COURSE TITLE : THEORY OF STRUCTURES-II
COURSE CODE : 3025
COURSE CATEGORY : B
PERIODS/WEEK : 5
PERIODS/SEMESTER : 90
CREDITS : 5

TIME SCHEDULE

MODULE	TOPIC	PERIODS
I	Theory of simple bending	23
II	Direct and bending stresses, Dams and retaining walls, Fixed beam	23
III	Deflection of beams	22
IV	Continuous beams, Moment distribution method	22
	TOTAL	**90**

Rationale:
In the field situation, structural members are subjected to axial as well as eccentric loads and may be determinate or indeterminate in nature. The members like fixed beam, continuous beam, portal frame are indeterminate structures. The methods of analyzing these members are studied in this subject. The maximum permissible deflection is to be checked for various structural members .This subject also deals with analysis of members for deflection and also with combined direct and bending stresses. The result of these various analysis is the pre requisite for the structural design.

OBJECTIVES

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

MODULE I

1.1.0 **To know the theory of simple bending**
1.1.1 Explain assumptions in the theory of simple bending.
1.1.2. Explain the terms Neutral Axis, moment of resistance and section modulus . Applications to symmetrical simple and compound sections
1.1.3 Derivation of formula for shear stress at the section of a loaded beam – distribution of Shear stress along the section of a rectangular, symmetrical I section..

MODULE II

2.1.0 **To Determine direct and bending stresses**
2.1.1 Differentiate between direct and bending stresses.
2.1.2 Calculate and Sketch the stress distribution diagram at the base of solid and hollow sections of rectangular and circular columns.
2.1.3 Calculate the maximum eccentricity to prevent tensile stress at the base of solid rectangular and Circular column sections.
2.1.4 Mark core area of rectangular and circular sections
2.2.0 **To Analyze dams and retaining walls for water/earth pressure**
2.2.1 Calculate and sketch the intensity of pressure at the base of a rectangular and trapezoidal [water Face vertical] dams.
2.2.2 Know stability conditions of a dam.
2.2.3 Determine the minimum base width of a rectangular and trapezoidal dam.

2.2.3 Compute the earth pressure on retaining walls using Rankine's method
2.2.4 Calculate and sketch the intensity of pressure at the base of a rectangular and trapezoidal [earth Face vertical] retaining wall without surcharge.
2.2.5 Determine the minimum base width of a rectangular and trapezoidal retaining wall.
2.3.0 **To Study the effects of loading on fixed beams**

2.3.1 Compute the SF,and BM for fixed beams subjected to concentrated loads.
2.3.2 Compute the SF, BM for fixed beams subjected to uniformly distributed load over whole span.
2.3.3 Compute the SF, BM for fixed beams subjected to concentrated and UD load combined [Symmetrical loading only].
2.3.4 Study the advantages of fixed beam over simply supported beam.

MODULE III

3.1.0 **To Study the different methods to calculate the deflection of beams under loading**
3.1.1 Study the significance of stregth and stiffness in design of beams.
3.1.2 Study the derivation of differential equation for slope and deflection
3.1.3 Application of double intregration[Maculay's method] and moment area method for determining slope and deflection of beams.
3.1.4 Compute the deflection of Cantilever, simply supported and fixed beams due to concentrated and U.D loads.
3.1.5 Design the section from strength and stiffness considerations

MODULE IV

4.1.0 **To Study the effects of loading on continuous beam.**
4.1.1 State the three moments theorem..
4.1.2 Draw the SFD and BMD for 3 span continuous beams for concentrated and UD loads,[symmetrical loading only] using theorem of three moments
4.2.0 **To Analyze continuous beams and simple portal frames for concentrated and UD loads [symmetrical loading only] by Hardy Cross method.**
4.2.1 Define stiffness factor, carry over moment, distribution factor.

COURSE CONTENT

MODULE I

Theory of simple Bending

Theory of simple bending, Explain the terms 'Neutral axis', 'moment of resistance' and 'section modules'. Apply the theory of simple bending to simple and compound sections to calculate stress, section modulus and moment of resistance. Calculate shear stress distribution in rectangular and I Sections

MODULE II

Direct and Bending Stresses

Eccentric loading of symmetrical columns (about one axis only) – maximum and minimum stress Limit of eccentricity.

Dams and Retaining walls.

Trapezoidal dam with vertical water face – forces acting, intensity of pressure at base, conditions of Stability, minimum base width. Retaining wall (trapezoidal with earth face vertical without surcharge) – Rankine's formulae for earth pressure (proof not required) – conditions of stability – minimum base width.

Fixed Beams

Fixed beams – advantages, method of finding fixing moments (derivations)
BM and SF diagrams for fixed beams under point load and u.d. load (for

Symmetrical loading only)

MODULE III

Deflection of Beams

Strength and stiffness of beam – curvature, slope and deflection – derivation of the differential Equation.

Double integration method (Macaulay's method) of slope and deflection of – cantilever with point load, cantilever with u.d. load, simply supported beam with point load, S.S. Beam with u.d. load – Problems in cantilever and simply supported beams with combinations of point and u.d. load Calculation of fixed beam with central point load; fixed beam with UD load over whole span using double integration method.

Moment area method for slope and deflection of beams – Mohr's theorems – application of the Method to problems in cantilever beams with point load ,UD. load ; and combinations of point and UD. Load.

Application of the Method to problems in simply supported beam with point load, UD. Load; and combinations of point and UD. Load.[symmetrical load. Only]

MODULE IV

Continuous Beams

Continuous beams – statement of the theorem of three moments – BM and SF diagrams for simple, Concentrated and u.d. loads

Moment distribution method

Hardy cross methods of moment distribution – stiffness factor – carry over moment – distribution factor – application to continuous beams and simple portal frames– sketching the SFD and BMD

REFERENCE

1. Strength of Materials – R.S.Khurmi – S.Chanda & Co.,
2. Applied Mechanics & Strength of Materials – R.S.Khurmi – S.Chand & CO.,
3. Strength of materials – M. Chakraborti
4 Strength of Materials – R.K.Rajput - S.Chand & Co
5.Strength of Materials - Dr. R.K.Bansal, Laxmi Publishers
6 Engineering Mechanics-Prabhu, Scitech Publications (India) Limited