COURSE TITLE : THEORY OF STRUCTURES-II
COURSE CODE : 4014
COURSE CATEGORY : B
PERIODS/WEEK : 6
PERIODS/SEMESTER : 78
CREDITS : 5

TIME SCHEDULE

Module	Topics	Period
1	Columns and struts Analysis of trusses	19
2	Direct and Bending stress Dams and retaining walls Analysis of Fixed beams	20
3	Beams and bending	22
4	Analysis of continuous beam	17
TOTAL		**78**

COURSE OUTCOME

Sl.	Sub	Student will be able to
1	1	Calculate the load carrying capacity of a column
	2	Analyse perfect frames
	3	Calculate and sketch the stress distribution diagrams under the base of a column
2	1	Analyse the dams and retaining walls for water/earth pressure
	2	Calculate the support moments in fixed beams and draw SFD and BMD
	3	Find the slope & deflection in beams
3	1	Calculate the support moments for continuous beam and draw SFD and BMD

SPECIFIC OUTCOME

MODULE - I

1.1.0 Understand the behavior of columns under vertical loads.

1.1.1. Define slenderness ratio

1.1.2. Differentiate short and long column

1.1.3 Compute the slenderness ratio for a given size of column, length and end conditions.

1.1.4 Compute the load carrying capacity of a given column with different end conditions by Eulers and Rankine's formulae.

1.2.0 Analyze the forces in the members of a truss

1.2.1 Determine the magnitude and type of forces in various members
1.2.2 Calculate the forces using methods of joints. [Simple problems]
1.2.3 Introduction to method of sections. [Description only]

MODULE - II

2.1.0 Understand 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 the core area of rectangular and circular sections

2.2.0 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 dams [water Face vertical].
2.2.2 Know stability conditions of a dam.
2.2.3 Calculate the minimum base width of a rectangular and trapezoidal dam
2.2.4. Define angle of repose and weep holes
2.2.5 Compute the earth pressure on retaining walls using Rankine's method
2.2.6 Calculate and sketch the intensity of pressure at the base of a rectangular and trapezoidal [earth Face vertical] retaining wall without surcharge.
2.2.7 Determine the minimum base width of a rectangular and trapezoidal retaining wall.

2.3.0 Understand the effects of loading on fixed beams

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

MODULE - III

3.1.0 Apply the different methods to calculate the deflection of beams under loading

3.1.1 Study the significance of strength and stiffness in the design of beams.
3.1.2 Study the derivation of differential equation for slope and deflection
3.1.3 Determine the slope and deflection of beams by applying double integration Maculay's method] and moment area method
3.1.4 Compute the deflection of Cantilever, simply supported and fixed beams due to Concentrated and U.D loads.

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MODULE -IV

4.1.0 Understand the effects of loading on continuous beam.

4.1.1 State the theorem of three moments.
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
4.2.3 Define stiffness factor, carry over moment, distribution factor.
4.2.4. Draw the S.F and B.M Diagram for continuous beams and simple portal frames for Concentrated and UD loads [symmetrical loading only] by Hardy Cross method.

CONTENT DETAILS

MODULE -I

Columns and Struts

Differentiate Strut and column – failure of strut, short and long columns – types of end conditions. Euler's formula for columns of different end conditions (Assumptions and derivation not required) – Slenderness ratio – limitations of Euler's formula – applications (simple problems only). Derivation of Rankine's formulae from Euler's formulae – Rankine's constant for different materials -applications (simple and built up sections)

Analysis of Truss

Determine the magnitude and type of forces in various members of the truss due to loading, using methods of joints:-simple problems.
Introduction to method of sections [Description only]

MODULE -II

Direct and Bending Stresses

Define eccentricity- differentiate bending stress and direct stress.-calculate and draw the stress distribution diagram for solid and hollow sections of rectangular and circular columns.
Calculate the maximum eccentricity to prevent tensile stress at the base of solid rectangular and circular column. Locate the core area of rectangular and circular sections

Dams and Retaining walls

Trapezoidal dam with vertical water face – calculate the forces acting, calculate and sketch the intensity of pressure at base, conditions of Stability of dam, minimum base width of dam.
Retaining wall (trapezoidal with earth face vertical, without surcharge) –state the purpose of weep holes. Define angle of repose - Rankine's formulae for earth pressure (proof not required) calculate the forces acting, calculate and sketch the intensity of pressure at the base, conditions of Stability of retaining wall, minimum base width of retaining wall.

Fixed Beams

Fixed beams – advantages, method of finding fixing moments (derivations)
Calculate BM and SF and draw the 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 for slope and deflection of cantilever with point load, u.d load, simply supported beam with point load, u.d load – Problems in cantilever and simply supported beams with combinations of point and u.d load and Macaulay's method for finding the slope and deflection.
Calculation of the deflection of fixed beam with central point load; fixed beam with UD load over whole span .Moment area method for slope and deflection of beams – Mohr's theorems – problems for finding the slope and deflection of cantilever beams with point load ,UD. load ; and combinations of point and UD. Load, 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. R.S.Khurmi : Strength of Materials ; S.Chanda & Co.,
2. M. Chakraborti : Strength of materials ; S.K Kataria & Sons
3. R.K.Rajput : Strength of Materials ; S.Chand & Co
4. Dr. R.K.Bansal : Strength of Materials ; Laxmi Publishers
5. Prabhu : Engineering Mechanics ; Scitech Publications (India) Limited
6. S.S.Bhavikkati : Strength of materials ; Vikas Publishing House