II Year-II Semester
(20CE4637) Earthquake Resistant Design of Structures

Int. Marks Ext. Marks Total Marks   **L   T   P   C**

30   70   100   **3   -   -   3**

Pre- Requisites: Fundamentals of Engineering Mechanics

UNIT-I:
Engineering seismology – rebound theory – plate tectonics – seismic waves - Earthquake size and various scales –local site effects – Indian seismicity –seismic zones of India – theory of vibrations – near ground and far ground rotation and their effects.

UNIT-II:
Introduction to Structural Dynamics: Fundamental objective of Dynamic analysis – Types of prescribed loadings Formulation of the Equations of Motion– Elements of a Vibratory system – Degrees of Freedom – Oscillatory motion – Simple Harmonic Motion – Free Vibrations of Single Degree of Freedom (SDOF) systems – Undamped and Damped – Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor.

UNIT-III:
Seismic design concepts – EQ load on simple building – load path – floor and roof diaphragms – seismic resistant building architecture – plan configuration – vertical configuration – pounding effects – mass and stiffness irregularities – torsion in structural system- Provision of seismic code (IS 1893 & 13920) – Building system – frames – shear wall – braced frames – layout design of Moment Resisting Frames (MRF) – ductility of MRF – Infill wall – Nonstructural elements.

UNIT-IV:
Calculation of equivalent lateral force- Design Base Shear- Storey Shear, Estimation of Natural period of Structure, Computation of Response acceleration Coefficient- Zone factor- Seismic weight- Response reduction factors- Seismic Coefficient Method.

UNIT-V:
Design and ductile detailing of Beams and columns of frames -Concept of strong column weak beams, Ductility criteria for earthquake resistant design, Ductile detailing of flexural members as per IS 13920-Longitudinal reinforcement, Shear reinforcement, Anchorage of reinforcement- Development length, Lap Splices.

Course Outcomes:

S.No	Course Outcomes	BTL
1	Explain fundamentals of Engineering Seismology	L2
2	Acquaint with the principles Structural dynamics	L3
3	Solve SDOF Systems and suggest ductile design	L4
4	Compute equivalent lateral seismic loads and carryout a seismic design as per IS codal provisions	L4
5	Carryout ductile detailing of flexural members as per codal provisions	L4

Text Books:
1. 'Earthquake Resistant Design of Structures' - Pankaj Agarwal and Manish Shri Khande, Prentice – Hall of India, 2007, New Delhi.
2. 'Earthquake Resistant Design of Building Structures' by Vinod Hosur, Wiley India Ltd.
3. 'Reinforced Concrete Design' by A. K. Jain.

Reference Books:
1. 'Introduction to the Theory of Seismology' by Bullen K.E., Great Britain at the University Printing houses, Cambridge University Press 1996.
2. Relevant code of practices.