**19CE41E1 - PRESTRESSED CONCRETE STRUCTURES**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Category** | Professional Elective | **Credits** | 3 |
| **Course Type** | Theory | **Lecture - Tutorial - Practical** | 3 - 0 - 0 |
| **Prerequisite** | Design of Reinforce Concrete structures | **Sessional Evaluation** | 40 |
| **Semester End Exam Evaluation** | 60 |
| **Total Marks** | 100 |

|  |  |  |
| --- | --- | --- |
| **Course Objectives** | 1. To familiarize the students with basic concepts of pre stressing systems and analysis of prestressed concrete structures. 2. To understand losses in prestress and prestressed concrete structures. 3. To carry out the design of pre-tensioned members. 4. To analyze and design of post-tensioned members. 5. To impart knowledge for analysis of composite prestressed concrete members. 6. To carry out the design of pre stressed concrete slabs. | |
| **Course Outcomes** | CO1 | Calculate the resultant stresses in rectangular prestressed concrete. |
| CO2 | Analyze the losses and design the prestressed concrete sections. |
| CO3 | Design Pre-tensioned concrete members. |
| CO4 | Analyze and design partially post-tensioned members. |
| CO5 | Analyze 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.  **DESIGN OF PRESTRESSED CONCRETE SECTIONS:** Design of sections for Flexure, Axial tension, Compression bending and Shear – Design of members for bond and bearing.  **UNIT – III**  **DESIGN OF PRE-TENSIONED MEMBERS:** Dimensioning of flexural members – Estimation of self-weight of beams – Ultimate flexure strength –Ultimate shear strength – design of pre tensioned members.  **UNIT – IV**  **DESIGN OF 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 CONCRETE STRUCTURES:** 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 and simple flat slabs. | |
| **Textbooks**  **& References** | **TEXTBOOKS:**   1. N. Krishna Raju, *Prestressed Concrete,* McGraw Hill Education, 6thEdition, 2018. 2. P. Dayaratham and P. Sarah, *Prestressed Concrete Structures*, Medtech Publishers, 7th Edition, 2017. 3. S. Ramamrutham, *Prestressed Concrete Structures*, Dhanpatrai publishing company, 6th Edition, 2018.   **REFERENCE BOOKS:**   1. N. C. Sinha and S. K. Roy, *Fundamentals of Prestressed Concrete*, S Chand Publishing, 3rd Edition, 2011. 2. T.Y. Lin & N.H. Burns, *Design of Prestressed Concrete Structures*, Wiley India Private Limited, 3rd Edition, 2010. 3. Code of practice for Prestressed Concrete, (IS 1343-2012) | |

**CO-PO Mapping:** 3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | - | 1 | - | - | - | - | - | - | - | 3 |
| **CO2** | 3 | - | 1 | 1 | - | - | - | 1 | - | - | - | 3 |
| **CO3** | 3 | - | 1 | - | 2 | - | - | 1 | - | - | 1 | 2 |
| **CO4** | 3 | - | 1 | 1 | 1 | - | - | 1 | - | - | 1 | 2 |
| **CO5** | 3 | - | 1 | 1 | 2 | - | - | 1 | - | - | 1 | 1 |
| **CO6** | 3 | - | 1 | - | 2 | - | - | 1 | - | - | 1 | 1 |