Course Name:
Geotechnical Earthquake Engineering

Course Number:
20440

Credit:
3

Course Content (outline):

1. Introduction to Geotechnical Earthquake Engineering
   1.1 Introduction
   1.2 Background
   1.3 Seismic Hazards
   1.4 Mitigation of Seismic Hazards
   1.5 Significant Historical Earthquakes

2. Seismology and Earthquakes
   2.1 Introduction
   2.2 Internal Structure of the Earth
   2.3 Continental Drift and Plate Tectonics
   2.4 Faults
   2.5 Elastic Rebound Theory
   2.6 Other Sources of Seismic Activity
   2.7 Geometric Notation
   2.8 Location of Earthquakes
   2.9 Size of Earthquake

3. Strong Ground Motion
   3.1 Introduction
   3.2 Strong-Motion Measurement
   3.3 Ground Motion Parameters
   3.4 Estimation of Ground Motion Parameters
   3.5 Spatial Variability of Ground Motions

4. Seismic Hazard Analysis
   4.1 Introduction
4.2 Identification and Evaluation of Earthquake Sources
4.3 Deterministic Seismic Hazard Analysis
4.4 Probabilistic Seismic Hazard Analysis

5. Wave Propagation
5.1 Introduction
5.2 Waves in Unbounded Media
5.3 Waves in a Semi-infinite Body
5.4 Waves in a Layered body
5.5 Attenuation of Stress Waves

6. Dynamic Soil Properties
6.1 Introduction
6.2 Representation of Stress Conditions by the Mohr Circle
6.3 Measurement of Dynamic Soil Properties
6.4 Stress-Strain Behavior of Cyclically Loaded Soils
6.5 Strength of Cyclically Loaded Soils

7. Ground Response Analysis
7.1 Introduction
7.2 One-Dimensional Ground Response Analysis
7.3 Two-Dimensional Ground Response Analysis
7.4 Three-Dimensional Ground Response Analysis
7.5 Soil-Structure Interaction

8. Local Site Effects and Design Ground Motions
8.1 Introduction
8.2 Effects of Local Site Conditions on Ground Motion
8.3 Design Parameters
8.4 Development of Design Parameters
8.5 Development of Ground Motion Time Histories
9. **Liquefaction**
   9.1 Introduction
   9.2 Liquefaction-Related Phenomena
   9.3 Evaluation of Liquefaction Hazards
   9.4 Liquefaction Susceptibility
   9.5 Initiation of Liquefaction
   9.6 Effects of Liquefaction

10. **Seismic Slope Stability**
    10.1 Introduction
    10.2 Types of Earthquake-Induced Landslides
    10.3 Earthquake-Induced Landslide Activity
    10.4 Evaluation of Slope Stability
    10.5 Static Slope Stability Analysis
    10.6 Seismic Slope Stability Analysis

11. **Seismic Design of Retaining Walls**
    11.1 Introduction
    11.2 Types of Retaining Walls
    11.3 Types of Retaining Wall Failures
    11.4 Static Pressures on Retaining Walls
    11.5 Dynamic Response of Retaining Walls
    11.6 Seismic Pressures on Retaining Walls
    11.7 Seismic Displacements of Retaining Walls
    11.8 Seismic Design Considerations

12. **Soil Improvement for Remediation of Seismic Hazards**
    12.1 Introduction
    12.2 Densification Techniques
12.3 Reinforcement Techniques
12.4 Grouting and Mixing Techniques
12.5 Drainage Techniques
12.6 Verification of Soil Improvement
12.7 Other Considerations

References:
Many other papers are assigned for further readings