JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

Year & Semester – III Year / V Semester (2020-21)
Subject –Structural Analysis-I
Name of Faculty – Akhil Maheshwari *(Asst. Prof., Department of Civil Engg.)*

Course Outcomes (CO)

CO1.   Students will be able to understand the Static and Kinematic Indeterminacy.

CO 2.   Students will be able to understand the different types of Prop, Fixed and Continuous Beam.

CO 3.   Students will be able to understand the Slope Deflection and Moment Distribution Method.

CO 4.   Students will be able to understand Mechanical vibrations.

PROGRAMME OUTCOMES (PO)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering Fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CO-PO MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	1	-	-	1	1	1	2
CO2	3	3	3	2	2	1	-	-	2	1	1	2
CO3	3	3	3	2	2	1	-	-	1	1	2	2
CO4	3	2	2	2	3	2	-	-	2	1	3	3

Lecture Plan

Lect No.	Unit Code	Topic Discription	Expexcted Month	Expected week	Plan of teaching
1	1.1	Introduction,Scope, and Coutcome of subject	July	1	PPT
2	2.1	Introduction to Indeterminate structures	July	1	PPT
3	2.2	Degrees of freedom per node		1	PPT
4	2.3	Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.)		1	PPT
5	2.4	Releases in structures		1	PPT
6	2.5	Maxwell's reciprocal theorem and Betti's theorem.	August	1	PPT
7	2.6	Analysis of prop cantilever structures		1	PPT
8	2.7	Analysis of Indeterminate Structure (fixed and continues beams) using Area moment method		1	PPT
9	2.8	Conjugate beam method		1	PPT
10	2.9	Three moments Theorem.		1	PPT

Lecture Plan

Lect No.	Unit Code	Topic Discription	Expexcted Month	Expected week	Plan of teaching
11	3.1	Analysis of Statically Indeterminate Structures using Slope-deflection method	September	1	PPT
12	3.2	Moment-distribution method applied to continuous beams and portal frames with and without inclined members		1	PPT
13	4.1	Vibrations: Elementary concepts of structural vibration, Mathematical models, basic elements of vibratory system.		1	PPT
14	4.2	Degree of freedom. Equivalent Spring stiffness of springs in parallel and in series.		1	PPT
15	4.3	Simple Harmonic Motion: vector representation, characteristic, addition of harmonic motions, Angular oscillation.	October	1	PPT
16	4.4	Undamped free vibration of SDOF system: Newton's law of motion		1	PPT
17	4.5	D Almbert's principle, deriving equation of motions, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Introduction to damped and forced vibration.		1	PPT

Syllabus

5CE4-02: STRUCTURE ANALYSIS-I

Credit: 2   **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P   **End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Betti's theorem. Analysis of prop cantilever structures, Analysis of Indeterminate Structure (fixed and continues beams) using Area moment method, Conjugate beam method, Three moments Theorem.	11
3	Analysis of Statically Indeterminate Structures using Slope-deflection method and Moment-distribution method applied to continuous beams and portal frames with and without inclined members	11
4	**Vibrations:** Elementary concepts of structural vibration, Mathematical models, basic elements of vibratory system. Degree of freedom. Equivalent Spring stiffness of springs in parallel and in series. **Simple Harmonic Motion**: vector representation, characteristic, addition of harmonic motions, Angular oscillation. **Undamped free vibration of SDOF system**: Newton's law of motion, D Almbert's principle, deriving equation of motions, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Introduction to damped and forced vibration.	5
	TOTAL	28

Akhil Maheshwari(AP)