

Branch Name:	Civil Engineering (Computer Aided Structural Analysis & Design)
Semester/Year:	Semester IV/ Second Year
Subject Title:	Advanced Seismic Design of Structures (Elective - IV)
Subject Code:	2ET2060402T
Pre-requisite:	Earthquake Engineering and Structural Dynamics

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	0	5	24	60	16	40	00	00	00	00	100

Course Objective:

- It is well understood that most of the structures are expected to deform beyond elastic limit when subject to strong ground shaking; for the seismic analysis of over ground and underground structures, consideration of the soil– structure interaction becomes extremely important when the soil or the foundation medium is not very firm and; seismic inputs are essential for deterministic analysis and random vibration analysis of structures.
- Thus, the study of performance based design, earthquake inputs, elastic and inelastic response analysis and seismic soil-structure interaction have become important for the earthquake resistant design of structure.

Subject Contents			
Sr. No	Topic	Total Hours	Weightage (%)
1	Earthquake Inputs: Time History Records and Frequency Contents of Ground Motion; Power Spectral Density Function of Ground Motion; Construction of Design Spectrum; Site Specific,	07	15
2	Response analysis for specific ground motion: Time and frequency domain analyses of single and multi point excitations.	08	20
3	Inelastic response of analysis - Incremental analysis for SDOF and MDOF systems, push over analysis.	09	20
4	Performance based seismic design: Overview of the principles of performance-based seismic design, failure mode control and capacity design	10	25
5	Seismic soil structure interaction – Direct, sub-structure method and equivalent spring-dashpot analysis for soil-structure interaction problems.	08	20

List of Tutorials:

- Minimum 15 problems from above topics along with cross checking using any open-source /professional software wherever applicable.
- Experimental study of behaviour of structure in linear and nonlinear range using shake table testing.
- Experimental study of behaviour of structure using structural controls.

Course Outcome:

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

- Construct Design Spectrum; Site Specific, Probabilistic and Uniform Hazard Spectrums,
- Carry out time and frequency domain analyses of single and multi point excitations,
- To perform inelastic analysis of SDOF and MDOF systems,
- Understand the principles of performance-based seismic design, failure mode control and capacity design.
- To understand Seismic soil structure interaction problems

List of Reference Books

1. Seismic Analysis of Structures by T. K. Datta, Wiley International, 2010
1. Dynamics of Structures - Application to Earthquake Engineering by A. K. Chopra, 1995.
2. Dynamics of Structures by R.W. Clough and J. Penzien, 1995.
3. Geotechnical Earthquake Engineering by C.L. Kramer, 1996.
4. Earthquake Engineering by Bruce A. Bolt, 1970.
5. Earthquake Resistant Design of Structures by Pankaj Agarwal and Manish Shrikhande, PHI, 2008
2. Advances in Performance-Based Earthquake Engineering, Fardis (editor), Springer, 2010.

Design based Problems (DP)/Open Ended Problem:

1. Study of real life building for conventional design and performance-based design including cost aspects.
2. Performing seismic hazard analysis for a specific site.
3. Construction of response spectrum.
4. Developing computer program for dynamic analysis of structure.

Learning website:

<http://nptel.ac.in/>
www.nicee.org
<http://www.earthquakeinfo.org>
[/ opensees.berkeley.edu/](http://opensees.berkeley.edu/)
www.eeri.org/
www.earthquakeengineering.com
[/ www.curee.org](http://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	Construct Design Spectrum; Site Specific, Probabilistic and Uniform Hazard Spectrums,	L-4 and L-5
CLO2	Carry out time and frequency domain analyses of single and multi point excitations,	L-3 L-4 and L-5
CLO3	To perform inelastic analysis of SDOF and MDOF systems,	L-5
CL04	Understand the principles of performance-based seismic design, failure mode control and capacity design.	L-1 and L-2
CL05	To understand Seismic soil structure interaction problems	L-1 L-2 and L3

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		
CLO2	M	M	M	M		M			M				M		
CLO3	M	M	M	M	H	M		M	M			H	M	H	
CL04	M	M	M	M	H	M		M				M	M	M	
CL05	M	M	M	M	H	M		M				M	M	M	

H: High, M: Medium, L: Low