

**CE445/545: GEOENVIRONMENTAL ENGINEERING
SPRING 2017**

Instructor:	Dr. Lianyang Zhang, CE Building/Room 200A Phone: 626-0532; E-mail: lyzhang@email.arizona.edu
Time and Room:	TuTh 9:30-10:45 AM; Civil Engineering Rm 201
Office Hours:	TuTh 4:45-6:00 PM or By Appointment

Catalog Description: (3 units) Waste generation and disposal regulations; types and characterization of wastes, engineering properties of soil-water-contaminants; use of earth and geosynthetic materials in waste containment applications; evaluation, design and construction of liner and leachate collection systems used in landfills and heap leach mining; remediation of contaminated sites.

Course Objectives: Design through analysis of landfills for waste containment and remediation of contaminated sites.

ABET outcomes

Primary

- C. Ability to design a system, component, or process to meet desired needs
- E. Ability to identify, formulate, and solve engineering problems
- K. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
- M. Be proficient in the major areas of civil engineering

Secondary

- A. Apply mathematics, science and engineering principles
- D. Ability to function on multidisciplinary teams
- I. Recognition of the need for and an ability to engage in life-long learning
- J. Knowledge of contemporary issues

Prerequisite(s)

CE343 Geotechnical Engineering and Design
or permission of the instructor. If the instructor has waived the prerequisite(s), you still take full responsibility for your performance in this course.

Grading Criteria

ACTIVITIES	PERCENTAGES
Attendance, Participation & Quizzes	10%
Homework	20%
Mid-Term Exam	20%
Term Paper	20%
Final Exam	30%

Attendance, Participation & Quizzes (10%)

Attendance will be randomly recorded by giving mini quizzes in class. If you miss a class when a quiz is given, you will lose the corresponding points for both the attendance and the quiz. Your participation in the class will be recorded based on answering oral questions in the class (right or wrong, does not matter) and participating in all class discussions. ***If you need to be absent from the class for justifiable reasons (sickness, family obligations, etc.), you must inform the instructor in advance (usually at least one week).***

Homework (20%)

If not specified, home work will be due a week after it is handed out. Homework must be turned in at the beginning of the class in the classroom on the due date. Late turned in homeworks will receive a zero grade. Students are expected to turn in neat and organized homework on engineering problem sheets using only one side of the sheet. Any homework which is sloppy, difficult to read, or difficult to understand will receive a reduced grade.

Mid-Term Exam (20%)

One exam will be given in the middle of the semester. The exam will be held at the same location as the class. It will be open book and open notes.

Term Paper (20%)

You can pick any topic related to waste disposal/containment or contaminant remediation and write a term paper. Your topic needs to be approved by the instructor by first submitting a one-page brief description of it. If you do not have a topic in mind, I will give you possible topics for your paper. You will need to type your paper (double-spaced, left and right justified, 1” margins on all sides). Total single-sided pages in the paper including tables and figures shall not exceed 15.

Final Exam (30%)

A final exam worth 30% of the total grade will be given at the end of the semester on the date/time listed in UA Calendar. The final exam will cover the entire syllabus (comprehensive) and be open book and open notes.

Grading Scale

Total Score	Grade Point	Total Score	Grade Point
≥ 90	A	≥ 60 to < 70	D
≥ 80 to < 90	B	< 60	E
≥ 70 to < 80	C		

- Notes:
1. If the class average is above 80, grades will be based on the “traditional” scale presented in the above table. If the class average is below 80, I may translate the grading scheme by statistical curving to reflect the true class average.
 2. The instructor will make the borderline decisions based on the student’s motivation, attendance, participation in the class, and quality of work.

Textbook

No textbook is required for this class. However, the following are two good reference books:

- Sharma, H.D., and Reddy, K.R., *Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies*, John Wiley & Sons Inc., 2004.
➔ A comprehensive reference on different topics
- Qian, X., R. M. Koerner, and D. H. Gray. *Geotechnical Aspects of Landfill Design and Construction*. New Jersey: Prentice Hall Inc., Upper Saddle River, 2002.
➔ A good technical reference on landfills

Academic Integrity

Principle Integrity and ethical behavior are expected of every student in all academic work. This Academic Integrity principle stands for honesty in all class work, and ethical conduct in all labs and clinical assignments. This principle is furthered by the student Code of Conduct and disciplinary procedures established by ABOR Policies 5-308 through 5-404, all provisions of which apply to all University of Arizona students.

This Code of Academic Integrity (hereinafter "this Code") is intended to fulfill the requirement imposed by ABOR Policy 5-403.A.4 and otherwise to supplement the Student Code of Conduct as permitted by ABOR Policy 5-308.C.1.

Failure to follow the code of academic integrity will result in failing the course and be reported to the Dean of Students' office.

Prohibited Conduct: Conduct prohibited by this Code consists of all forms of academic dishonesty, including, but not limited to:

- 1 Cheating, fabrication, facilitating academic dishonesty, and plagiarism as set out and defined in the Student Code of Conduct, ABOR Policy 5-308-E.6, E.10, and F.1
- 2 Submitting an item of academic work that has previously been submitted without fair citation of the original work or authorization by the faculty member supervising the work.
- 3 Violating required professional ethics rules contained or referenced in the student handbooks (hardcopy or online) of undergraduate or graduate programs, or professional colleges.
- 4 Violating health, safety or ethical requirements to gain any unfair advantage in lab(s) or clinical assignments.
- 5 Failing to observe rules of academic integrity established by a faculty member for a particular course.
- 6 Attempting to commit an act prohibited by this Code. Any attempt to commit an act prohibited by these rules shall be subject to sanctions to the same extent as completed acts.

Student Responsibility

Students engaging in academic dishonesty diminish their education and bring discredit to the academic community. Students shall not violate the Code of Academic Integrity and shall avoid situations likely to compromise academic integrity. Students shall observe the generally applicable provisions of this Code whether or not faculty members establish special rules of academic integrity for particular classes. Students are not excused from complying with this Code because of faculty members' failure to prevent cheating.

CE445/545: GEOENVIRONMENTAL ENGINEERING
SPRING 2017 CLASS SCHEDULE
Instructor: Dr. Lianyang Zhang

Week	Class	Date	Topics	References	Remark
1	1	Thu Jan 12	Introduction		
2	2	Tue Jan 17	Environmental Regulations; Wastes and Waste Management	EPA (2006) ch. I & VI; ch. II & III	
	3	Thu Jan 19	Engineering Properties of Wastes	Qian et al. ch. 6	
3	4	Tue Jan 24	Contaminant Transport	Sharma/Reddy ch. 8	HW1
	5	Thu Jan 26	Landfill Regulations, Siting and Configurations	EPA (1994) Ch. 1 & 2	
4	6	Tue Jan 31	Site Investigation	NHI (2001)	
	7	Thu Feb 2	Compacted Clay Liner	Daniel/Koerner (1993) Ch. 2	
5	8	Tue Feb 7	Geotextile	Daniel/Koerner (1993) 6.2	HW2
	9	Thu Feb 9	Geomembrane	Daniel/Koerner (1993) ch. 3	
6	10	Tue Feb 14	Geosynthetic Clay Liner	EPA (2001); Daniel/Koerner (1993) ch. 4	
	11	Thu Feb 16	Drainage Layer	EPA (2004) 2.4; Daniel/Koerner (1993) ch. 5, 6.3	
7	12	Tue Feb 21	Landfill Hydrology	EPA (2004) ch.4	HW3
	13	Thu Feb 23	Leachate Collection and Removal System	EPA (1994) 3.4	
8	14	Tue Feb 28	Gas Collection and Control System	EPA (2004) ch. 5	
	15	Thu Mar 2	Final Cover System	DOE (2000); EPA (2004) ch. 2	
9	16	Tue Mar 7	Landfill Settlement	EPA (2004) ch. 6	HW4
	17	Thu Mar 9	MID TERM EXAM (Open Book and Open Notes)	-	
10	-	Tue Mar 14	Spring recess – No class	-	
	-	Thu Mar 17	Spring recess – No class	-	

11	18	Tue Mar 21	Landfill Stability	EPA (2004) ch. 6	HW5
	19	Thu Mar 23	Landfill Construction and Operation	EPA (1994) ch. 4	
12	20	Tue Mar 28	Landfill Monitoring, Maintenance and Site End use	EPA (1994) Ch. 5 EPA (2004) ch. 8 & 9	Term paper topic due
	21	Thu Mar 30	Contaminated Site Investigation and Risk Assessment	EPA (1991) ch. 2, 3 , 4, 6, and 9; EPA (1989)	
13	22	Tue Apr 4	Multi-Phase Flow	Huling/Weaver (1991); Newell et al. (1995)	HW6
	23	Thu Apr 6	Remedy Selection	EPA (1997)	
14	24	Tue Apr 11	In-Situ Waster Barriers	Sharma/Reddy ch. 12	
	25	Thu Apr 13	Pump and Treatment	Cohen et al. (1997)	
15	26	Tue Apr 18	Soil Vapor Extraction, Soil Washing, Stabilization and Solidification	Sharma/Reddy ch. 13	HW7
	27	Thu Apr 20	Air Sparging, Permeable Reactive Barrier	Powell et al. (1998)	
16	28	Tue Apr 25	Bioremediation and Monitored Natural Attenuation	Sims et al. (1992); EPA (1999)	Term paper due
	29	Thu Apr 27	Miscellaneous Topics	EPA (2001a); EPA (2001b)	
17	30	Tue May 2	Final Review		
FINAL COMPRHENSIVE EXAM (Open Book and Open Notes): Tue May 9: 8:00-10:00 AM					