



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code: ME02000271

Subject Name: Design of Prestressed Concrete Structures

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Mechanics of Solids, Design of Reinforced Concrete Structures and Concrete Technology.
Rationale:	Prestressed concrete is one of the most reliable, durable and widely used construction materials in building and bridge projects around the world. It has made significant contributions to the construction industry, the precast manufacturing industry and the cement industry as a whole. It has led to an enormous array of structural applications, including buildings, bridges, foundations, parking garages, water towers, nuclear reactors, TV towers and offshore drilling platforms due to its distinct advantages. This subjects covers basic principles and in depth knowledge of designing prestressed concrete structures.

Course Outcome:

After Completion of the Course, Student will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Apply principle of prestressing, determination of losses, deflections and cable profile.	20
CO-2	Analyze and design pre-tensioned and post-tensioned prestressed concrete beam with limit state design method.	30
CO-3	Apply principles of prestressing to slab, column, beam-column, pipes & cylindrical water tank.	20
CO-4	Apply prestressing techniques to composite structures like Prestressed concrete beam over cast-in-situ slab.	20
CO-5	Apply design principles of partial prestressing, of few special structures like folded plates, cylindrical shell and poles.	10

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150



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IS:1343- "Code for Practice for Prestressed Concrete".is permitted in examination.

Course Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction: Principles of prestressing - types and systems of prestressing, need for High Strength materials, Loading stages, Determination of losses, deflection (short-long term), camber, cable layouts.	05	10
2	Statically determinate PSC beams: Analysis and design for ultimate and serviceability limit states for flexure, shear, bond and torsion, code provisions.	06	15
3	Transmission of prestress: Prestress Transmission in pre-tensioned members; Anchorage zone stresses and design for post-tensioned members.	06	10
4	Statically indeterminate structures: Analysis and design of continuous beams, choice of cable profile, linear transformation and concordance.	06	15
5	Design of structural elements: Analysis and design of various structural elements like slab, column, beam-column. Application in the design of prestressed pipes and prestressed concrete cylindrical water tanks.	10	25
6	Composite construction: Analysis and design of precast PSC beams and cast in-situ RC slab, creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack width calculations.	07	15
7	Miscellaneous structures: Introduction to the special prestressed structures like prestressed folded plates, Prestressed cylindrical shells, prestressed concrete poles.	05	10
TOTAL		45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	20	20	20	15	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and 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.



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Reference Books:

1. Prestressed concrete - Krishna Raju
2. Design of Prestressed Concrete Structures - T.Y.Lin
3. Fundamentals of Prestressed Concrete - N.C.Sinha & S.K.Roy S.Chand & Co.,
4. Prestressed Concrete- Design and Construction – Leonhardt F., Wilhelm Ernst and Shon, Berlin
5. Prestressed Concrete - Freyssinet
6. Prestressed Concrete, - Evans, R.H. and Bennett, E.W., Chapman and Hall
7. Prestressed concrete - Rajgopalan
8. IS:1343-Code for Practice for Prestressed Concrete.
9. IS:3370-3 : Code of Practice Concrete structures for the storage of liquids, Part 3: Prestressed concrete structures

Open source website:

<http://nptel.ac.in/>

Suggested Course Practical List:

At least two designs suitably selected from topics and small design examples from each topics of the course. The report shall consist of full analytical treatment, design procedure, references and all necessary drawings in the form of neat dimensioned sketches.
