

THE UNIVERSITY OF TOLEDO
CIVE 4/5210 Advanced Soil Mechanics
Fall Semester, 2007
MW 4:10 - 5:25, PL 3040

Instructor: Dr. Andrew Heydinger

Office Hours: MW 3:00 - 4:00; other times as needed or by appointment

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Course Objectives:

An advanced course covering topics from classical soil mechanics: soil characteristics; soil stress distributions; deformation; consolidation; shear strength and soil behavior that are required for geotechnical analysis. Methods of analysis will be developed using fundamental mathematics and mechanics principles. The use of computer programs with numerical methods for analysis will be introduced. Laboratory tests will be conducted. At the conclusion of this course, students will thoroughly understand stress, strain and strength principles as they relate to soils and geotechnical analysis.

<u>Lectures</u>	<u>Topic</u>	<u>Readings</u>
3	Introduction; Soil Characteristics	Chapter 1, 2
5	Soil Stress, Mohr's Circle Analysis, Subsurface stress, Immediate Settlement, Stress Invariants, Stress Paths	Chapter 3 Spreadsheet
6	Consolidation Theory for Settlement and Settlement Rate, Solutions for Primary Consolidation, Secondary Consolidation, Consolidation Test	Chapter 4 Test Description Spreadsheet
2	Permeability Testing	
6	Shear Strength Testing, Soil Shear Strength, Factors Effecting Shear Strength, Modeling Shear Strength	Chapter 5
6	Critical State Soil Mechanics, Yielding of Soil, Critical State Models	Chapter 6

Text: The text assigned for this course is SOIL MECHANICS & FOUNDATIONS by Muni Budhu.

Course Grade:	Homework Assignments & Labs	35%
	Midterm Exam	30%
	Final Exam	35%

Homework:

Problems will be assigned from the text or passed out during lecture periods. They will usually be due the following week. Computer solutions will be incorporated into the homework assignments wherever possible. Late assignments will not be accepted without a valid excuse.

Laboratory:

The laboratory testing will likely include consolidation, triaxial compression, permeability, and direct shear tests. Some of the tests (consolidation, permeability) will be conducted as a class. Other tests will be conducted in groups (triaxial compression, direct shear) with each group consisting of at least one graduate and one undergraduate student. The graduate student will be the group leader. A short report will be due with each lab result.

Final Exam: Wednesday, December 12, 2007, 5:00 - 7:00 p.m.

Lectures

2

5

6

2

1

2

1

1

2

6

Topics

Introduction, Soil Characteristics

Effective Stress Concept, Elasticity,

Elasticity Solutions, Stress Paths

Derivation, Solution for 1-D Consolidation

Numerical Solution, Consolidation Testing

Permeability Testing, Back Pressure Saturation

Shear Strength Testing

Shear Strength Parameters, τ at Failure,

SHANSEP

Midterm Exam

SHANSEP

Hyperbolic Stress-Strain Curve,

Description of Finite Element Method

Concepts of Critical State Soil Mechanics,

Cam Clay Model

Assignments

Problems 3.2, 3.5, 3.7, 3.8, 3.10, 3.12, 3.14, 3.15, 3.18, 3.20, 3.22

Hook's Law for stress in terms of strain

Problem 5.1, 5.4, 5.9, 5.10, 5.12, 5.13, 5.15, 5.17

Problem 6.5, 6.8, 6.15, 6.18

Elasticity solutions:sz/p(10);Buildings(20);Tank(20)

Consolidation handout

Elastic solution for tank, SIGMAW

Hyperbolic model