

## 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
<b>1</b>	<b>Introduction to Prestressed Concrete</b> 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.	<b>10</b>
<b>2</b>	<b>Statically Determinate &amp; Indeterminate PSC Beams:</b> Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, Ultimate strength in flexure, code provisions.	<b>18</b>

**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.	
<b>3</b>	<b>Design of Structural Elements</b> 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	<b>14</b>
		<b>42</b>

**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