ADVANCED STRUCTURAL ANALYSIS
(Professional Core)

Course Code: 19CE2201

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Course Outcomes:
At the end of the course, the student will be able to:
CO1:Know the type of non-linearity and its analysis.
CO2:Analyse beams and building frames by stiffness method.
CO3: Apply the concept of ILDs for beams and trusses.
CO4: Analyse cables and suspension bridges.
CO5: Apply Rayleigh Ritz method and Galerkin's method for beams and bars.

UNIT-I   (10-Lectures)
NON-LINEAR ANALYSIS: Introduction, types of non-linearity, Methods of non-linearity, analysis of material non-linear problems, analysis of geometric non-linear problems, contact nonlinearity, Newton Raphson methods
LO1: Understand the concept of non-linear analysis.
LO2: Analyse different types of non-linear problems.

UNIT-II   (10-Lectures)
Degree of static and Kinematics indeterminacy
STIFFNESS METHOD: Analysis of Indeterminate beams, frames and trusses by stiffness matrix method including support settlements (up to maximum Kinematic indeterminacy of 3 degree).
LO1: Analyse indeterminate beams using stiffness method.
LO2: Analyse the frames using stiffness method.
LO3: Analyse the trusses using stiffness method.

UNIT-III   (10-Lectures)
FLIXIBILITY METHOD:
Analysis of Indeterminate beams, frames and trusses by flexibility method including support settlements (up to maximum static indeterminacy of 3 degree).
LO1: Analyse indeterminate beams using flexibility method.
LO2: Analyse the frames using flexibility method.
LO3: Analyse the trusses using flexibility method.

UNIT-IV   **(10-Lectures)**

INFLUENCE LINES: Analysis of indeterminate beams, three hinged arches, two hinged arches using Influence Line Diagram (ILD). **LO1:** Draw the ILD's of indeterminate beams and analyse.
LO2: Draw the ILD's of three hinged arches and analyse.
LO3: Draw the ILD's of two hinged arches and analyse.

UNIT-V   **(10-Lectures)**

CABLES AND SUSPENSION BRIDGES: Introduction, Equation of the cable, General Cable theorem, horizontal reaction for uniformly loaded cable, Tension in the cable supported at same and different levels, lengths of the cable when supported at the same and different levels.
LO1: Understand the behavior of suspension cables.
LO2: Compute the tension in the cable supported at same and different levels.
LO3: Determine the lengths of suspension cable when supported at the same and different levels.

Text Books

1. Weaver and Gere, Matrix Analysis of Framed Structures – 3rd Edition, Van Nostrand Reinhold New York, 1990

2. G.S. Pandit & S.P. Gupta, *"Structural Analysis–A Matrixapproach"*, 2ndEdition, Tata McGrah Hill Companies, 2011.

3. Devdas Menon, *"StructuralAnalysis"*, 2nd Edition, Narosa Publications, 2012.

References

1. S.B. Junarkar, *"Mechanics of Structures"*, 3rd Edition, Dhanpat Rai Publications, 2011.
2. V.K. Manicka Selvam, *"Finite Element Premier"*, 3rd Edition, Dhanapat Rai Publications, 2011.
3. *S. Ramamrutham & R. Narayanan, *"Theory of Structures"*, 9thEdition, Dhanapat Rai Publications, 2012.