



GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRUCTURAL ANALYSIS

Course Code: GR15A2015
II Year II Semester

L:3 T:1 P:0 C:4

Prerequisites

- Knowledge of Engineering Mechanics
- Knowledge of Mechanics of Solids

Course Objectives

- To estimate the deflections of simple beams and pin-jointed trusses using energy theorems
- To analyze three and two hinged, circular and parabolic arches
- Ability to idealize and analyze indeterminate beams to understand the effect of moving loads and learn about influence diagrams

Course Outcomes

Students who successfully complete this course will be able to:

- Determine deflections of beams and trusses using energy methods.
- Analyze three and two hinged, circular and parabolic structures.
- Analyze indeterminate beams using force method.
- Apply the Slope deflection, Moment distribution and Kani's methods to analyze statically indeterminate structures.

Unit-I

Energy Theorems: Introduction – strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castiglione's first theorem – Deflections of simple beams and pin jointed trusses.

Unit-II

Arches: Types of arches- three and two hinged arches – Circular and parabolic arches – yielding of supports –Effect of shortening of rib-Effect of temperature changes –Tied and linear arch.

Unit-III

Indeterminate Beams (Force method):

- a. Propped cantilever's
- b. Fixed beams
- c. Continuous Beams (By Clapeyorn's theorem of three moments)



Unit-IV

Analysis of Indeterminate Structures for Beams:

- a. Slope Deflection
- b. Moment Distribution
- c. Kani's Method

Unit-V

Moving Loads and Influence Diagrams: Introduction maximum SF and BM at a given section and absolute maximum S.F and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads – Equivalent uniformly distributed load – focal length.

Definition of influence line for SF, Influence line for B.M- load position for maximum SF at a section –Load positions for maximum BM at a section – Point loads , UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Teaching Methodologies

1. White Board and marker
2. Assignments
3. Tutorials

Text Books

1. V. N. Vazirani & M. M. Ratwani, Analysis of structures – Vol. I & Vol. II, Khanna Publications, New Delhi.
2. T.S. Thandavamoorthy, Analysis of structures, Oxford University Press, New Delhi
3. S.S Bhavikatti, Structural Analysis, Vikas Publishing House

Reference Books

1. S.B. Junnakar, Mechanics of structures, Charotar Publishing House, Anand, Gujarat.
2. Pandit & Gupta, Theory of structures, Tata Mc. Graw Hill Publishing Co. Ltd., New Delhi.
3. R. S. Khurmi, Theory of structures, S. Chand Publishers.
4. B. C. Punmia, Strength of materials and Mechanics of Structures, Khanna Publications, New Delhi
5. B.D. Nautiyal, Introduction to structural analysis, New age international publishers, New Delhi.