19CE4801A – EARTHQUAKE ENGINEERING

Course Category:	Program Elective		Credits:	3
Course Type:	Theory		Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	19CE3501 - Structural Analysis 19CE3503 – Design of Reinforced Concrete Structures		Continuous Evaluation:	30
			Semester End Evaluation:	70
			Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	**Illustrate** the principles of vibration with regard to single degree of freedom system for free vibration.	K3
CO2	**Demonstrate** the principles of vibration with regard to single degree of freedom system for forced vibration.	K3
CO3	**Establish** the earthquake response of linear systems	K3
CO4	**Understand** the engineering seismology	K2
CO5	**Demonstrate** the concept of ductility and corresponding detailing.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3		2							2	3	
CO2	2		3		2							2	3	
CO3	2		3		2							2	3	
CO4	2		3		2							2	3	
CO5	2		3		2							2	3	
Avg.	2		3		2							2	3	

1- Low	2-Medium	3-High

Course Content

UNIT-1	**Single-Degree- of – Freedom (SDF) Systems - Equations of Motion and Free Vibration** Simple Harmonic Motion, Mass-Spring- Damper System, Equation of Motion, D'Alembert's Principle), Degrees of Freedom, Single Degree of Freedom, Mathematical Modeling, Equation of Motion for Free Vibration for Damped and Un damped System (Single Degree of Freedom System)	CO1
UNIT-2	**Single-Degree- of – Freedom (SDF) Systems - Equations of Motion and Forced Vibration** Equation of Motion for Forced Vibration for Damped and Un damped System (Single Degree of Freedom System), Logarithmic Decrement.	CO2
UNIT-3	**Earthquake Response of Linear Systems:** Earthquake excitation, Equation of motion, Response quantities, Response history, Response spectrum concept, Deformation, Pseudo-velocity, and Pseudo-acceleration, Response spectra, Peak structural response from the response spectrum, Response spectrum characteristics.	CO3
UNIT-4	**Engineering seismology** Earthquakes, Epicenter, Hypocenter and earthquake waves, Measurement of ground motion, Seismic Regions, Intensity and Isoseismal of an earthquake, Magnitude and energy of an earthquake, Consequences of earthquakes, Seismic zoning, Seismic effects on structure.	CO4
UNIT-5	**Ductile detailing of Beams as per IS 13920** Ductility in Reinforced Cement Concrete Structures, Detailing Principles to ensure sufficient Ductility, Ductile detailing as per IS 13920, Longitudinal reinforcement,	CO5

	Shear reinforcement, Anchorage of reinforcement and concept of development length.	

Learning Resources

Text Books	2. Jai Krishna and Chandrasekharan, Saritha Prakasham, Elements of Earthquake Engineering, 2/e, South Asian Publishers, Dec.2000. 3. Anil K.Chopra, Dynamics of Structures, Theory and Applications to Earthquake Engineering, 4/e, Prentice Hall of India, 2011.
Reference Books	3. Vinod Hosur, Earthquake-Resistant Design of Building Structures, 1/e, Wiley India Pvt Ltd. 2013.
e-Resources& other digital material	2. https://nptel.ac.in/courses/105/101/105101004/