CE4T6   **STRUCTURAL ANALYSIS-I**   **Credits: 4**

Lecture: 4 periods/week   **Internal assessment: 30 marks**
Tutorial: 1 period /week   **Semester end examination: 70 marks**

Objectives:

- To get practice in doing the analysis of propped cantilever, fixed and cantilever beams. Knowing the application of slope deflection method for various beams
- To draw Influence Line Diagrams (ILDs) and to know the application of ILDs for the analysis of simply supported girders.
- To understand the analysis of trusses and Castiglione's theorems.

Learning outcomes:

At the end of course the student will be able to undertake:
- The analysis of cantilever, fixed and continuous beams
- Strain energy and slope deflection methods
- Drawing Influence lines and their applications in the analysis will be improved

UNIT – I
INDETERMINATE TRUSSES:
Determination of static and kinematic indeterminacies – Castigliano's theorems- Solution of trusses up to two degrees of internal and external indeterminacies

UNIT – II
PROPPED CANTILEVERS:
Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

UNIT – III
FIXED BEAMS:
Introduction to statically indeterminate beams with U.D.load central point load, eccentric point load. Number of point loads, uniformly varying load, couple and combination of loads shear force and bending moment diagrams-Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT – IV
CONTINUOUS BEAMS:
Introduction-Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, continuous beams with different moment of inertia for different spans-Effects of sinking of supports-shear force and Bending moment diagrams.

UNIT-V
SLOPE-DEFLECTION METHOD:
Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports.

UNIT – VI
ENERGY THEOREMS:
Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear - Deflections of beams and pin jointed trusses

UNIT – VII
MOVING LOADS:
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.

UNIT – VIII
INFLUENCE LINES FOR DETERMINATE STRUCTURES:
Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section, single point load, U.D.load longer than the span, U.D.load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Learning resources

Text books:
1. Analysis of Structures-Vol I & Vol II, (Vol I -17th edition & Vol II-16th edition) by Vazirani, V.N. and Ratwani M.M., Khanna Publications, New Delhi, 2005.
2. Basic structural Analysis, (2nd edition) by Reddy C.S., Tata McGraw-Hill, New Delhi, 2009.

Reference books:
1. Mechanics of Structures, (20th edition) by Junnarkar S.B., Anand Charotar Publishing House, 2009.
2. Theory of Structures by Gupta, Pandit, Tata McGraw – Hill, New Delhi, 1999.
3. Theory of Structures by Khurmi, R.S., S. Chand Publishers, 2010.

Web Reference books: NPTEL