Course Code	Course Title	L	T	P	C
20SE017	EARTHQUAKE RESISTANT DESIGN OF STRUCTURES	3	0	0	3

PRE-REQUISITE COURSES: DESIGN OF REINFORCED CONCRETE STRUCTURES

COURSE OBJECTIVES:

The aim of this course is to impart the knowledge on origin and effects of earthquakes on structures and design according to that. The objective of this course is to make students familiar with dynamics of structures during earthquakes and calculation of additional loads according to IS Code Methods. This course also discusses varied types of Seismic Control Methods

COURSE OUTCOMES:

At the end of the course student will be able to

CO's	Course Outcomes	PO's
1	Illustrate the measurement of earthquakes and their effect on engineering structures	1,2
2	Analyze the free and forced vibration response of single-degree and multi-degree of freedom and continuous systems	2,4
3	Apply the Basic Principles of Conceptual Design for Earthquake Resistant Buildings	3,6
4	Explain the concepts and implementation of IS codes in relation to earthquake design	2,3,4
5	Learn the various seismic control methods	1,2

SKILLS:

- ✓ Ability to understand effects of earthquakes on engineering structures and its measurement.
- ✓ Ability to apply dynamic loads on various structures.
- ✓ Ability to design buildings for earthquake loads as per IS codes.
- ✓ Ability to understand and implement the concept of ductility in Earthquake Resistant Design.
- ✓ Ability to suggest various seismic control techniques to minimize the vibration effects.

UNIT-I:

EARTHQUAKES AND GROUND MOTION: Introduction, Classification of Earthquakes Effects and Consequences of Earthquake, Measurements of Earthquakes, Ground Motion Characteristics, Response of Structure to Ground Motion, Case Study on Past Earthquake Disasters.

UNIT-II:

DYNAMICS OF STRUCTURES: Introduction, Modeling of Structures, Equations of Motion, Single Degree of Freedom Systems, Dynamic and Seismic Response of Single-Storey Structure, Free vibration response and Forced Vibration Response including Damping effects, Response Spectrum, Multi Degree of Freedom Systems, Periods and Modes of Vibration of MDOF Systems Dynamic and Seismic Response of Multi-Storey Structures.

UNIT-III:

CODE-BASED ANALYSIS METHODS AND DESIGN APPROACHES: Seismic Design Requirements, Importance of Ductility, Role of Response Reduction Factor, Seismic Methods of Analysis, Factors in Seismic Analysis, Design Guidelines and Calculation of Seismic Base Shear according to Equivalent Static Method (Linear Static) and Response Spectrum Method (Linear Dynamic) as per IS: 1893:2016.

UNIT-IV:

Ductility Considerations in Earthquake Resistant Design of RC Structures: Introduction, Impact of Ductility, Types and Factors effecting ductility, Assessment of Ductility, Ductile Detailing considerations of Structural Elements as per IS13920:2016, Earthquake Resisting Design of Four Story Building as per IS 13920:2016, Earthquake Resisting, Design of Shear wall as per IS 13920:2016.

UNIT-V:

Seismic Protection of Structures : Introduction; Considerations for seismic isolation; Basic elements of seismic isolation; seismic-isolation design principle; Feasibility of seismic isolation; Seismic isolation configurations-Seismic dampers - Types of Dampers: Viscous, Friction, Yielding dampers – Seismic vibration control-Seismic Strengthening Measures.

TEXT BOOKS:

1. Mario Paz and leigh, "Structural Dynamics",2 nd edition, CBS Publishers, 2004**.**
2. Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", 1st edition, PHI Learning Pvt Ltd, 2006.
3. Duggal S.K, "Earthquake Resistant Design of Structures", 2 nd edition, Oxford University Press, 2013.

REFERENCES:

1. Chopra A.K, "Dynamics of Structures" Prentice-Hall of India Limited, New Delhi,2006.
2. Paulay T and Priestley M.J.N. "Seismic Design of Reinforced Concrete and Masonry Buildings", John Wiley & Sons, 1991.

LAB COMPONENT

1. Design of beam for various loads including Earthquake and Wind loads using any MS-Excell/MATLAB
2. Design of Column for various loads including Earthquake and Wind loads using any MS-Excell/MATLAB
3. Design of Slab for various loads including Earthquake and Wind loads using any MS-Excell/MATLAB
4. Analysis and Design of G+2 and above RC buildings for all types of loads including Earthquake loads using STAAD-Pro/ETabs/SAP 2000 (Equivalent Static Method)
5. Analysis and Design of G+2 and above RC buildings for all types of loads including Earthquake loads using STAAD-Pro/ETabs/SAP 2000 (Response Spectrum Method)
6. Nonlinear Static Pushover Analysis for RC building using SAP 2000/ETabs.