

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

III Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
BSTB22	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			

I. COURSE OVERVIEW:

Introduction to Prestressed concrete-prestressing concepts; pre-tensioning and post-tensioning; full and partial prestress; the need for prestress; advantages and disadvantages; methods of prestressing. Forces imposed by prestressing (straight, draped and kinked tendon profiles). Load balancing. Introductory examples. Design requirements: strength and serviceability. Material properties. Design for serviceability: stress limits; serviceability criteria; determination of prestress and eccentricity; cable profiles; cracked section analysis; decompression and cracking moment; effect of cracking at service loads; short-term deflection calculations; crack control; design for strength: limit state design. Rectangular stress block. Ultimate moment capacity. Effect of non-prestressed steel; ductility; transfer strength; design for shear-effect of prestress on shear; stirrup design. Special problems in prestressing: losses; effect of creep and shrinkage; end block design-bursting and spalling forces in post anchorages; transmission lengths in pre-tensioned members. Statically indeterminate beams: introduction to continuous prestressed concrete beams; secondary moments.

II. COURSE OBJECTIVES:

The course should enable the students to:

I. Find out losses in the prestressed concrete.

II. Understand the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes.

III. Analyze prestressed concrete deck slab and beam/ girders.

IV. Design prestressed concrete deck slab and beam/ girders.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Explain the concepts of stresses and strains developed within the structures subjected to different loads and their combinations for understanding the behavior of prestressed concrete structures.	Understand
CO 2	Elucidate the concept of methods of pre and post tensioning and the systems of prestressing for the designing of prestressed concrete structural elements	Understand
CO 3	Estimate the losses in the prestress and post tensioned members for the efficient design of prestressed concrete structures.	Analyze
CO 4	Design prestressed and post tensioned structural elements using Indian standard code method.	Apply
CO 5	Summarize the concepts of transfer of prestress in pre and post tensioned members by bond and transmission length using Indian standard code method.	Understand
CO 6	Design the composite prestressed concrete structural elements subjected to flexure and shear for designing multi storied structures.	Apply

IV. SYLLABUS		
UNIT-I	INTRODUCTION TO PRESTRESSED CONCRETE	Classes: 09
Types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions.		
UNIT-II	STATICALLY DETERMINATE PSC BEAMS	Classes: 09
Design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions. Transmission of prestressing, pretensioned members; Anchorage zone stresses for post tensioned members.		
UNIT-III	STATICALLY INDETERMINATE STRUCTURES	Classes: 09
Plane Truss – Determinacy and Analysis method, Structural Analysis – Plane truss and Space truss. Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy		
UNIT-IV	COMPOSITE CONSTRUCTION	Classes: 09
Composite construction with precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack width calculations.		
UNIT-V	ANALYSIS AND DESIGN	Classes: 09
Analysis and design of prestressed concrete pipes, columns with moments		
Text Books:		
1. Lin T.Y, “Design of Prestressed Concrete Structures”, Asia Publishing House, 1955. 2. Krishnaraju N, “Prestressed Concrete”, Tata McGraw Hill, New Delhi, 1981.		
Reference Books:		
1. GuyanY, “Limited State Design of Prestressed Concrete”, Applied Science Publishers, 1972. 2. IS: 1343- Code of Practice for Prestressed Concrete 3. IRC: 112- code for concrete road bridges.		
Web References:		
1. http://nptel.ac.in/courses/105106117/		
E-Text Books:		
1. http://textofvideo.nptel.ac.in/105106118/lec17.pdf		