M.E. (Civil) (Infrastructure Engineering) Semester: I

Subject Name: Advanced Structural Analysis

Subject code : MECV105 - B

A. Learning objectives:

The objective of this course is

- To understand the Fundamentals of Stiffness and Flexibility Matrices which is essential for dimensional proportioning of Civil Engineering Structures
- To make students familiar with Matrix techniques to find analytical solution to a range of Structural engineering problems.
- To Prepare the students to give Safe and durable structural solution to the society.

B. Teaching Scheme (Credits and Hours)

Teaching Scheme				Credit Scheme			Evaluation Scheme				
Lect Hrs	Tu Hrs	Prac. Hrs	Total	Theory	Pra/TW	Total	UE	IE	CIA	Prac/Viva	Total
04	02	00	06	04	01	05	70	30	20	30	150

C. Detailed Syllabus

Unit No.	Topics
1	**Introduction**: Principles of Virtual Work. Concepts of Flexibility: Analysis of Pin jointed and Rigid Jointed Frames, Grids by Member Approach
2	**Stiffness methods**: Analysis of Plane truss, plane frames, grids, space truss, space frame and composite structures by member approach. Special problems such as member discontinuities, non prismatic members, curved members, and beams on elastic supports, second a effects due to temperature changes, Pre-strains and end displacements semi-rigid connections, plastic analysis, and effect of shear deformations by stiffness method, sub-structuring, Programming techniques for solution of large number of simultaneous equations.
3	**Introduction to Non-linearity**: Introduction to Non-linearity in structure and non-linear analysis

D. Lesson Planning:

Unit No	Topics	Hours	Weightage
1	Introduction	20	30%
2	Stiffness methods	30	50%
3	Introduction to Non-linearity in structure and non-linear analysis	10	20%

E. List of Tutorials:

Sr. No.	Tutorial Content
1	Principles of Virtual Work. Concepts of Flexibility
2	Analysis of Pin jointed and Rigid Jointed Frames, Grids by Member Approach
3	Analysis of Plane truss, plane frames, grids, space truss, space frame & composite structures by member approach
4	Special problems such as member discontinuities, non prismatic members, curved members, and beams on elastic supports, second a effects due to temperature
5	Pre-strains and end displacements semi-rigid connections, plastic analysis, and effect of shear deformations by stiffness method
6	Sub-structuringProgramming techniques for solution of large number of simultaneous equations.
7	Introduction to Non-linearity in structure and non-linear analysis

F. Instructional Method and Pedagogy (Continuous Internal Assessment (CIA) Scheme)

- 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 Evalution.

G. Students Learning Outcomes:

On the successful completion of this course

- The Students will be able to understand the fundamentals of structure and Methods of analysis Stiffness and Flexibility Method.
- 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 important of structural analysis and the tools available to determine the response of a structural system to external loads.

H. Text Books & Reference Books:

1 Weaver William, Gere James M., " Matrix analysis of Framed Structure", CBS Publishers, 1/e/1986

2 Wang C. K., "Intermediate Structural Analysis", McGraw Hill Co (International Edition)

3 Jenkins W. W., "Matrix and Digital Computer Methods in Structural Analysis", McGraw Hill.