

COURSE TITLE : DESIGN OF PRE STRESSED CONCRETE
COURSE CODE : 6016
COURSE CATEGORY : E
PERIODS/WEEK : 4
PERIODS/SEMESTER: 60
CREDITS : 4

TIME SCHEDULE

Module	Topics	Period
1	Working stress method of design	15
2	Principles of prestressing	15
3	Design of prestressed beams for flexure	15
4	Losses in pre stressing	15
TOTAL		60

COURSE OUTCOME

Sl.	Sub	Student will be able to
1	1	Understand the principles of working stress method of design
	2	Understand the principles of prestressed concrete
	3	Calculate the stresses in the prestressed concrete
2	1	Know the design of prestressed concrete beam for flexure
	2	Understand the losses in prestressed concrete

SPECIFIC OUTCOME

Upon completion of the course the student should be able to:

MODULE -I

- 1.1.0 Apply the Principles of Working stress method of Design as per the IS Code**
- 1.1.1 List the assumption in the working stress method,
 - 1.1.2 Calculate depth of N.A.
 - 1.1.3 Define Lever arm
 - 1.1.4 Calculate design coefficients
 - 1.1.5 Identify different types of sections.
 - 1.1.6 Derive expression for Moment of Resistance of singly Reinforced balanced section for different grades of concrete and steel.
 - 1.1.7 Determine the moment of resistance of singly reinforced beam for a given section, area of steel and permissible stresses.
 - 1.1.8 Calculate the stresses in concrete and steel for a given dimensions, area of steel and bending moment of a singly reinforced beam.

- 1.1.9 Calculate the area of tensile reinforcement for a given dimensions, bending moment and grade of concrete and steel of a singly reinforced beam.
- 1.1.10 Design a singly reinforced beam for a given bending moment and grade of concrete and steel.

MODULE -II

2.1.0 Understand the principle of pre-stressing

- 2.1.1 Explain the Basic principle of pre-stressed concrete
- 2.1.2 List the materials for pre-stressed concrete
- 2.1.3 Justify the necessity of using high strength concrete and high tensile steel in pre stressed Concrete.
- 2.1.4 List the Advantages of pre-stressing
- 2.1.5 Identify the Applications of pre-stressed concrete.
- 2.1.6 List assumptions in pre-stressed concrete design.

2.2.0 Explain the different systems of Pre-stressing.

- 2.2.1 List different methods of applying pre-stress.
- 2.2.2 Differentiate between pre-tensioning and post tensioning system.
- 2.2.3 Classify pre-stressing

MODULE -III

3.1.0 Analyze pre-stressed beams for flexure

- 3.1.1 Draw the stress distribution of pre-stressed beam with concentric and eccentric tendon (straight & parabolic)
- 3.1.2 Draw the stress distribution of pre-stressed beam due to eccentric pre-stressing, dead and Live loads.
- 3.1.3 Define load balancing
- 3.1.4 Calculate the pre-stressing force required to balance the load
- 3.1.5 Design simple pre-stressed beam sections for flexure.
- 3.1.6 Calculate minimum section modulus
- 3.1.7 Calculate minimum possible depth of beam
- 3.1.8 Calculate minimum pre-stressing force required for the section and corresponding Eccentricity

MODULE - IV

4.1.0 Understand the different Losses of pre-stress.

- 4.1.1 Explain different losses of pre-stress
- 4.1.2 Calculate losses due to friction, elastic deformation, shrinkage of concrete, creep of concrete, creep of steel and anchorage slip.
- 4.1.3 Calculate the effective pre-stressing force

CONTENT DETAILS

(IS: 456-2000 & IS:1343-2012 are permitted inside the Examination Hall)

MODULE-I

Basic Principles of Working stress method of Design as per the BIS- the assumption in the working stress method-calculation of depth of Neutral axis -lever arm- lever arm factor- moment of resistance factor- types of sections- derivation of moment of resistance of singly reinforced balanced section for different grades of concrete and steel. Calculation of moment of resistance-checking the stresses in concrete and steel of a singly reinforced beam- Determination of area of tensile reinforcement of a singly reinforced beam- design of singly reinforced beam for a given bending moment and grade of concrete and steel.

MODULE-II

Introduction: Basic principles of pre-stressed concrete-materials for pre stressed concrete-necessity of using high strength concrete and high tensile steel in pre stressed concrete-advantages of pre-stressed concrete -applications of pre-stressed concrete-basic assumptions in pre-stressed concrete design. Systems of pre-stressing: methods of applying pre-stress-differentiate between pre-tensioning and post tensioning system-classification of pre-stressing

MODULE –III

Analysis of pre-stress:- sketch the stress distribution of pre-stressed beam .load balancing-Design of pre-stressed beam sections for flexure: Determination of section modulus required -determination of possible depth of beam-determination of minimum pre-stressing force required -determination of corresponding eccentricity.

MODULE-IV

Losses of pre-stressing:- different losses of pre-stress -calculation of different pre-stress losses-friction loss – elastic deformation – shrinkage of concrete – creep of concrete – anchorage slip [simple problems]- effective pre-stressing force

REFERENCES

1. IS: 456-2000: code of practice for Reinforced Cement Concrete.
2. IS: 1343-2012: code of practice for Pre-stressed concrete
3. Ramamruthm : Pre-stressed Concrete ; Dhanpat Rai & Sons
4. N C Sinha & Roy : Pre-Stressed Concrete ; S.Chand.
5. N. Krishna Raju : Pre-Stressed Concrete ; Tata Mc Graw Hill
6. Praveen Nagarajan : Pre-stressed Concrete Design ; Pearson Publishers