PURDUE UNIVERSITY FORT WAYNE | Department of Electrical and Computer Engineering

Course	CE 43400 – Geotechnical Engineering Design
Type of Course	Technical Elective for Civil Engineering Program
Catalog Description	Slope stability analyses and stabilization measures, filtration, drainage and erosion control design, analysis and design of sheet pile, soil nail and mechanically stabilized earth retaining walls, , geosynthetics design, and geotechnical earthquake design
Credits	3
Contact Hours	3
Prerequisite Courses	CE 380 and CE 381
Prerequisites by Topics	Soil Mechanics and Soil Mechanics Laboratory
Textbook	Geotechnical Engineering Design by Ming Xiao (ISBN: 9780470632239); Publisher: John Wiley & Sons, Ltd
Course Objectives	To provide students exposure to the modern and practical sides of soil mechanics and geotechnical engineering. The contents of this course will groom students in analyzing and handling design problems in applied geotechnics.
Course Outcomes	Students who successfully complete this course will be able to: 1. Work efficiently in problem-solving teams. [5] 2. Analyze the stability of natural and manmade slopes using multiple analyses methods under static and dynamic conditions. [1, 2, 6] 3. Perform rapid drawdown analysis. [1, 2, 6] 4. Perform slope stability analysis using finite element methods [1, 2, 6] 5. Plan and design slope stabilization measures. [1, 2, 6] 6. Understand filtration methods and design for free water passage to protect drains from clogging in CE applications. [1, 2, 6] 7. Analyze the need for dewatering and design drainage system for CE applications. [1, 2, 6] 8. Evaluate surface and subsurface erosion potential and design control measures. [1, 2, 6] 9. Design modern soil retaining structures. [1, 2, 6] 10. Understand the functions of various geosynthetics in CE applications. [1, 6]

11. Understand basic seismology and earthquake characteristics. [7]
12. Evaluate dynamic earth pressures. [1, 6]
13. Perform pseudo-static analysis of seismic slope stability. [1, 6]
14. Understand liquefaction process and perform basic liquefaction analysis [1, 6].

Lecture Topics

1. Overview of slope stability analyses
2. Slope stability analyses – infinite slope methods
3. Slope stability analyses – Culmann's method for planar failure surfaces
4. Slope stability analyses – curved failure surfaces
5. Slope stability analyses – method of slices
6. Slope stability analyses – consideration of pore water pressure
7. Morgenstern charts for rapid drawdown analysis
8. Slope stability analyses – finite element methods
9. Slope stabilization measures
10. Saturated flow in porous media
11. Filtration methods and design
12. Surface erosion and control measures
13. Seepage erosion and control measures
14. Lateral earth pressure theory (Coulomb's theory)
15. Sheet pile wall design
16. Soil nail wall design
17. Geosynthetic types and characteristics
18. Design of mechanically stabilized earth wall with geosynthetics
19. Seismology and earthquake terminology and characteristics
20. Dynamic (active and passive) earth pressures
21. Pseudo-static analyses of seismic slope stability
22. Evaluations of liquefaction hazard

Computer Usage High

Lab/Field Experience Low

Design Experience High

Coordinator Fawad Niazi, Ph.D.

Date _____ 2023