

Course Code	Course Title	L	T	P	C
17CE011	ADVANCED PRESTRESSED CONCRETE	3	0	0	3

**Course Objectives:**

1. To develop an advanced understanding of the behavior, analysis and design of pre-stressed concrete members and connections.
2. By the end of the course, students should be able to calculate pre-stress losses.
3. Design a post-tensioned continuous beam for transfer, serviceability and strength.
4. Design a post-tensioned slab and Specify detailing and material.

**Course Outcomes:**

The student will be able to

1. Understand the basic concepts about prestressed concrete.
2. Analyze pre-stressed concrete structures.
3. Calculate deflections of pre-stressed members.
4. Gain the knowledge about composite structural members.

**Activities:**

1. Make a pre-stressed beam and analyze
2. Make a pre-stressed column and analyze
3. Find out deflections of pre-stressed
4. Design and analyze pre stressed frame

**Skills:**

1. Design and analysis of pre tensioned and post tensioned concrete members
2. Determination of deflections of prestressed members
3. Calculation of losses of prestress, creep and shrinkage.

**UNIT-I: Introduction, Prestressing Systems and Material Properties:**

Basic concepts of pre-stressing; Historical development; Advantages and Types of Prestressing, Pre-tensioning Systems and Devices, Post-tensioning Systems and Devices, Need for High strength steel and High strength concrete; Losses Of Prestress: Nature of losses of pre-stress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.

**UNIT-II: Analysis of Prestressed Member:**

Analysis of Members under Axial Load: Analysis at Transfer, Analysis at Service, Analysis for Ultimate Strength, Analysis of Member under Flexure:, Analysis at Transfer and at Service, Cracking Moment, Kern Point, Pressure Line, Analysis for Ultimate Strength, design loads and

strength, Calculation of Crack Width, Variation of Stress in Steel, Analysis of a Rectangular Section, Analysis of a Flanged Section.

### **UNIT-III: Deflections of Prestressed Concrete Members:**

Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members. Long term deflection of cracked member; Transmission Of Pre-Stress: Transmission of Pre-stressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses in pre –tensioned and post – tensioned grouted beams, stress distribution in end block, Anchorage zone reinforcements. Shear And Torsion Resistance of Prestressed Concrete Member Shear and Principal stresses; Ultimate shear resistance of pre-stressed concrete members; Design of shear reinforcement, pre-stressed concrete members in torsion, Design of reinforcements for torsion, shear and bending.

### **UNIT-IV: Design of Pre-Stressed Members:**

Design of sections for flexure, Design of Sections for Axial Tension, Design of Sections for compression and bending, design of pre-stressed section for shear and torsion, design of prestressed member for bond. Dimensioning of flexural member, design for pre-tensioning member, design of post-tensioning members.

### **UNIT-V: Composite Construction of Prestressed Concrete:**

Composite structural member, types of composite construction, analysis of stresses, differential shrinkages, deflection of composite member, flexural strength of composite sections, shear strength of composite section; Design of Continuous Prestressed Concrete Member Advantages of continuous members, ultimate load analysis of continuous pre-stressed member, design of continuous pre-stressed concrete beams.

### **TEXT BOOKS:**

1. N. Krishna Raju , “Prestressed Concrete”, Tata Mc Graw - Hill Publishing Company Limited, New Delhi.3rd edition, 1995.
2. T.Y. Lin & Ned H. Burns, “Design of Prestressed Concrete Structures”, John Wiley & Sons, 3rd edition, 1981.

### **REFERENCE BOOKS:**

1. N. Rajagopalan, “Prestressed concrete”, Narosa Publishing House.2nd edition, 2005.
2. A. Nilson, “Design of Prestressed Concrete”, John Willey & Sons.2nd edition, 1987.