**17CE41E1 - PRESTRESSED CONCRETE STRUCTURES**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Category** | Core Elective | **Credits** | 3 |
| **Course Type** | Theory | **Lecture - Tutorial - Practical** | 3 - 0 - 0 |
| **Prerequisite** | RCC Structural Design-I | **Sessional Evaluation** | 40 |
| **Semester End Exam Evaluation** | 60 |
| **Total Marks** | 100 |

|  |  |  |
| --- | --- | --- |
| **Course Objectives** | 1. To understand the basic concepts and analysis of prestressed concrete structures. 2. To perform the design of prestressed concrete structures. 3. To understand the design of pre-tensioned members. 4. To understand the concept and analyse post-tensioned members. 5. To understand and analyse the composite prestressed concrete members. 6. To understand the concept of design of pre stressed concrete slabs. | |
| **Course Outcomes** | CO1 | Calculate the resultant stresses in rectangular prestressed concrete. |
| CO2 | Analyse the losses and design the prestressed concrete sections. |
| CO3 | Design Pre-tensioned members. |
| CO4 | Analyse and design partially post-tensioned members. |
| CO5 | Analyse and design composite prestressed concrete members. |
| CO6 | Design prestressed concrete slabs. |
| **Course Content** | **UNIT – I**  **INTRODUCTION:** Basic concepts of prestressing –Historical development –Advantages of prestressed concrete –High strength concrete –High tensile steel.  **PRESTRESSING SYSTEM:** Introduction –Tensioning devices –Pretensioning and post tensioning systems –Thermo-electric and chemical prestressing.  **ANALYSIS OF PRESTRESSED CONCRETE SECTIONS:** Basic assumptions – analysis of prestress –Resultant stress at a section –Pressure line –Concept of load balancing –Stress in tendons and cracking moment.  **UNIT – II**  **LOSSES OF PRESTRESS**: Nature of losses of prestress – 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 design.  **DESIGN OF PRESTRESSED CONCRETE SECTIONS:** Design of sections for Flexure – Axial tension – Compression bending and for shear – Design of members for bond and the sections for bearing.  **UNIT – III**  **DESIGN OF PRE- TENSIONED MEMBERS:** Dimensioning of flexural members – Estimation of self-weight of beams –Ultimate flexure strength –Ultimate shear strength –Limit state of design.  **UNIT – IV**  **DESIGN POST-TENSIONED MEMBERS:** Ultimate moment and shear –Cross sectional dimensions –Moment and shear forces – Minimum section modules – permissible tendon zone – Deflection and serviceability – Design of partially prestressed members.  **UNIT – V**  **COMPOSITE CONSTRUCTION OF PRESTRESSED AND IN SITU CONCRETE:** Composite structural members –Types of composite construction –Analysis of stress – differential shrinkage –Deflection of composite members –Flexural strength of composite sections and design of composite sections.  **UNIT – VI**  **PRESTRESSED CONCRETE SLABS**: Types of prestressed concrete floor slabs –Design of prestressed concrete one way slabs –Two way slabs & simple flat slabs. | |
| **Textbooks**  **& References** | **TEXTBOOKS:**  1. Prestressed concrete by N.Krishna Raju.  2. Prestressed concrete structures by P. Dayaratham.  3. Prestressed concrete by S. Ramamrutham.  **REFERENCE BOOKS:**  1. Fundamentals of Prestressed Concrete by N.C.Sinha and S.K.Roy.  2. Modern Prestressed Concrete by James R.Libby.  3. Design of Prestressed Concrete Structures by T.Y. Lin & N.H. Burns. | |