Marwadi University

Bachelor of Technology
Civil Engineering

01CI0804: Advanced Structural Analysis

Objective of the Course

Objectives of introducing this subject at third year level in civil branches are:

- To make students understand Force method and Displacement method used for structural analysis of indeterminate beams, trusses and portal frames.
- To equip students with analysis of special structures like Domes and Beams curved in plan.

Credits Earned: 4

Students Learning Outcomes

After studying this subject students will be able:

- Determine displacement and reactions for indeterminate structures with the help of stiffness and flexibility matrix method.
- Analyze domes with and without opening for given loading condition.
- Analyze the stresses for beams curved in plan subjected to point load and uniformly distributed load.

Teaching and Examination Scheme

Subject Name	Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
	Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term Work (TW)	
Advanced Structural Analysis	3	2	0	4	50	30	20	25	25	150

Detailed Syllabus

Sr. No	Topic name	Hours
1	**Basics of Structural Engineering**	**4**
	1.1 Static and Kinematic indeterminacy, force-displacement relationship.	2
	1.2 Principle of virtual work and its application in deriving stiffness and flexibility matrices	2
2	**Matrix Analysis of Structures**	**24**
	2.1 Force method: Derivation of member flexibility matrix.	1
	2.2 Analysis of continuous beams, indeterminate portal frames and trusses using member flexibility matrix.	8
	2.3 Displacement method: Derivation of member stiffness matrix and analysis of beams, plane frames and plane trusses using member stiffness matrix methods.	12
	2.4 Analysis of trusses subjected to secondary stresses due to imperfections	3

	in length of members.	
3	**Domes**	**8**
	3.1 Introduction: Uses of Domes, Types of Domes	1
	3.2 Stresses induced in conical and spherical domes, Analysis of conical and spherical domes subjected to udl and concentrated loads	5
	3.3 Analysis of domes with opening	2
4	**Beam curved in Plan**	**6**
	4.1 Internal force in curved beams, Analysis of curved beams fixed at ends subjected to point and uniformly distributed load	4
	4.3 Analysis of circular beam supported Symmetrically	2
		42

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
10%	10%	5%	70%	5%	0%

Instructional Method and Pedagogy

1. Prerequisite of the course and its pattern shall be discussed on the commencement of the course.
2. Lectures shall be conducted in class room using various teaching aids.
3. Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation.
4. At the end of each unit/topic an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.
5. The laboratory experiments are planned in such a way that it covers the practical aspects of the course contents. The performance of these experiments shall bring the clarity of the theoretical concepts which the students have studied during the academic sessions.

Recommended Study Material

Reference Books:

1. Mechanics of Structures Vol-II by Junnarkar S. B. & Shah H.J, Charotar publishing house, Anand.
2. Matrix methods of Structural Analysis by Wang C.K, Mc Graw Hill book Company, New Delhi.
3. Basic Structural Analysis by Reddy C.S., Tata Mc Graw Hill Publishing Company Ltd, New Delhi.
4. Matrix Analysis of Framed Structures by William Weaver, Jr & James M. Gere, CBS Publishers & Distributors, Delhi.
5. Matrix Analysis of Structures by Meghre & Deshmukh, Charotar publication