

**(ELECTIVE – A/I)**  
**4/4 B.Tech. SEVENTH SEMESTER**

**CE7T5A**

**PRE-STRESSED CONCRETE STRUCTURES**

**Credits: 3**

**Lecture: 3 periods/week**

**Internal assessment: 30 marks**

**Tutorial: 1 period /week**

**Semester end examination: 70 marks**

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**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 apply the shear strength and ultimate shear resistance capacity as per IS code.
- To design prestressed concrete beam & slab.

**Learning outcomes:**

At the end of course the student will be able to

- Have an understanding of basic concepts of pre-stressing & it's losses and IS codal provisions.
- Analyse and design sections subjected to flexure & shear, end blocks and composite section.
- Assess deflection of pre-stressed concrete beams

**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.

**UNIT – II**

**PRESTRSSING 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 – III**

**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.

**UNIT – IV**

**ANALYSIS:**

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

**UNIT – V**

**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.

#### **UNIT – VI**

##### **END BLOCKS:**

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

#### **UNIT – VII**

##### **COMPOSITE SECTION:**

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

#### **UNIT – VIII**

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

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

### **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.