CE 280 – Principles of Environmental Engineering and Science
Fall 2009, MWF 9:10-10:00, 116 Farrall Agricultural Engineering Hall

Instructor: Assistant Professor Alison M. Cupples
A129 Engineering Research Complex
432-3370, cupplesa@msu.edu
Office hours: 10:15-11:15AM MWF, Engineering Building, Room 3550
Other times by appointment in A129 Engineering Research Complex

TAs: Ph. D. Student Alla Alpatova,
Ph. D. Student Fernanda Paes

Description: Physical, chemical and biological processes related to environmental science and engineering. Environmental systems analysis with application to air, water and soil. Analysis of environmental problems and development of engineering solutions.

Text: Introduction to Environmental Engineering and Science, Third Edition by G.M. Masters and W. P. Ela, Prentice-Hall, 2008.

Web Page: accessible via https://angel.msu.edu

Required: Non-programmable scientific calculator

Class Schedule: MWF 9:10-10:00, 116 Farrall Agricultural Engineering Hall

Other Important Dates: 9/28/2009 – end of tuition refund
10/21/2009 - last day to drop with no grade reported

Grading:

4 hourly exams @ 15%	60%
Homework (see below)	10%
Final Exam	30%

>90% = 4.0
84 – 90% = 3.5
78 – 84% = 3.0
72 – 78% = 2.5
66 – 72% = 2.0
60 – 66% = 1.5
50 – 60% = 1.0
<50% = 0.0

Tentative Syllabus:

Wk	DATE	Lec	TOPIC	READING	HW
1	2 Sept. (Wed.)	1	Administrative details and introduction	-	
	4 Sept. (Fri.)	2	Units of measurement	Ch. 1, p. 1-6	
	7 Sept. (Mon.)	-	*No class – Labor Day holiday*	Ch. 1, p. 6-21	
2	9 Sept. (Wed.)	3	Material and energy balances I	-	
	11 Sept. (Fri.)	4	Material and energy balances II	Ch. 1, p. 21-40	
	14 Sept. (Mon.)	5	Environmental chemistry I	Ch. 2, p. 47-56	**1**
3	**16 Sept. (Wed.)**	-	***Practice exam***		
	18 Sept. (Fri.)	6	Environmental chemistry II	Ch. 2, p. 57-81	
	21 Sept. (Mon.)	7	Environmental chemistry III	Ch. 2, p. 57-81	
4	**23 Sept. (Wed.)**	8	Environmental chemistry IV	Ch. 2, p. 57-81	**2**
	25 Sept. (Fri.)	9	Reaction Rates	-	
	28 Sept. (Mon.)	10	Mathematics of growth	Ch. 3, p.87-94, 102-104	
5	**30 Sept. (Wed.)**	-	Exam review	-	**3**
	2 Oct. (Fri.)	-	***Exam 1: Lectures 1-10, Homework 1, 2 & 3***	-	
	5 Oct. (Mon.)	11	Risk assessment I	Ch. 4, p. 127-165	
6	7 Oct. (Wed.)	12	Risk assessment II	Ch. 4, p. 127-165	
	9 Oct. (Fri.)	13	Risk assessment II	Ch. 4, p. 127-165	
	12 Oct. (Mon.)	14	Water resources and management	Ch. 5, p. 173-181	
7	**14 Oct. (Wed.)**	15	Surface water hydrology	-	**4**
	16 Oct. (Fri.)	16	Water pollutants & their sources I	Ch. 5, p. 181-199	
	19 Oct. (Mon.)	17	Water pollutants & their sources II	Ch. 5, p. 181-199	
8	21 Oct. (Wed.)	18	Water quality management in rivers I	Ch. 5, p. 199-219	
	23 Oct. (Fri.)	19	Water quality management in rivers II	Ch. 5, p. 199-219	**5**
	26 Oct. (Mon.)	-	Exam review	-	
9	**28 Oct. (Wed.)**	-	***Exam 2: Lectures 11-19, Homework 4 & 5***	-	
	30 Oct. (Fri.)	20	Ecosystems and nutrient cycles	-	
	2 Nov. (Mon.)	21	Water quality management in lakes	Ch. 5, p. 219-229	
10	4 Nov. (Wed.)	22	Groundwater hydrology and quality	Ch. 5, p. 229-245, 255-266	
	6 Nov. (Fri.)	23	Drinking water quality & health	Ch. 6, p. 281-289	
	9 Nov. (Mon.)	24	Water treatment	Ch. 6, p. 289-316	
11	**11 Nov. (Wed.)**	25	Wastewater treatment I	Ch. 6, p. 316-333	**6**
	13 Nov. (Fri.)	26	Wastewater treatment II	Ch. 6, p. 316-333	
	16 Nov. (Mon.)	-	Exam review	-	
12	**18 Nov. (Wed.)**	-	***Exam 3: Lectures 20-26, Homework 6***	-	
	20 Nov. (Fri.)	27	Hazardous waste legislation & treatment	Ch. 6, p. 333-358	
	23 Nov. (Mon.)	28	Air pollution I	Ch. 7, p. 367-400	
13	25 Nov. (Wed.)	29	Air pollution II	Ch. 7, p. 426-486	
	27 Nov. (Fri.)		*No class - Thanksgiving holiday*	-	
	30 Nov. (Mon.)	30	Air pollution III	Ch. 7, p. 426-486	
14	**2 Dec. (Wed.)**	31	Global atmospheric change I	Ch. 8, p. 574 -587	**7**
	4 Dec. (Fri.)	32	Global atmospheric change II	Ch. 8, p. 501-574	
	7 Dec. (Mon.)	33	Solid waste management & resource recovery	Ch. 9, p. 601-677	
15	**9 Dec. (Wed.)**	-	***Exam 4: Lectures 27-33, Homework 7 ,8***	-	**8**
	11 Dec. (Fri.)	-	Review for final exam, class evaluations	-	
	18 Dec. (Fri.)	-	*Final Exam: Comprehensive (7:45 – 9:45 AM)*	-	

Course Objectives:

1. Define and describe the primary environmental regulations, and discuss how regulations affect engineering practice.
2. Use material balances to determine the concentration of water contaminants.
3. Perform elementary chemical calculations involving concentration conversions.
4. Perform elementary chemical calculations involving stoichiometry.
5. Perform elementary chemical calculations involving zero- and first order kinetics.
6. Describe the four step process of risk assessment.
7. Describe the hydrological cycle.
8. Solve hydrologic storage problems.
9. Give examples of biological and chemical substances that cause water pollution.
10. Provide examples of the human health effects of pollutants.
11. Describe the biochemical oxygen demand (BOD) test.
12. Calculate BOD values.
13. Calculate dissolved oxygen concentrations in a river.
14. Describe eutrophication in lakes.
15. Describe the basic engineering approaches to drinking water treatment.
16. Describe the basic engineering approaches to wastewater treatment.
17. List the criteria air pollutants and their sources.
18. Describe the impact of criteria air pollutants on the environment.
19. Define the key characteristics of a hazardous waste and provide examples of hazardous waste treatment technologies.

How to do well in this course:

1. The class is designed to provide you with an overview of the field of environmental engineering and science. I want you to understand the context or "big picture" of the primary areas in which environmental engineers and scientists work. In addition, we will employ some commonly used engineering tools for addressing environmental problems. You should focus on first gaining a sound *conceptual understanding* of each area, and then on *relating* the tools presented to this understanding.
2. Try to relate what you are learning to the world around you. We all encounter environmental issues daily and the science behind much of what we observe can be understood with the material covered in this class.
3. Ask questions when you don't understand something.
4. The lectures are designed to complement the readings. You will gain the maximum benefit by completing the reading before coming to lecture and using the lecture to clarify your understanding.
5. Do the homework. The only way to learn how to solve problems is to attempt to solve them. Experience shows a high degree of correlation between effort on the homework and the final grade.
6. Make sure your work is professionally presented. Grading is based on the *understanding* you demonstrate and this can only be determined if your work is 1) neat, 2) logical, 3) complete and 4) clearly presented. Numerical answers alone are worth little credit. Extraneous solution material suggests a less-than-complete understanding and will generally lower your score.

Policies:

1. You are responsible for all material presented in class, in the assigned readings, and concepts contained in the homework problems.
2. Homework will not be rigorously graded. Problems will be assigned, assistance in solving them will be offered during office hours, papers will be collected on the due date, and solutions will be posted. Credit will be awarded for making a reasonable attempt at each assigned problem. Exam problems will be very similar, and in some cases identical, to the homework problems.
3. Exams will consist of two parts: short answer questions covering concepts, and numerical problems. A formula sheet will be provided and you can bring a non-programmable scientific calculator. Programmable calculators are not allowed. Laptop computers, cell phones, PDAs and other electronic devices must remain in a backpack, briefcase or book bag. Violations will result in a grade of 0.0 on the exam.
4. Make-up exams will only be permitted, at the discretion of the instructor, in the case of personal/family emergencies. Documentation must be provided.
5. If you feel an error has been made in grading your exam, you may submit an appeal **within one week** after a grade was awarded. You must send the instructor a professional memorandum describing the claimed error, explaining why your answer should be accepted with reference to the relevant sections of the text or exam solution. No regrades will be given without a written request. DO NOT make requests verbally, by email, on scraps of paper, or on the graded exam itself, as these will not be accepted.
6. Professionalism is expected in both your behavior and work products. Unprofessional work will be graded accordingly. Your respect for the instructor and one another is expected at all times. Cell phones must be turned off or set to silent mode during class, and their use will not be tolerated during class. Please refrain from entering or leaving class during the lecture. If you need to enter late or leave early, please notify the instructor before class. Students who consistently disrupt the class by participating in such activities as reading the newspaper, talking to those around them (except during cooperative learning exercises), using a cell phone, or sleeping during class will be asked to leave as these activities serve as a distraction to those around you.
7. Academic dishonesty will not be tolerated. Article 2.3.3 of the Academic Freedom Report states that "the student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." In addition, the College of Engineering adheres to the policies on academic honesty as specified in General Student Regulations 1.0, Protection of Scholarship and Grades, and in the all-University Policy on Integrity of Scholarship and Grades, which are included in Spartan Life; Student Handbook and Resource Guide. ***Students who represent the work of others as their own will receive a 0.0 for the course. In most cases, formal disciplinary action will also be initiated.***
8. According to University regulations, you have 30 days from the first day of the next semester to request a grade change. As such, you have until February 6, 2006 to request a grade change. Requests made after this date cannot be considered.
9. Students with disabilities should contact the Resource Center for People with Disabilities to develop reasonable accommodations. For an appointment with a counselor, call 353-9642 (voice) or 355-1293 (TTY).
10. Students with special needs related to religious observances should discuss these in advance with the instructor.