

Soil Dynamics & Earthquake engineering
01GT0202 (PC)

Objective of the Course: Objectives of introducing this subject at first year level in Masters of civil engineering are:

1. Impart the knowledge of earthquake and related terminologies
2. Educate student with the properties and response of soil as a material subjected to the dynamic loading.

Credits Earned: 5

Students learning outcomes:

After the successful completion of the course student will be able to..

1. Understand the earthquake occurrence and damages possible
2. Analyse the potential of soil for liquefaction
3. Apply the mitigation techniques against liquefiable soil
4. Apply the knowledge of soil dynamic properties to stabilise the slopes

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
4	0	2	5	50	20	30	25	25	150

Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	Seismology & Earthquake engineering	
	Introduction to seismology definition of earthquake, types , introduction to earthquake engineering	2
	Plate tectonic and elastic rebound theories,	2
	Measurement of earthquake Magnitude intensity, seismic zones of india	1
	Strong Ground Motion.: Measurement, characterization and estimation	2
	Amplification theory and ground response analysis.	1
2	Liquefaction of soils	
	Definition, Assessment of liquefaction susceptibility	3
	Evaluation of liquefaction potential	2
	Principles & methods of liquefaction mitigation.	2
3	Vibrations of SDOF system	
	Nature of dynamics loads	1
	free vibrations and forced vibrations of spring mass systems	3
	Damping and its effect, equation of motion for free and forced vibrations, solution and graphical representation	3
	Resonance and its effects	2
4	Soil dynamic properties & stress	
	Deformation and strength of soils	3
	dynamic bearing capacity and earth pressure	3
	Effect of transient and pulsating loads -	2
	resonant column apparatus -cyclic shear test -typical values of soil constants soil damping, shear wave velocity etc.	3
5	Seismic stability of the slopes	
	Seismic slope stability analysis various methods	3
	Codal provisions	3
	Case Studies	3

Suggested lists of experiments

- Demonstration of finding out soil dynamic properties by ..
1. Block vibration test
 2. Cyclic soil shear test
 3. Resonant column method
- Demonstration related to Dynamics
4. Free and forced vibration
 5. Effect of damping on vibration

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	25%	10%	35%	20%	00%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:**Reference Books:**

1. Das B M, "Fundamental of Soil Dynamics", Elsevier Scientific Publishing Co., NewYork,1983
2. Shamsheer Prakash, "Soil Dynamics", McGraw-Hill Book Company.
3. Steven L. Kramer, "Geotechnical Earthquake Engineering", Prentice Hall Inc.
4. Winpgel R. (Coordinating Editor) Earthquake Engineering, Prantice Hall, 1970
5. Richter S. F., Elementary Seismology, Freeman, 1958.
6. Vibrations of soils and Foundations - Richart, Hall and Woods, Practice-Hall, New Jercey.

Web resources:

1. <http://nptel.ac.in/courses/105101005/>
2. <http://nptel.ac.in/courses/105101004/>
3. <http://nptel.ac.in/courses/105101134/>
