

Branch Name:	Civil Engineering (Structural Engineering)
Semester/Year:	Semester I / First Year
Subject Title:	Matrix Methods Of Structural Analysis
Subject Code:	2ET2060102T
Pre-requisite Subject:	Mechanics of Solids, Structural Analysis and Matrix Algebra

Course Objective:

1. Understand flexibility and stiffness matrices to solve problems in beams, frames, trusses and Grid.
2. Gain knowledge of direct stiffness method to solve problems in beams, frames and trusses.
3. Gain knowledge of solving problems involving temperature changes and lack of fit.

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
5	3	2	-	5	24	60	16	40	-	-	-	-	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
01	Introduction: Principles of Virtual work, Basic concepts of flexibility and stiffness.	01	-	
02	Flexibility Member Approach: Analysis of Continuous beam, Plane truss, Plane frame and Grid.	10	25	
03	Stiffness Member Approach: Analysis of Continuous beam, Plane truss, Plane frame, Grid, Space truss, Space frame and Composite structures including secondary effects such as Temperature variations, Pre-strains and Restrained displacement; Programming direct stiffness method.	20	50	
04	Special Problems: Member discontinuities, Non-prismatic members, curved members, beams on elastic supports, semi-rigid connections, effect of shear deformations by stiffness method, Sub-structure analysis and symmetry concepts.	08	20	
05	Introduction to Non-linearity in structure and non-linear analysis.	03	05	

List of Tutorials:

1. Minimum 15 problems from above topics along with cross checking using any open-source / professional software.
2. Modeling and analysis of at least one real-life structure using open-source/ professional software.

List of References:

1. Matrix Analysis of Framed Structure - Weaver W. and Gere J. M., CBS Publishers, Delhi.
2. Structural Analysis - Ghali & Nevelle, Spon Press, London.
3. Matrix Analysis of Structures – Aslam Kassimali, Cengage Learning, USA.
4. Matrix Analysis of Structures - Meghre & Deshmukh, Charotar Publication, Anand.
5. Computer Methods of Structural Analysis - Beaufait, Rowan, Hadley and Heckett
6. Linear Analysis of Frameworks - Graves Smith
7. Computer Analysis of Structural Systems - Fleming J.F
8. Matrix Structural Analysis - McGuire, Gallagher, and Ziemian, John Wiley & Sons, Inc. 2000.

Course Learning Outcomes:

After learning the course, the students should be able to:

1. Analyze framed structures using flexibility and stiffness method,
2. Develop computer programs for analysis of framed structure,
3. Use effectively commercial software for analysis and design of structures
4. Analyse structure having member discontinuities, curved members, non-prismatic members, elastic supports, semi-rigid connections etc.

Open Ended Problems:

Apart from above tutorials/experiments a group of students has to undertake one open ended problem/design problem. Few examples of the same are given below.:

1. Development of computer programme for the analysis of planner and space skeletal structure.
2. Development of front end and back end for the computer programme developed as mentioned above.
3. Modelling and analysis of real-life structure using open-source/professional software

List of Open Source Software/learning website:

www.scilab.org/
http://nptel.ac.in/
http://ocw.mit.edu/
www.mastan2.com/

Course Learning Outcomes (CLO):

After successful completion of the course the students shall be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Analyze framed structures using flexibility and stiffness method.	L-1, L-2, L-4
CLO2	Develop computer programs for analysis of framed structure.	L-1, L-2, L-6
CLO3	Use effectively commercial software for analysis and design of structures.	L-1, L-2, L-5, L-6
CLO4	Analyse structure having member discontinuities, curved members, non-prismatic members, elastic supports, semi-rigid connections etc.	L-1, L-2, L-4

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with Pos & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CLO1	M	M	M	M		M						M	M	M	
CLO2	M	M	M	M	M		M					M	M	M	M
CLO3	M	M	M	M	M								M	M	M
CLO4	M	M	M	M		M						M	M	M	M

H:High, M:Medium, L:Low