

Sankalchand Patel University
Faculty of Engineering and Technology
First Year Master of Technology in Civil Engineering
(Computer Aided Structural Analysis and Design)
In Effect from Academic Year 2023-24

Branch Name:	Civil Engineering (Computer Aided Structural Analysis & Design)
Semester/Year:	Semester II / First Year
Subject Title:	Structural Dynamics and Earthquake Engineering
Subject Code:	2ET2100202T
Pre-requisite:	Mechanics of Solids, Structural Analysis, Structure Design, Earthquake Engineering

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	0	0	3	24	60	16	40	00	00	00	00	100

Course Objective:

1. Earthquakes are one of the most devastating natural hazards that cause great loss of life and livelihood because of collapse of structures.
2. Earthquakes impose time-dependent lateral inertia forces on the structure.
3. To make a structure earthquake resistant, it is to be designed for lateral loads in addition to gravity loads.
4. The lateral loads acting on structure are calculated using theory of structural dynamics.
5. Therefore, the understanding of structural dynamics, characteristic of earthquakes and its effect on structure is essential for safe design of civil engineering structures

Subject Contents			
Sr. No	Topic	Total Hours	Weightage (%)
1	Structural Dynamics: Response of SDOF to harmonic and general dynamic loading, Vibration of multiple degree of freedom systems, numerical techniques for finding natural frequencies & mode shapes, orthogonality relationship of principal modes, Rayleigh's & Dunkerley's principle, Evaluation of dynamic response by mode superposition method, Analysis by response spectrum theory and time history analysis.	08	15
2	Earthquake Engineering: Causes of earthquake and their characteristic, earthquake parameters, seismic zoning of India, Lessons from past earthquake and remedial measures, Response spectra & Combined D-V-A plot,	09	15
3	Behavior of floor diaphragms, effect of various structural irregularities, lateral force analysis of building - Torsionally uncoupled and coupled system	08	15
4	Capacity design of various structural elements, various lateral load resisting structural systems – MR frame with shear wall & bracing, Provisions of IS1893 & IS 13920	10	30
5	Structural controls: Passive Controls – Base isolation, various dampers, Active controls	02	07
6	Response of nonstructural components & structural considerations	05	18

Course Outcome:

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

1. Understand characteristics of earthquake and its effect on structures, Skill development
2. Estimate lateral forces acting on symmetric as well as asymmetric buildings, Skill development
3. Find mode shapes and natural frequency, Skill development
4. Carry out seismic response analysis of a structure, Skill development
5. Design and detail to enhance ductility, Skill development
6. Understand various seismic response control strategies, Skill development

7. Design earthquake resistant masonry structures. Employability

Reference Books

1. Dynamics of Structures - A. K. Chopra
2. Structural Vibrations - Theory and Computation - Mario Paz
3. Earthquake Resistant Design - Manish Shrikhande & Pankaj Agrawal
4. Design Structural Dynamics - Clough & Penzien
5. Elements of earthquake engineering - Jaikrishna & Chandrasekaran
6. Advanced reinforce of concrete design – P.C. Vergesh
7. IS 1893-2016, IS 13920- 1993 & IS 4326
8. Matrix Structural Analysis - McGuire, Gallagher, and Ziemian, John Wiley & Sons, Inc. 2000.

E-Resources (If any):

www.nicee.org
<http://www.earthquakeinfo.org/opensees.berkeley.edu/>
<http://neptel.ac.in/>
<http://ocw.mit.edu/courses/civil-and-environmental-engineering/>
www.eeri.org/
www.earthquakeengineering.com/
www.curee.org/

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand characteristics of earthquake and its effect on structures	L-1 and L-2
CLO2	Estimate lateral forces acting on symmetric as well as asymmetric buildings	L-3 L-4 and L-5
CLO3	Find mode shapes and natural frequency	L-5
CL04	Carry out seismic response analysis of a structure	L-4 and L-5
CL05	Design and detail to enhance ductility	L-4 L-5 and L6
CL06	Understand various seismic response control strategies	L-1 and L-2
CL07	Design earthquake resistant masonry structures	L-2 and L-5

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CLO1	M	M		M		M	M	M	M			M	M		
CLO2	M	M	M	M	H	M	M	M	M			M	M		M
CLO3	M	M	M	M	H	M	M	M	M			H	M	H	M
CL04	M	M	M	M	H	M	M	M				M	M	M	M
CL05	M	M	M	M	H	M	M	M				M	M	M	M
CL06	M	M	M	M	H	M	M	M	M			H	M	H	M
CL07	M	M	M	M	H	M	M	M				M	M	M	M

H: High, M: Medium, L: Low