

# Earthquake Engineering

<b>Course Code</b> CE-416	<b>Credit Hours</b> 3-0
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## Course Description

This is a multi-disciplinary course covering three major areas seismology, structural dynamics and seismic design.

1. Earthquake engineering and seismology are taught to cover origin of earthquakes and ground motion effects.
2. Structural dynamics cover basic understanding of behaviour of single degree of freedom systems under action of earthquake and other dynamic loading.
3. Finally seismic design considerations and provisions of seismic design codes are discussed.

## Text Book:

1. A. K. Chopra, (1995): Dynamics of Structures-Theory and Applications to Earthquake Engineering, Prentice Hall, New Jersey.
2. Seismic Analysis of Structures by T.K Datta
3. Design of Reinforced Concrete Structures, 9<sup>th</sup> Edition, Jack C McCormac

## Reference Book:

1. W. F. Chen and C. Scawthorn (2003), Earthquake Engineering Handbook
2. P. M. Shearer (1999), Introduction to Seismology
3. S. L. Kramer (1996), Geotechnical Earthquake Engineering
4. A. Coburn and R. Spence, (2002), Earthquake protection
5. B. Bolt, Earthquakes
6. C. H. Scholz, The Mechanics of Earthquakes and Faultings
7. H. Tiedemann, Earthquake and Volcanic Eruptions: A Handbook on Risk Assessment
8. W. Hays, B. Mohammandioun and J. Mohammadioun, Seismic Zonation
9. T. Pauley and M. J. N. Priestley, Seismic Design of Reinforced Concrete and Masonry Buildings

## Prerequisites :

Nil.

## ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15

Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

### **ASSESSMENT SYSTEM FOR LAB**

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

### **Teaching Plan**

<b>Week No</b>	<b>Topics/Learning Outcomes</b>
1	Introduction to Seismology and earthquake engineering
2-3	Seismic Hazard Analysis
4	Introduction to structural dynamics
5	Generalized SDOF system, rigid body assemblages, lumped mass system: shear building
6	Equation of motion for SDOF Lumped mass system
7-9	Response of SDF system to harmonic, periodic and general dynamic loadings Direct integration solution of SDF systems using time-stepping methods
9	<b>Mid Semester Exam</b>
10-11	Equation of motion for MDOF Lumped mass system, Calculation of eigen values and eigen vectors, shear building and solution of various examples
12	Equivalent static lateral force procedure and Calculation of base shear for given building frame system, response spectrum and time history analysis
13	Seismic analysis of reinforced concrete structures according to provisions of UBC/IBC.
14	General seismic design considerations: common mistakes in practice, regularity, lateral force resisting mechanisms and ductility
15	Use of FEM software (SAP2000) for earthquake design of structures
16-17	Project seismic design of a multi-storey building (a software based project)
18	End Semester Exam

**Practical:** Nil.