CE 597B
Experimental Methods in Geotechnical and Materials Engineering

The Pennsylvania State University
Department of Civil and Environmental Engineering
Fall 2013

Hours

Lecture/Lab	TTh	8:00-9:15am	HAMMOND 2A

Instructors

Prof. Tong Qiu
Office: Sackett 226A
Phone: 814-863-7305
Email: tqiu@engr.psu.edu
Office Hours: T 1 - 3pm or by appointment

Prof. Farshad Rajabipour
Office: Sackett 223B (231M)
Phone: 814-863-0601
Email: farshad@psu.edu
Office Hours: T 11-1pm

Textbooks and Other References

There is no single textbook for this course. Reading assignments will be posted on ANGEL. Other references will be included in the handouts and will be available through PSU libraries.

Course Objectives

The goal of this graduate course is to familiarize students with advanced experimental and characterization techniques commonly used in geotechnical and materials engineering. A list of methods covered in this course is provided on the last page of this handout. The students will learn and practice these techniques through interactive classroom discussions, laboratory demonstrations and hands on experiments, homework assignments, and a project.

Prerequisites

Graduate standing in geotechnical or materials engineering; or the instructors' consent

Attendance

This course includes lectures that discuss theories and backgrounds of various experimental techniques, and lab assignments and exercises that are hands on. You are REQUIRED to attend all lectures to broaden your general knowledge in experimental methods. However, you can choose to skip up to two lab assignments (homework or lab report) that are of less relevance to your research. For example, a geotechnical student is required to complete all lab assignments in geotechnical area but can choose to miss up to two lab assignments in the materials area. Similarly, a materials student is required to complete all lab assignments in

the materials area but can choose to miss up to two lab assignments in the geotechnical area. Class attendance will be checked at the BEGINNING of class.

Exception: If you are experiencing flu-like symptoms, please do not attend class to safeguard the health of your classmates. No doctor's note is required; however, you are asked to inform one or both instructors by email or telephone no later than 9:30am on the day of the class. If there is homework due on the day of your absence, you are still required to submit the homework by email or through a classmate. If you miss a quiz due to your absence, you will be given a chance to take the quiz at a later date.

Grading

Homework/Lab Reports	30%
Project Report/Presentation	40%
Quizzes and Exams	20%
Attendance and Participation	10%

Grade Distribution: A: (20%), A- (40%), B+ (20%), Discretionary (20%, A – F)

Quizzes and Exams

Short five to ten minutes quizzes will be given at the beginning or during lectures. One exam (take home) will be given towards the end of semester.

Homework and lab reports (30%)

Homework and lab reports are due at the beginning of each class (e.g., 8am on the due date). No late submissions will be accepted; however, in extreme circumstances, the instructors may consider a late submission and assign a penalty for not meeting the due date/time.

All homework and lab reports should be submitted in a format that is consistent with professional engineering practice. Solutions must be prepared using word processing software (e.g., Microsoft Word). Graphs should be prepared using Excel, Grapher, SigmaPlot, or similar software. No hand-drawn graph will be accepted. You can use both side of paper to prepare homework solutions; however, each sheet/side of paper must not include more than one problem. All the sheets should contain your name and assignment number. All pages must be stapled together.

Students are expected, even encouraged, to consult with one another on homework assignments/lab reports. However, all work submitted by the student is expected to be his/her own effort. If there is a reason to believe that work has been copied from another student, university regulations may be invoked regarding punitive action. Furthermore, the instructor reserves the right to assign a failing grade for either the specific work or for the entire course.

Course Project (40%)

Among all the laboratory techniques covered in this course, please identify one that interests you the most. Although it can be, the technique does not necessarily have to be the one you are currently using for your research. Please read a minimum of three journal articles that are based on this technique. Preferably these papers are closely related to one topic/theme and span over a minimum of two decades (20 years). After you have read these papers in detail, please do the following:

(I) Write a five-page report (letter size, double spacing, 12 font size). In this report, you should summarize the papers you have read, but more importantly, comment on the

development of the technique and knowledge in the topic area with time, and critique the paper(s) if applicable. (10%)

(II) Conduct a mini-experimental investigation. In this investigation, you should utilize the technique and conduct several experiments to examine one or more conclusions from these papers. Your experiments may produce results that agree or disagree with the conclusion(s). Please write a lab report (5 to 10 pages) about your experimental investigation. In this lab report, please include (1) the objective of your experimental investigation (i.e., the conclusion(s) you are trying to examine), (2) your laboratory results, (3) comments on your results, and (4) references. (10%)

(III) Make a 15-minute presentation about your course project. Your presentation should cover the papers you read and your experimental investigation. Following your presentation, there will be five minutes for questions and answers. (20%)

Important Dates:
November 12th: Citations of the papers you will use for your course project and a draft plan (up to 300 words) of your experimental investigation are due. In this plan, you should clearly identify the conclusion(s) you are trying to examine and your proposed testing. By then, you should have read the papers in detail. Comments and suggestions will be provided. Therefore, you are encouraged to submit the citations and draft plan early.

December 10th and 12th: Presentations.

December 17th: Final project report due (i.e., Items I and II).

Academic Integrity

Students are expected to uphold the highest academic integrity. Any deviation will result in disciplinary measures consistent with University policies, including a grade of zero points for that assignment and potentially a failing grade in the class. Please consult the university and College of Engineering policies at http://www.engr.psu.edu/CurrentStudents/acadinteg.aspx

Disability

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Office for Disability Services (ODS) Web site provides contact information for every Penn State campus: http://equity.psu.edu/ods/dcl. For further information, please visit the Office for Disability Services Web site: http://equity.psu.edu/ods.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: http://equity.psu.edu/ods/doc-guidelines. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.

Tentative Schedule

	Date	Lecture Number	Day	Lecture Title
Week 1:	8/27/13	1	T	Introduction - Materials
	8/29/13	2	Th	SEM/EDS
Week 2:	9/3/13	3	T	Introduction - Geotechnical
	9/5/13	4	Th	Compaction: theory
Week 3:	9/10/13	5	T	X-ray Methods
	9/12/13	6	Th	SEM/EDS and XRD Labs
Week 4:	9/17/13	7	T	Compaction: theory
	9/19/13	8	Th	SHPB test: theory and lab demo
Week 5:	9/24/13	9	T	CT Lab
	9/26/13	10	Th	Pore size distribution (MIP)
Week 6:	10/1/13	11	T	Resonant column test: theory
	10/3/13	12	Th	Resonant column test: lab demo
Week 7:	10/8/13	13	T	Gas adsorption
	10/10/13	14	Th	Laser diffraction, BET, TGA labs
Week 8:	10/15/13	15	M	Drying and shrinkage
	10/17/13	16	W	Shrinkage lab
Week 9:	10/22/13	17	T	Consolidation: theory and lab
	10/24/13	18	Th	Consolidation: lab (continued)
Week 10:	10/29/13	19	T	Direct shear: theory and lab
	10/31/13	20	Th	Direct shear: lab (continued)
Week 11:	11/5/13	21	T	Basic chemistry
	11/7/13	22	Th	Chemical thermodynamics
Week 12:	11/12/13	23	T	Triaxial test: theory and lab
	11/14/13	24	Th	Triaxial test: lab (continued)
Week 13:	11/19/13	25	T	Chemical analysis lab
	11/21/13	26	Th	Exam
Week 14:	11/26/13		T	Thanksgiving Break
	11/28/13		Th	Thanksgiving Break
Week 15:	12/3/13	27	T	Soil erosion test: theory and lab
	12/5/13	28	Th	Soil erosion test: lab (continued)
Week 16:	12/10/13	29	T	Project Presentations
	12/12/13	30	Th	Project Presentations
Week 17:	12/17/13		T	Project Report Due