

B.E.Semester : III

Civil Engineering

Subject Name: STRUCTURAL ANALYSIS I (CV305)

A. Objectives of the Course:

- To understand the fundamentals of structural analysis that is essential for an economical dimensional proportioning of various civil engineering structures.
- To make students familiar with techniques to find analytical solution to a range of structural engineering problems.
- To prepare the students to give cost-effective, safe and durable structural solution to the society.

B. Teaching & Evaluation Scheme

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract/ Tut.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
04	02	00	06	06	03	70	30	20	30	150

C. Detailed Syllabus

1. Fundamentals:

Introduction to Determinate and Indeterminate structures, Introduction to SI and KI, Calculation of SI and KI of various structures like beams, trusses, frames, grids.

2. Analysis of Determinate Beams and Frames:

(A) Calculations of Shear Force and Bending Moment for

- (i) Determinate Beams (ii) Determinate Frames

(B) Calculations of Slope and Deflection for

- (i) Determinate Beams Using (a) Double Integration Method (b) Macalul Method
(c) Moment Area Method (d) Conjugate Beam Method

3. Analysis of Determinate Trusses:

- (A) Calculations of member forces Using (a) Method of Joints
(B) Calculations of Vertical and Horizontal Deflections Using (a) Unit Load Method

4. Influence Lines for Determinate Structures:

Introduction to Influence lines, Draw Influence Lines for Determinate beams for (a) Point Load (b) UDL Shorter and Longer than span (c) Several Point loads (d) For BM, Shear force and reactions.

5. Torsion

Torsion of solid and hollow circular shaft, shear stress and strain due to torsion, angle of twist, torsional moment of resistance, power transmitted by shaft, keys and coupling, combined bending and torsion, closed coiled helical springs.

6. Strain Energy

Resilience, strain energy in tension, compression, shear, bending, torsion, proof resilience, modulus of resilience, impact loads, and sudden loads.

7. Column and Struts

Buckling of columns, different end conditions, effective length, least radius of gyration, product of inertia, principal axes and Mohr's circle of inertia, Euler's and Rankine's formulae, columns with initial curvature, eccentrically loaded columns, columns with lateral loading.

D. Lesson Planning

Sr. No.	Title of the Unit	Minimum Hours	Weightage
1.	Fundamentals	10	15
2.	Analysis of Determinate Beams and Frames	20	20
3.	Analysis of Determinate Trusses	15	15
4.	Influence Lines for Determinate Structures	20	20
5.	Torsion	4	10

6.	Strain Energy	5	10
7.	Column and Struts	4	10

E. Instructional method and pedagogy (Continuous Internal Assessment Scheme) (CIA) :

- At the start of course, the course delivery pattern, prerequisite of the subject will be Discussed.
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures, practical and Tutorial which carries 05 Marks.
- At regular intervals assignments is given. In all, a student should submit all assignments of 05 marks each.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 05 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

F. Students Learning Outcomes:

On the successful completion of this course

- The students will be able to understand the fundamentals of structure and various Methods of analysis.
- The students will be able to determine the effects of loads on physical structures and their Components.
- The course gives students an understanding of the importance of structural analysis And the tools available to determine the response of a structural system to external loads.

G. Recommended Study Materials

A. Text book & Reference Books:

1. Junarkar, S.B. and Shah, H.J., Mechanics of Structures Vol. I, Charotar Publishing House
2. Negi, L.S. and Jangid, R.S., Structural Analysis, Tata McGraw Hill
3. Reddy, C.S., Basic Structural Analysis, Tata McGraw Hill
4. Structure By Schedok
5. Gere and Timoshenko, Mechanics of Materials, CBS Publishers
6. Hibbler, R.C., Mechanics of Materials, Pearson Education
7. Wang, C.K., Intermediate Structural Analysis, Tata McGraw Hill 50
8. Use BIS and IS Code.

B. Web Materials:

1. <http://www.nptel.iitm.ac.in/courses.php?branch=Civil>
2. <http://www.nptel.iitm.ac.in/video.php?courseId=1053>
3. <http://www.nptel.iitm.ac.in/courses/Webcoursecontents/IITDelhi/Mechanics%20Of%20Solids/index.htm>
4. <http://www.nptel.iitm.ac.in/video.php?courseId=1069>