective***							
B.1	**Theory**								
C		**Multidisciplinary Courses**							
	MOOC Course - II	3	-	-	-	-	-	-	3
D		**Ability Enhancement Courses (AEC)**							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
G		**Summer Internship / Research Project / Dissertation**							
MSTCCV3403	Internship	-	-	12	-	40	60	100	6
MSTCCV3404	Dissertation Part - I	-	-	12	-	60	40	100	6
Total		3	0	30					**18**
Total Teaching Hours		**33**							

PO's and PSO's are as follows

PO No.	PO's
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Considerations.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO No.	**PSO's**
1	A civil engineering graduate is efficient in fundamentals of civil engineering, mathematical & scientific reasoning and are able to plan, design the building structure, roads, sewage and water supply networks & other component of infrastructure system considering environmental, safety & health aspects.
2	A civil engineer is able to use modern tools, techniques, software's to solve complex engineering problems.
3	A civil Engineer able to prepare BOQ & cost estimation & able to execute the projects in lined with set project goals.
4	A civil engineer is able to compile detailed project report & give technical specifications to provide required quality of work.
5	A civil engineer is able to access the quality of material used for construction & able to find out deviations & able to suggest preventative and corrective measures for sustainable development.

M. Tech. Structural Engineering Syllabus-Third Semester

Code: MSTCCV3401	Review/Research Paper- II	1 Credits [LTP: 0-0-2]

A. COURSE OVERVIEW AND OBJECTIVES

To familiarize students with basic of research and the research process. To enable the students in conducting research work and formulating research synopsis and report. Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling

B. OUTCOME

The student will be able to:

CO1 To be able to distinguish a purpose statement, a research question or hypothesis, and a research objective.

CO2 To be able to define the meaning of a variable, and to be able to identify independent, dependent, and mediating variables.

CO3 To be able to distinguish between categorical and continuous measures.

CO4 To be able to design a good quantitative purpose statement and good quantitative research questions and hypotheses.

CO5 To understand the link between quantitative research questions and data collection and how research questions are operationalized in educational practice.

C. DETAILED SYLLABUS

Unit	Contents
1.	**Foundations of Research**
	Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process
2.	**Problem Identification & Formulation**
	Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance
3.	**Research Design**
	Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.
4.	**Qualitative and Quantitative**
	Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.
5.	**Data Analysis**
	Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.
6.	**Interpretation of Data and Paper Writing**
	When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.
7.	**Use of Encyclopedias, Research Guides, Handbook**
	Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline
8.	**Use of tools / techniques for Research**
	Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

D. RECOMMENDED STUDY MATERIAL:

S.No	Title of the Book	Author
1.	Research Methodology	R. Panneerselvam, PHI
2.	Research Methodology: Methods and Trends	Dr. C. R. Kothari
3.	Research Methodology: A Step by Step Guide for Beginners	Ranjit Kumar

Code: MSTCCV3402	Industrial Technical Seminar	2 Credits [LTP:0-0-4]

A. DETAILED SYLLABUS

Unit	Contents
	1. For the seminar every student will individually study a topic assigned to him/her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term. 2. Selection of topic should be done by students in consultation with the concerned guide a). The topic should be related to the branch but it should be an extended part of the branch (latest and advanced topic). b). The topic should be such that the student can gain the latest knowledge. Students should preferably refer to at least one research paper 3. Seminar topics should not be repeated in the department and registration of the same should be done on a first come first served basis. 4. Seminar report should be submitted in paper-bound copy prepared with computer typing a). The size of the report depends on the advancement of the topic. b). Students should preferably refer minimum of 5 reference books/magazines. c). Format of content i. Introduction. ii. Literature survey. iii. Theory 1) Implementation 2) Methodology 3) Application 4) Advantages, Disadvantages. iv. Future scope. v. Conclusion..

Code: MSTCCV3404	Dissertation Part-I	6 Credits [LTP:-0-0-12]

The Project can be carried out in the Institution/Industry/Research laboratory or any other competent institutions.

	POORNIMA UNIVERSITY, JAIPUR								
	Faculty of Engineering and Technology								
Name of Program:	**M.Tech. in Structural Engineering** **Duration: 2 Years** **Total Credits: 81**								
	Teaching Scheme for Batch 2025-27								
	Semester-IV								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
-	-	-	-	-	-	-	-	-	-
A.2	**Practical**								
-	-	-	-	-	-	-	-	-	-
B.		**Minor Stream Courses/ Department Electives/*Core Elective***							
B.1	**Theory**								
-	-	-	-	-	-	-	-	-	-
B.2	**Practical**								
-	-	-	-	-	-	-	-	-	-
C		**Multidisciplinary Courses**							
-	-	-	-	-	-	-	-	-	-
D		**Ability Enhancement Courses (AEC)**							
-	-	-							
E		**Skill Enhancement Courses (SEC)**							
-	-	-	-	-	-	-	-	-	-
F		**Value Added Courses (VAC)**							
	-	-	-	-	-	-	-	-	-
G		**Summer Internship / Research Project / Dissertation**							
MSTCCV4401	Dissertation Part - II	-	-	30	-	250	250	500	15
Total		0	0	30					**15**
Total Teaching Hours		**30**							

Code: MSTCCV4401	Dissertation Part-I	15 Credits [LTP:-0-0-30]

The Project can be carried out in the Institution/Industry/Research laboratory or any other competent institutions.