

(ELECTIVE – A/I)

4/4 B.Tech. SEVENTH SEMESTER

CE7T4A

PRE-STRESSED CONCRETE STRUCTURES

Credits: 3

Lecture: 3 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

**Pre-requisites:** Design of concrete structures, Materials of solids

**Learning objectives:**

- To know the various prestressing methods and analysis of prestress and the resultant stresses using different concepts.
- To learn the losses in prestressed concrete & anchorage zone stresses in end block.
- To consider flexure, shear and deflection as per IS code.
- To design prestressed concrete beam & slab.

**Course outcomes:**

At the end of course the student will be able to:

1. Comprehend basic concepts of pre-stressing and IS codal provisions.
2. Consider Losses of prestress and analyse prestressed beam sections.
3. Design prestressed sections subjected to flexure & shear and end blocks.
4. Comprehend composite prestressed sections and assess deflection of pre-stressed concrete beams.
5. Design prestressed one way slab and two way slab.

**UNIT – I**

**INTRODUCTION**

Historic development – General principles of prestressing, pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics.

**PRESTRESSING METHODS**

I.S. Code provisions, Methods and Systems of prestressing; pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

**UNIT – II**

**LOSSES OF PRESTRESS**

In pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

**ANALYSIS**

Analysis of sections for flexure; Elastic analysis of concrete beams, prestressed with straight, concentric, eccentric, bent and parabolic tendons.

**UNIT – III**

**DESIGN**

Design of Sections for Flexure and Shear, Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.

**END BLOCKS**

Analysis of End Blocks by Guyon's method and Magnel method, Anchorage zone stresses – Approximate method of design – Anchorage zone reinforcement – Transfer of prestress pre-tensioned members.

## **UNIT – IV**

### **COMPOSITE SECTION**

Introduction – Analysis of stress – Differential shrinkage – General design considerations.

### **DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS**

Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members – prediction of long term deflections.

## **UNIT – V**

### **PRESTRESSED CONCRETE ONE WAY SLAB**

Introduction – Design Considerations – Design of prestressed one way slab.

### **PRESTRESSED CONCRETE TWO WAY SLAB**

Introduction – Design Considerations – Design of prestressed two way slab.

### **Learning resources:**

#### **Text books:**

1. Pre-stressed Concrete, (4<sup>th</sup> edition) by Krishna Raju, Tata McGraw-Hill 2009.
2. Pre-stressed Concrete by Rajagopalan N., Narosa Publications, 2013.

#### **Reference books:**

1. Pre-stressed Concrete, (5<sup>th</sup> edition) by Ramamrutham, Dhanpatrai Publications, 2010.
2. Design of Pre-stressed concrete structures, (3<sup>rd</sup> Edition) Lin T.Y. and NedBurns H., John Wiley & Sons, 2010.
3. IS 1343 Codes: BIS code on prestressed concrete, 1980.

#### **e-learning resources:**

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

<http://jntuk-coeerd.in/>