COURSECONTENT

ADVANCED PRESTRESSED CONCRETE DESIGN								
II Semester: SE								
CourseCode	**Category**	**Hours/ Week**			**Credits**	**Maximum Marks**		
2522050	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100
contactClasses:45	**Tutorial Classes:Nil**	**Practical Classes:Nil**				**TotalClasses:45**		
Prerequisites: Reinforced Concrete Design & Structural Analysis.								

Course Overview:

This course covers fundamentals of prestressed concrete, including pretensioning and post-tensioning systems, material properties, and stress analysis. It explains prestress losses, deflection behavior, and ultimate flexural strength of members. The syllabus also includes composite construction, prestressed slabs, and pipes. Advanced topics cover continuous beams, secondary moments, cable profiles, and anchorage zone stresses, with design approaches based on IS 1343:2012 provisions for safe and efficient structural performance.

Course Objectives:

1. To understand prestressing systems, stress analysis, load balancing, and various prestress losses.
2. To analyze deflections and flexural strength of prestressed concrete beams as per design requirements.
3. To study composite construction and design composite prestressed concrete sections for strength and serviceability.
4. To design prestressed concrete slabs and pipes, including circular prestressing concepts.
5. To analyze continuous prestressed beams, secondary moments, and anchorage zone stresses using standard methods.

CourseOutcomes: AfterCompletion of theCourse,Studentsshouldbeableto

1. Explain various prestressing systems, losses of prestress, and the concepts of resultant stresses and load balancing in prestressed concrete.
2. Calculate short-term and long-term deflections of prestressed concrete members and determine the ultimate flexural strength of beams using simplified methods.
3. Examine the behavior of composite beams, including flexural and shear strengths, differential shrinkage, and deflections, and design composite sections accordingly.
4. Design prestressed one-way and two-way slabs, as well as prestressed concrete pipes, considering their types and specific design requirements.
5. Analyze the effects of prestressing on continuous beams, secondary moments, and anchorage zone stresses using relevant methods and IS code provisions.

UNITI:

Introduction – Prestressing Systems – Pretensioning Systems – Post-tensioning Systems – High Strength Steel and Concrete - Analysis of Prestress - Resultant Stresses at a Section – Pressure Line orThrustLine–ConceptofLoadBalancing.

LossesofPrestress–Loss DuetoElastic DeformationofConcrete –Shrinkage ofConcrete–Creep – RelaxationofStressinSteel–Friction–AnchorageSlip.

UNITII:

Deflections of prestressed concrete members: Importance of Control of Deflections – Factors InfluencingDeflection–Short-termDeflectionsofUncrackedMembers–PredictionofLong-time Deflections – Deflections of Cracked Members – Requirements of IS 1343-2012.

Ultimate Flexural Strength of Beams: Introduction, Flexural theory using first principles – Simplified Methods—UltimateMomentofResistanceofuntensionedSteel.

UNITIII:

Composite constructions: Introduction, Advantages, Types of Composite Construction, Analysis of Compositebeams-Differential shrinkage-UltimateFlexural andshear strengthof compositesections-Deflection of Composite Beams. Design of Composite sections.

UNITIV:

Prestressed concrete slabs: Types OfPrestressed Concrete Floor Slabs- Design of Prestressed Concrete One Way and Two-Way Slabs.

PrestressedConcretePipes: Circularprestressing-Typesof PrestressedConcretePipes-Designof Prestressed Concrete Pipes.

UNITV:

Continuousbeams: AdvantageofContinuousMembers—EffectofPrestressingIndeterminate Structures—Methodsof Achieving Continuity —Methodsof Analysisof SecondaryMoments—Concordant Cable Profile – Guyon's Theorem, Redistribution of moments in a continuous beam.

AnchorageZoneStressesinBeams:Introduction,StressdistributioninEndBlock–Anchoragezonestresses–Magnel'smethod-Guyon'sMethod-AnchoragezoneReinforcementasperIS1343-2012.

REFERENCEBOOKS:

1. Prestressed concrete, krishnanraju N.,TataMcGrawHill,NewDelhi.
2. Prestressed concrete byK.U.Muthu,PHILearningPvt.Ltd
3. Designofprestressedconcretestructure,LinT.YandBurns,AsiaPublicationhouse,1995.
4. Limitstatedesignofprestressedconcrete,GutanY,Appliedsciencepublishers,1972.
5. IS:1343-2012-codeofpracticeforPrestressedconcrete

ELECTRONICRESOURCES:

https://nptel.ac.in/courses/105106686

MATERIALSONLINE:

1. Course template
2. Tutorialquestionbank
3. Definitionsand terminology
4. Assignments
5. Modelquestionpaper–I
6. Modelquestionpaper–II
7. Lecturenotes
8. E-LearningReadinessVideos(ELRV)