

**M. Tech. II Semester III**

**Subject Name:** Design of Prestressed Concrete Structures

**Subject Code:** MTST14301

**Type of course:** PE - V

**Prerequisite:** Basic Structural Analysis & Design Subjects

**Rationale:** Prestressed concrete is one of the most advanced construction materials used in building and bridge projects around the world. It is being used significantly in construction industry. Due to its enormous benefits, it has found applications in variety of projects like Buildings, Bridges, Water Tanks, Foundations, Nuclear Reactors, TV Towers and Offshore Projects. This subject covers Basics of Prestressed Concrete and its Applications in Fields.

**Teaching and Examination Scheme:**

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

**CA1:** Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

**Content:**

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	<b>Introduction, Prestressing Systems and Material Properties:</b> Basic Concepts, Early attempts of Prestressing, Brief History, Definitions, Advantages and Limitations of Prestressing, Types of Prestressing, Prestressing Systems and Devices, Properties of Hardened Concrete and Prestressing Steel, Losses of Prestress	07	15%
2	<b>Analysis and Design of Members:</b> Axially Loaded Tension Members, Members under Flexure, Analysis at Transfer, Analysis at Service Load Condition, Analysis of Behavior, Calculation of Demand for Axial Tension & Moment, Design of Prestressing Force	08	20%
3	<b>Shear &amp; Torsion Effects:</b> Analysis and Design for Shear & Torsion, Crack Width and Deflection Calculation, Transmission of Prestress	07	15%
4	<b>Analysis and Design of Continuous Beams:</b> Introduction, Analysis, Incorporation of moment due to reactions, Pressure line due to prestressing force, Concordant cable profile, Cable profiles, Partially continuous beams, Analysis at ultimate limit state, Moment redistribution	07	15%
5	<b>Special Topics:</b> One Way Slab, Two Way Slab, Compression Member, Water Tank	16	35%

**Suggested Specification table with Marks (Theory/Practical):**

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
<b>10</b>	<b>20</b>	<b>25</b>	<b>25</b>	<b>10</b>	<b>10</b>

**Legends:** **R:** Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels (**Revised Bloom's Taxonomy**)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Text Books:**

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of Publication	Publication Edition
01	Prestressed Concrete	N. Krishna Raju	McGraw Hill 9387886204	2018	6thEdition
02	Fundamentals of Pre-Stressed Concrete	N. C. Sinha and Sujit Kumar Roy	S Chand 9788121924276	2018	2 <sup>nd</sup> Edition
03	Prestressed Concrete	N. Rajagopalan	Alpha Science International 978-1842652121	2005	2 <sup>nd</sup> Edition
04	Design of Prestressed Concrete Structures	T.Y. Lin & Ned H. Burns	Wiley 9788126528035	2010	1st Edition
05	Prestressed Concrete Structures	P. Dayaratnam	Medtech 9789386479778	2017	7thEdition
06	Prestressed concrete design and construction	F. Leonhardt	Wilhelm Ernst and Shon	1964	1st Edition

- IS 456 : 2000 - Plain and reinforced concrete - Code of Practice
- IS: 1343-Code for Practice for Prestressed Concrete.
- IS:13920: 2016 – Ductile Design and Detailing of Reinforced Concrete Structures subjected to Seismic Forces – Code of Practice

**Course Outcome:**

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % Weightage
CO-1	Understand the principle of prestressing, determination of losses and deflections ( <i>R, U, A, N, E – Cognitive Level</i> )	20%
CO-2	Analyze and design prestressed concrete axially loaded tension member and beam ( <i>U, A, N, E – Cognitive Level</i> )	20%
CO-3	Analyze and design prestressed concrete continuous beams ( <i>R, U, A, N, E, C – Cognitive Level</i> )	20%
CO-4	Analyze and design prestressed concrete One-Way Slabs, Two Way Slabs, Compression Members and Water Tanks ( <i>R, U, A, N, E, C – Cognitive Level</i> )	25%
CO-5	Analyze and design prestressed concrete Water Tanks ( <i>R, U, A, N, E, C – Cognitive Level</i> )	15%

**List of Tasks to be performed by Students:**

- Group of Students have to prepare presentation based on topics of subject as well as individually students have to write / solve assignments

**PE - V: Programme Elective - V**

**List of Open-Source Software / Learning Website:**

- <https://nptel.ac.in/courses/105/106/105106117/>
  - Lecture Notes on Prestressed Concrete Structures from IIT Madras
- <https://nptel.ac.in/courses/105/106/105106118/>
  - Lecture Series on Prestressed Concrete Structures by Dr. A. K. Sengupta, IIT Madras.