STRUCTURAL ANALYSIS – I

Course Code: 13CE1114

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Course Outcomes:

At the end of the course the student will be able to:

CO 1 Analyse Propped Cantilever and Fixed Beams under different loading and support conditions.

CO 2 Analyse Continuous Beams under different loading and support conditions.

CO 3 Apply Energy theorem for Simple Beams and Simple Portal Frames and calculate the deflections.

CO 4 Apply Energy theorem and analyse Indeterminate Structures.

CO 5 Analyse beams subjected to moving loads using Influence line diagrams.

UNIT-I (15 Lectures)

PROPPED CANTILEVERS:

Analysis of propped cantilever – Shear Force and Bending Moment diagrams-Deflection of propped cantilever.

FIXED BEAMS:

Introduction, Analysis of fixed beams, subjected to single and multiple point loads, UDL, UVL, couple and combination of loads. Draw SFD, BMD and deflection diagrams – Effect of sinking and rotation of supports.

UNIT-II (12 Lectures)

CONTINUOUS BEAMS:

Introduction- Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia, continuous beams with different M.I for different spans – Effects of sinking of supports – SF and BM diagrams.

UNIT-III (10 Lectures)

ENERGY THEOREMS:

Introduction – Strain energy in linear elastic system, expression of Strain Energy due to axial load, BM and SF. Castigliano's first theorem, deflections of simple beams of simple portal frames.

UNIT-IV (12 Lectures)

INDETERMINATE STRUCTURAL ANALYSIS:

Determination of Static and Kinematic indeterminacies – Trusses upto one degree of internal and external indeterminacy using Castigliano's theorem-II.

UNIT-V (16 Lectures)

INFLUENCE LINES:

Definition of Influence line for reactions, SF and BM at a given position of loading, number of point loads, UDL.

MOVING LOADS:

Introduction, maximum S.F and B.M at a given section and absolute maximum S.F. and B.M due to single concentrated load, UDL longer than the span, UDL shorter than the span, Two point loads with fixed distance between them and several point loads-Load position for maximum B.M at a given section, Load position for max S.F. at a given section.

TEXT BOOKS:

1. V.N. Vazirani & M.M.Ratwani, *"Analysis of Structures"*, (Vol I&II), Khanna Publications, New Delhi.
2. T.S. Thandavamoorthy, *"Analysis of Structures"*, Oxford University Press, New Delhi
3. Dr. R. Vaidyanathan & Dr. P.Perumal, *"Comprehensive Structural Analysis (Vol I & II)"*, Laxmi publications Pvt. Ltd., New Delhi.
4. C.S. Reddy, *"Basic structural Analysis"*, Tata Mc Graw hill, New Delhi.

REFERENCES:

1. S.B.Junnarkar, *"Mechanics of Structures"*, 10th Edition, Charotar Publishing House, Anand, Gujrat, 2000.
2. Pandit & Gupta, *"Theory of Structures"*, 3rd Edition, Tat McGraw – Hill Publishing Co. Ltd, New Delhi, 2006.
3. R.S. Khurmi, *"Theory of Structures"*, 2nd Edition, S. Chand Publishers, 2000.
4. B.C.Punmia, *"Strength of Materials and Mechanics of Structures"*, 2nd Edition, Khanna Publications, New Delhi, 2006.
5. B.D.Nautiyal, *"Introduction to Structural Analysis"*, 1st Edition, New age International Publishers, New Delhi, 2008.