

Design of Prestressed Concrete Structures

01ST1111 (PEC)

Objective of the Course:

- To introduce the need of prestressing techniques & advantages and disadvantages of prestressed concrete.
- To learn the principle, materials and methodology of the prestressing.
- To design the prestressed concrete members for flexure and shear.

Credit Earned: 3
Students learning outcomes:

After successful completion of the course, it is expected that student will be able to,

1. Apply the principle of prestressing, determination of losses and deflection.
2. Analyze the determinate & indeterminate prestressed concrete members.
3. Design of various prestressed structural elements.
4. Analyze and Design of composite prestressed concrete structures.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CS E (I)	IA (M)	Viva (V)	Term Work (TW)	
03	00	00	03	50	20	30	25	25	150

Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	Introduction to Prestressed Concrete Development, Concept and Principles of Prestressed Concrete, Advantages & Disadvantages, Types of Prestressing, Systems & Devices, Materials, Estimation of Losses due to various effects, Deflection of PSC members.	10
2	Statically Determinate & Indeterminate PSC Beams: Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, Ultimate strength in flexure, code provisions.	18

Structural Engineering

	Design for Ultimate and Serviceability Limit States for Flexure, Analysis and Design for Shear and Torsion, Code Provisions. Prestress Transmission in pre-tensioned members, Anchorage zone stresses and design for post-tensioned members. Analysis and Design of Continuous Beams, Choice of Cable Profile, Linear Transformation and Concordance.	
3	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. <i>Composite Construction:</i> 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	14
		42

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	5%	20%	25%	25%	20%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through presentations on power point and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:
Reference Book:

1. Krishna Raju, Prestressed concrete, Tata McGraw Hill Education Pvt. Ltd.
2. Ghos, Karuna Moy, Prestressed Concrete: analysis and design practice of members, PHI Learning Private Limited
3. T.Y.Lin , Design of Prestressed Concrete Structures, Wiley India Private Limited
4. N.C. Sinha & S.K. Roy, S.Chand, Fundamentals of Prestressed Concrete
5. Leonhardt F., Wilhelm Ernst and Shon, Berlin, Prestressed Concrete- Design and Construction
6. Freyssinet, Prestressed Concrete
7. Evans, R.H. and Bennett, E.W., Chapman and Hall, Prestressed Concrete
8. Rajagopalan, Prestressed concrete
9. IS:1343-Code for Practice for Prestressed Concrete.
10. IS:3370 Code of Practice Concrete structures for the storage of liquids, Part 3: Prestressed concrete structures