

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*	*		*	
CO2	*	*	*	*	*	*		*	
CO3	*	*	*	*	*	*		*	
CO4	*	*	*	*	*	*		*	

Wks Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*		*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern:

Attendance	: 5 marks
Continuous Assessment Test	: 20 marks
Continuous Assessment Assignment /Course Activity	: 15 marks

SYLLABUS**Module 1 (16 hrs)**

Approximate Methods of Analysis of Multi-storeyed Frames: Analysis for vertical loads-substitute frames -loading condition for maximum hogging and sagging moments in beams and maximum bending moment in columns.

Analysis for lateral loads – portal method, cantilever method.

Plastic Theory: Introduction – plastic hinge concepts – plastic modulus – shape factor – redistribution of moments – collapse mechanisms – Plastic analysis of beams and portal frames by equilibrium and mechanism methods. (single storey and single bay frames only)

Module 2 (16 hrs)

Matrix analysis of structures:

Flexibility method: Definition of flexibility influence coefficients - Concepts of physical Approach. Flexibility matrices for truss and frame elements- load transformation matrix- development of total flexibility matrix of the structure- analysis of simple structures (determinate & indeterminate)-plane truss and plane frame-nodal loads and element loads.

Stiffness method: Definition of stiffness influence coefficients - Concepts of physical approach. Development of stiffness matrices by physical approach- stiffness matrices for truss and frame elements- displacement transformation matrix- analysis of simple indeterminate structures- plane truss and plane frame- nodal loads and element loads.

Module 3 (11 hrs)

Direct stiffness method: Introduction to direct stiffness method-Rotation of axes in two dimensions, stiffness matrix of elements in global co- ordinates from element co-ordinates- assembly of load vector and stiffness matrix, solution of two span continuous beam-single bay single storey portal frame.

Module 4 (13 hrs)

Structural dynamics: Introduction - degrees of freedom - equation of motion, D'Alembert's principle- damping- free response of damped and undamped systems- logarithmic decrement-- single degree of freedom systems subjected to harmonic load - transient and steady state responses, simple portal frame problems.

Course Activity

Analyse a two storeyed frame using any suitable structural analysis software.

Text Books:

1. Gere, J. M., & Weaver, W. (2018). *Matrix analysis of framed structures*. CBS Publishers.
2. Junnarkar, S. B. (2020). *Mechanics of structures* (Vols. I & II). Charotar Publishing House.
3. Menon, D. (2010). *Structural analysis*. Narosa Publications.
4. Wang, C. K. (2017). *Intermediate structural analysis*. McGraw Hill.
5. Paz, M. (2018). *Structural dynamics*. Springer international publishing AG.

Reference Books

1. Chopra, A. K. (1995). *Dynamics of structures*. Pearson Education / Prentice Hall India.
2. Hibbeler, R. C. (2012). *Structural analysis*. Pearson Education.
3. Mukhopadhyay, M., & Sheikh, A. H. (2005). *Matrix and finite element analysis of structures*. Ane Books India.
4. Pandit, G. S., & Gupta, S. P. (2008). *Structural analysis: A matrix approach*. Tata McGraw Hill.
5. Rajasekharan, S., & Sankara Subramanian, G. (2001). *Computational structural mechanics*. PHI Learning.

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

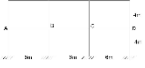
Course Code	25UCET402
Course Name	STRUCTURAL ANALYSIS II
Max. Marks: 60	Duration: 2.5 Hours

Part A <i>(Answer all questions. Each question carries 3 marks)</i>				
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Qn No.	Question	Marks	CO	BL
1	Explain the Ideal Elastic-Plastic Stress-Strain diagram of mild steel.	3	1	L2
2	Outline the assumptions in Portal method of analysis of multi-storeyed buildings.	3	1	L2
3	Describe the terms nodal load, element load, and equivalent joint load.	3	2	L2
4	Explain the properties of stiffness matrix.	3	2	L2
5	Differentiate between local coordinates and global coordinates.	3	3	L2
6	Describe rotation of axes.	3	3	L2
7	Explain damping in vibration.	3	4	L2
8	Explain D'Alembert's principle.	3	4	L2

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Module I				
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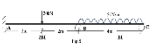
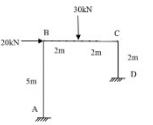
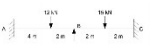
Qn No.	Question	Marks	CO	BL
9	In a multi-storeyed building frame shown in figure, the spacing between the frames is given as 4m c/c. Dead load from slabs is 3kN/m² and Live load is 5kN/m². Compute the maximum positive mid span bending moment in beam BC using substitute frame method. Self-weight of the beams may be ignored . 	9	1	L3

OR				
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10	Calculate the lateral loads in the frame using portal method. 	9	1	L3
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Module II				
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Qn No.	Question	Marks	CO	BL
11	Calculate the redundant forces in the beam shown in Fig 5	9	2	L3

	using flexibility method.			
				
	OR			
12	Determine the end moments for the frame shown in figure below by stiffness method.	9	2	L3
				
	Module III			
Qn No.	Question	Marks	CO	BL
13	Calculate the end moments in the beam using direct stiffness matrix method and draft the BMD	9	3	L3
				
	OR			
14	Compute the end moments in the beam using direct stiffness matrix method and draft the BMD	9	3	L3
				
	Module IV			
Qn No.	Question	Marks	CO	BL
15	Develop the expression for response of a SDOF system subjected to damped free vibration in x-direction with mass 'm', spring constant 'k' and damping constant 'c'.	9	4	L3
	OR			
16	A vibrating system consists of a weight 50N and a spring constant 4N/mm is viscously damped. The ratio of two successive amplitudes are 1:0.8, compute: (i) Natural frequency of undamped system (ii) Natural frequency of damped system	9	4	L3
