

**B.E. Semester: VII**  
**Department of Civil Engineering**

**Subject Name: Design of Prestressed Concrete Structures (CV703-N-A)**

**Course Category: Program Course Elective – II (PCE – II)**

**A. Objectives of the Course:**

- Students will be able to identify and apply the applicable industry design codes relevant to the design of prestressed concrete members.
- Students will be familiar with professional and ethical issues and importance of lifelong learning in structural engineering
- Students will be able to become familiar with professional and contemporary issues in design and fabrication of prestressed concrete members
- Students will be able to identify and interpret the industrial design codes

**B. Teaching & Evaluation Scheme:**

Teaching Scheme				Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE	CIA	Pra/Viva	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
3	0	0	3	3	3	70	30	20	00	120

**C. Detailed Syllabus:**

**1. Introduction to Prestress Concrete:**

Definition, Concept of Prestressing, Advantages and Limitations of Prestress, Comparison of Prestress Member with RCC member, Classification of Prestress, Applications of Prestressing, Introduction to IS 1343 – 1980

**2. Materials of Prestress Concrete:**

High Strength Concrete, High Strength Steel and Classification of Prestressing Steel and Wires, Strands, Tendons, Cables as per IRC 6006, IS 14268: 2017 for Low Relaxation Steel

**3. Concepts of Analysis of Prestressed Concrete Girder:**

Cable Profiling as per Stress Concept, Strength Concept, Load Balancing Concept

**4. Losses in Prestress Concrete:**

Introduction and Calculation of Friction Loss, Anchorage Loss, Elastic Shortening, Creep of Concrete, Shrinkage of Concrete and Relaxation of Steel

**5. Stages of Loading:**

Before Prestress, During Prestress, After Prestress i.e. After Application of SIDL, After Application of Live Load

**6. Analysis and Design of Prestressed Girders:**

Analysis and Design of Rectangular Prestressed Girders Considering All Losses and All Stages of Loading for (i) Straight Cables without Eccentricity, (ii) Straight Cables with Eccentricity

**7. Prestressing at Site:**

Importance of each Component of Prestressing on Site, Pre Tensioning Systems – Hoyer’s System, Post Tensioning Systems – Freyssinet’s System

**D. Lesson Planning:**

<b>Unit No</b>	<b>Title of the Unit</b>	<b>Minimum Hours</b>	<b>Weightage (%)</b>
1	Introduction to Prestress Concrete	05	13
2	Materials of Prestress Concrete	03	05
3	Concepts of Analysis of Prestressed Concrete Girder	06	12
4	Losses in Prestress Concrete	10	25

5	Stages of Loading	04	08
6	Analysis and Design of Prestressed Girders	15	32
7	Prestressing at Site	02	05
Total:		45	100

### **E. Assignments:**

Minimum 10 and 5 theory questions examples from first four topics

Separate individual project for sixth topic with all required calculations and drawings

**Note: Students will have to submit the term work in one spiral bound of A4 Blank Pages**

### **F. Instructional Method and Pedagogy (Continuous Internal Assessment Scheme CIA):**

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures, practical and Tutorial which carries 05 Marks.
- At regular intervals assignments is given. In all, a student should submit all assignments of 05 marks each.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 05 Marks.
- One internal exam of 30 marks is conducted as a part of Mid Semester evaluation.

### **G. Students Learning Outcomes:**

On the successful completion of this course

- The students will be able to understand the fundamentals of prestressed concrete structural elements
- The students will be able to understand the use of high strength concrete and steel

- The students will be able to decide the cable profile as per the three concepts of PSC design
- The students will be able to analyse various losses in PSC girder
- The students will be able to identify various stages in PSC girder
- The students will be able to analyse the rectangular PSC girder considering all stages of loading and all losses as per IS 1343: 1980
- The course gives students an understanding of the importance of various components required at site for prestressing

## **H. Recommended Study Materials:**

### **a. Text book & Reference Books:**

1. Dr. Y. R. M Rao, J. P. Annie and P. Easwary, Prestressed Concrete Analysis and Design, Katson Books Publications
2. PravinNagarajan, Prestressed Concrete Design, Pearson Publications
3. T. Y. Lin, Design of Prestressed Concrete Structures, John Wiley and Sons Publications
4. N. Krishnaraju, Prestressed Concrete, Tata McGraw Hill Publications
5. P. Dayaratnam, Prestressed Concrete, Oxford and IBH Publications
6. R. Rajagopan, Prestressed Concrete, Narosa Publications

### **b. Web Materials:**

1. <http://www.nptel.iitm.ac.in/courses.php?branch=Civil>
2. <http://www.nptel.iitm.ac.in/video.php?courseId=1053>
3. <http://www.nptel.iitm.ac.in/video.php?courseId=1069>

### **c. Indian Codes of Practice:**

1. IS 1343:2012 “Code of Practice for Prestressed Concrete”
2. IS 6006 (1983) “ Specifications for uncoated stress relieved strand for Pre-stressed Concrete”
3. IRC 112 “Code of Practice for Concrete Road Bridges”
4. IS 14268 (1995) “Uncoated stress relieved low relaxation seven ply strand for prestressed concrete”



