CIVE 455 – APPLICATIONS IN GEOTECHNICAL ENGINEERING

Date Distributed: January 17, 2018
Semester: Spring 2018
Credits: 3
Prerequisite: CIVE 355 – *Introduction to Geotechnical Engineering* or equivalent
CRN: 20642
Lecture Time: MWF: 1:00-1:50 PM
Lecture Location: B 105, Engineering Building
Instructor: Professor C.D. Shackelford, Department Head
Instructor's Office: A203D Engineering Building **(**CEE Dept. Head Office)
Instructor's E-mail: shackel@engr.colostate.edu
Office Hours: TR: 1:00-1:50 pm, or by appointment

Course Description

The purpose of this course is to introduce students to various applications in geotechnical engineering, including earth retaining structures, shallow and deep foundations, slope stability and embankments, and waste containment systems. The course is offered primarily as a technical elective to upper division undergraduate students who have already completed the required introductory geotechnical course, viz., CIVE 355 – *Introduction to Geotechnical Engineering*, and represents a transition between the introductory and fundamental nature of the material covered in CIVE 355 and the more detailed and applied subject material contained in the various 500-level courses that are currently offered in each of the application areas covered in this course (viz. CIVE 550 – *Foundation Engineering*, CIVE 553 – *Slope Stability and Retaining Structures*, CIVE 556 – Slope Stability, *Seepage*, *and Earth Dams*, and CIVE 558 – *Containment Systems for Waste Disposal*). The course also may be beneficial to graduate students who may not have an opportunity to take one or more of the associated 500-level courses, but who still desire to obtain a broad-based knowledge of the applications typically inherent in the practice of geotechnical engineering.

Course Objectives

Upon successful completion of this course, the student will have an understanding of the types of problems that geotechnical engineers routinely encounter in practice and the basic information and technical background to address these problems.

Textbook

There is no textbook for this course, primarily because there is no single textbook that covers all of the topics to be covered in the course. There are several textbooks that cover a significant percentage of the topics, but these textbooks generally provide far more depth than can be covered in a single semester course, such that students would end up paying an exorbitant price for a textbook of which they would use only a fraction. As a result, a textbook is not assigned for this course.

Instructional Methodology

The class will meet as a single group three days a week for lecture.

Mode of Delivery

Most of the course material will be transmitted to students through lectures, in handouts provided during the lectures, and through outside reading. Since there is no formal textbook for this course, students are advised to take good lecture notes to ensure they have the proper background necessary to do well on the exams.

Tentative Course Topics/Weekly Schedule

Week	Tentative Topics for Weekly Lectures
1	Review of Basic Soil Mechanics-I: (a) introduction; (b) physical and mechanical properties of soils; (c) stresses in soil
2	Review of Basic Soil Mechanics-II: (a) Darcy's law and seepage; (b) compressibility & consolidation; (c) shear strength
3	Earth Retaining Structures-I: (a) lateral earth pressures; (b) gravity retaining walls, (c) mechanically stabilized retaining walls
4	Earth Retaining Structures-II: (a) braced excavations; (b) sheet-pile walls; (c) cofferdams
5	Earth Retaining Structures-II (cont'd): (a) braced excavations; (b) sheet-pile walls; (c) cofferdams
6	Shallow Foundations: (a) bearing capacity theory; (b) footings; (c) various loading conditions **(1st Exam Covering Weeks 1-5)**
7	Shallow Foundations (cont'd): (a) bearing capacity theory; (b) footings; (c) various loading conditions
8	Deep Foundations: (a) types of deep foundations; (b) piles; (c) drilled piers
9	Deep Foundations (cont'd): (a) types of deep foundations; (b) piles; (c) drilled piers
10	Slope Stability: (a) methods of stability analyses; (b) simplified analytical approaches; (c) analyses using stability charts
11	Slope Stability (cont'd): (a) methods of stability analyses; (b) simplified analytical approaches; (c) analyses using stability charts **(2nd Exam Covering Weeks 6-10)**
12	Earth Dams and Embankments: (a) types of earthen dams and embankments; (b) design considerations; (c) seepage
13	Earth Dams and Embankments (cont'd): (a) types of earthen dams and embankments; (b) design considerations; (c) seepage
14	Geosynthetics: (a) types and basic properties of geosynthetics; (b) uses and applications
15	Other Topics: (a) waste containment systems; (b) vertical cutoff walls
16	**3rd Exam Covering Weeks 11-15; Tuesday, May 8, 4:10 - 6:10 pm**

Methods of Evaluation

The grade for the course will be based on two components: (1) homework and (2) three exams.

In terms of homework, assignments will be given periodically throughout the semester to enhance the concepts presented in class (typically 7-10 assignments over the 15-week semester). Assignments will be collected and graded. Completed assignments will be due at the beginning of class on the assigned due date (late homework will neither be collected nor graded). Usually, the due date for homework assignments will be one week after the distribution date.

In terms of exams, three equally weighted exams, each covering approximately one-third of the material covered in the class, will be given. The grade distribution will be as follows.

Homework	10 %
1st Exam	30 %
2nd Exam	30 %
3rd Exam	30 %
Total	100 %

I will use straight average (except for exams in cases where class average is too low), and the +/- grading system as follows:

Straight Scale Grading
96.7 % ≤ A^+ ≤ 100 %
93.3 % ≤ A < 96.7 %
90.0 % ≤ A^- < 93.3 %
86.7 % ≤ B^+ < 90.0 %
83.3 %≤ B < 86.7 %
80.0 % ≤ B^- < 83.3 %
76.7 % ≤ C^+ < 80.0 %
70.0 % ≤ C < 76.7 %
60.0 % ≤ D < 70.0 %
F < 60.0 %

Exams

Exams are closed book, closed notes. Exams will be 50 % quantitative (i.e., worked problems) and 50 % qualitative in the form of multiple choice questions.

Academic Integrity Policy

The University has adopted a new (Fall 2011) Academic Integrity Policy and faculty members are responsible for the following items:

1) "*Each course instructor shall state in his or her course syllabus that the course will adhere to the Academic Integrity Policy of the Colorado State University General Catalog (Page 7) and the Student Conduct Code*."

2) "*By the end of the second week of the course and/or in the course syllabus, the course instructor shall address academic integrity as it applies to his or her course components, such as homework, written assignments, lab work, group projects, quizzes, and exams. Examples of items to address include, but are not limited to, the use of class notes, study sheets, and solution manuals; appropriate uses of sources, Internet or otherwise; receiving assistance from others; and the use of prior work*."

Historical Class Grades

Student No.	Year								
	2008	**2009**	**2010**	**2011**	**2013**	**2014**	**2015**	**2016**	**2017**
1	A^+	A	A	A	A	A	A^+	A^-	A
2	A^-	A	B^+	B^+	A^-	A	A	A^-	A^-
3	A^-	A^-	B	B^+	B^+	A^-	A^-	A^-	A^-
4	B	A^-	B	B^+	B^+	B^+	A^-	A^-	A^-
5	B^-	B^+		B^+	B^+	B^+	A^-	B^+	B^+
6	B^-	B^+		B^-	B^+	B	A^-	B	B^+
7		B^-		C^+	B^+	B	B^+	C^+	B^+
8		C		C	C	B^-	B^+	C	B^+
9				C	D	C^+	B	C	B^+
10					D	C^+	C	C	B
11						C^+	C	D	B
12						C	D		B
13							D		B
14							F*		B
15									B^-
16									B^-
17									B^-
18									C^+
19									C^+
20									C
Class Average	B^+	B^+	B^+	B^-	B^-	B	B^-	B^-	B

*Did not take final exam