**20CE41E5 - PRESTRESSED CONCRETE**

**(Civil Engineering)**

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

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| **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*, SChand Publishing, 3rd Edition, 2011. 2. T.Y. Lin & N.H. Burns,*Design of Prestressed Concrete Structures*,Wiley India Private Limited, 3rd Edition, 2010. 3. Shrikan B.Yanakudre, Ashish A.Yoligar, *Prestressed Concrete,* Khanna Publishing, 1st edition, 2018. | |

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

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