Syllabus – Introduction to Environmental Engineering – CEE 361 – Spring 2012

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Office Hours: By Appointment. Please contact Dr. Rittmann by e-mail or in class to arrange an appointment. Due to the security procedures in the Biodesign Institute, you must have an appointment and check in at the security desk (north entrance to Biodesign), where you must show a photo ID.

TA Office Hours: Tuesdays, 1:15 to 3PM at ECD110 (lab location)

Course Times: Lecture: Mondays & Fridays 11:50 am – 1:05 pm in PSA103
Lab/Recitation: Fridays 11:50 am – 2:30 pm in PSA103, except for selected wet-lab sessions that meet in ECD 110.

Course Content: This course introduces the most essential elements of environmental engineering to junior- and senior-level civil engineering students, although other students are welcome. The course provides a fundamental basis from which to understand and evaluate the environment and design engineered systems for environmental quality control. These systems include: drinking water and wastewater treatment, air pollution control, soil and aquifer pollution and remediation, and solid waste management. Critical evaluation of contemporary issues concerning our environment and the regulatory structure will be incorporated into the class in lecture and through the lab/recitation periods.

Consistent with ABET criteria, the department has set the following **course objectives:**

1) You will demonstrate a familiarity with the scope and purpose of environmental engineering
2) You will demonstrate a knowledge of water and air quality parameters and an understanding of the associated chemistry and biology
3) You will demonstrate the application of basic mass balances, reactor theory, and transport theory required to solve quantitative water and air quality problems and design environmental reactors
4) You will critically evaluate and discuss contemporary environmental contaminant issues that are of concern as an environmental engineer and as a citizen
5) You will work in teams and communicate (written and oral) information that applies knowledge gained in this course to environmental issues.

Text: One textbook is required for this course: G.M. Masters and W.P Ela, *Introduction to Environmental Engineering and Science*, 3rd ed., Prentice-Hall, Upper Saddle River, NJ, 2008. The book is available at the ASU bookstore. Here are some additional, fundamental references that are not required, but may help in this class and in your engineering careers:

Additional introductory text on environmental engineering: Mihelcic, J. R. and J. B. Zimmerman, *Environmental Engineering: Fundamentals, Sustainability, Design.* John Wiley & Sons, Inc., New York (2010).

Fundamental reference on writing: Strunk, W., Jr. and E.B. White, *The Elements of Style*, Latest edition, MacMillan Publishing Co., Inc., New York

Fundamental laboratory analysis reference for environmental engineers: *Standard Methods for the Examination of Water and Wastewater*. 20th Edition. American Public Health Association (1998). (A later edition is available.)

Fundamental reference for wastewater treatment: Metcalf and Eddy, Inc. *Wastewater Engineering: Treatment, Disposal, and Reuse*, Fourth Edition. McGraw-Hill, New York (2003).

Fundamental reference for drinking water treatment: James M. Montgomery Consultants. *Water Treatment Principles and Design*. Second Edition. John Wiley and Sons, New York. (2005)

Fundamental reference for groundwater remediation: Montgomery, J.H. (2000) *Groundwater Chemicals Desk Reference.* Third Edition, CRC Lewis Publishers, Boca Raton.

Fundamental reference for air quality engineering: Seinfeld, J.H., and Pandis, S.N. (1998) *Atmospheric Chemistry and Physics: from Air Pollution to Climate Change*. John Wiley and Sons, New York.

Course Information: The course syllabus, schedule, homework assignments, quiz solutions, and other supplemental material will be posted on the web page at http://my.asu.edu . You are responsible for the material posted on the web page and presented in lectures and lab/recitations. **In particular you must bring with you the materials in the course syllabus that are relevant to each day's lecture.** These materials include key graphics, example problems, and example quizzes.

Workload: Reading assignments, homework, and quizzes occur each week. One midterm and one final exam are used as evaluation tools.

Reading Assignments. Reading assignments from the textbook are assigned for each class. You are responsible for reading this material **BEFORE** class of the specified due date. You are wise to review this material **again** **after** the lecture.

Homework Assignments. Weekly problem sets are due each Wednesday, beginning January 18. Completing these assignments comprises an important portion of this class and will be required preparation for the quizzes and tests. Weekly assignments will be posted on the course web page, and solutions also will be made available on the web page. Homework is due at the end of class on the due date. No late homework will be accepted without prior approval. Graded homework will be returned in class on the Monday following the Wednesday it is turned in.

I would like your homework solutions to follow a specific format. For full credit on your homework, please follow this format.

1. State the **objective** of the problem in your own words. For example, *"The objective of problem #2 is to determine the total mass (in kg) of carbon dioxide emitted from my Hummer during my 19 mile commute to work each day."*
2. Identify the physical setting of the problem using a well labeled figure of the system or a brief statement of the physical setting: list of important parameters, dimensions, constants, etc.
3. Solve the problem showing all assumptions and without skipping any steps. Make sure that all parameters have clearly indicated and correct units. Include a brief running summary so that I can follow exactly what you have done.
4. **BOX all Answers,** and call attention to important intermediate results.
5. Discuss briefly (one complete sentence) the significance of the results.

Quizzes. There will be short (15 - 25 min.) quizzes given every week at the beginning of the lab/recitation period, starting on January 27. These quizzes cover the material of the homework

assignment returned on the preceding week. For example, H1 is due on January 18, it will be returned on January 23, and Q1 will be given on January 27. Quizzes may require verbal and mathematical proficiency and will be based largely on homework problems and reading. Please bring a calculator. Quizzes are open book, open notes.

Midterm Exam. One midterm exam will be given. It will be on Friday, March 30. The exam is open book and open notes. Students may not use anything belonging to another student and may not give or accept assistance during an exam. The only electronic devices allowed in quizzes and exams will be a calculator. This exam will have problems that require quantitative and verbal proficiency.

Final Exam. A final exam will be given—same rules as the midterm exam. It will focus on the materials after the mid-term exam. The final exam is scheduled for Wednesday, May 2 from 9:50 am until 2:00 pm and will be held in PSA103.

Lab/Recitations. Most Friday periods (from 11:50 am) will be lab/recitations following the format described below:

~ The first 15-30 minutes will be devoted to a quiz on the content of the previous homework assignment. The solution will be posted after the quiz. Thus, it is not possible to make-up a quiz. If you must be absent, you should try to arrange a make-up quiz in advance. Do everything possible to take each quiz.

~The next 30-60 minutes will involve analysis of a contemporary article from a newspaper or other media source. I will provide the reading after the quiz. Each student will have time to read it; then, we will have a plenary discussion. Each student will turn in a set of written responses.

~ We will have wet laboratories running on Fridays beginning February 3 and running through March 2. Due to the finite capacity of the laboratory facility, we will divide the class into groups. Students doing the wet laboratory will be excused from the quiz and discussion that day. All other students will do the quiz and discussion. The detailed plan for the laboratory sessions will be provided in a separate document once the enrollment in the class is known.

~In a few cases, the format will differ. For example we have a special introduction session on January 6, a day off on January 13, a special discussion session on January 20, the mid-term exam on March 30, and a special non-wet laboratory session on April 6, Please refer to the course schedule for details.

Evaluation. Grades will be assigned based on weekly homework, quiz scores, participation in the lab/recitation and class sessions, and the midterm and final exams. Scores will be weighted to compute final grades as listed below:

20% Homework
20% Quizzes (the lowest score is dropped)
10% Lab reports and participation
10% Participation in class and discussion
20% Midterm exam
20% Final exam

Grading Scale. I will use the following grading scale:

A *Excellent* – Homework, quiz, lab/recitation, and exam scores greater than 90% of possible course points.

B *Good* – Scores between 90%-80% of possible course points.

C *Adequate* – Scores between 80%-70% of possible course points.

D *Poor* – I do not expect anyone to get a D or and E in this class. To do so, you will need to have an overall average below 70% for D and 60% for E

You may appeal my or the TA's grading. I will not alter the established grading criteria, but will re-grade your work against the criteria.

Participation. Your participation in this class and lab/recitation is necessary. I appreciate students who volunteer good questions or answers. You may be called upon at any time whether or not you volunteer. You will also be required to work in groups and summarize group work in the lab/recitation period.

Diversity. Engineers are expected to treat others fairly, with respect and courtesy, regardless of such factors as race, religion, sexual orientation, gender, disability, age, or national origin. In this class, you are expected to contribute to the overall campus climate such that others feel welcome, are respected, and are able to develop to their full potential. This will allow each person to contribute to the success of the class as a whole. ASU, the Fulton Schools of Engineering, and I are committed to maintaining a productive, enjoyable, and diverse campus environment.

Thinking critically and independently. It is my sincere hope that as a graduate of ASU, you will be a thoughtful citizen, as well as a fundamentally sound engineer. Many aspects of environmental engineering extend beyond traditional engineering and science fundamentals. As someone knowledgeable about the environment, you are empowered in a special way to serve human society and your fellow citizens of the world.

Academic integrity. I encourage you to work together on homework. You must, however, come up with you own solution to the problems. Turning in an exact copy of your classmates' homework is not acceptable. I am intolerant of dishonesty. If a student is caught cheating, I will gladly punish him/her to the fullest extent in accordance with the university academic policy:

http://www.asu.edu/studentlife/judicial/integrity.html

CEE 361 Spring 2012 Course Schedule

Date	Day	Subject	Readings by page numbers in Masters & Ela (2008)
1/6	F	Introduction to CEE 361	--
1/9	M	Mass and Mass Balances	1-20, 687-695
1/11	W	Mass Balances	1-20; 687-695
1/13	F	Break; no meeting	--
1/16	M	Martin Luther King Holiday	--
1/18	W (H1)	Energy	21-39, 52-56
1/20	F	Recitation Discussion	--
1/23	M	Water Properties and Quantities	173-180; 229-244
1/25	W (H2)	Water Sources and Movement	229-244
1/27	F (Q1)	Quiz & Discussion	--
1/29	M	Drinking Water Quality	281-289
2/1	W (H3)	Drinking Water Quality	181-195, 281-315
2/3	F (Q2)	Quiz & Discussion (Lab 1a)	--
2/6	M	Drinking Water Quality	157-161, 193-198
2/8	W (H4)	Drinking Water Treatment	289-315
2/10	F (Q3)	Quiz & Discussion (Lab 1b)	--
2/13	M	Surface Water Quality	181-195, 199-209
2/15	W (H5)	Surface Water Quality	210-219
2/17	F (Q4)	Quiz & Discussion (Lab1c)	--
2/20	M	Surface Water Quality	219-228, 68-70, 219-228
2/22	W (H6)	Surface Water Quality	157-162, 196-199
2/24	F (Q5)	Quiz & Recitation Discussion (Lab 2a)	--
2/27	M	Wastewater Treatment	316-332
2/29	W (H7)	WW Treatment and Hot Water Topics	--
3/2	F (Q6)	Quiz & Discussion (Lab 2b)	--
3/5	M	Structure of the Atmosphere	438-469
3/7	W (HW8)	Structure of the Atmosphere	"
3/9	F (Q7)	Quiz &Discussion (Lab 2c)	--
3/12	M	Ambient Air Quality	367-379, 380-398
3/14	W (H9)	Ambient Air Quality	426-437
3/16	F (Q8)	Quiz & Discussion	--
3/19-23	M-F	SPRING BREAK	--
3/26	M	Ambient Air Quality	380-398
3/28	W (No H)	Ambient Air Quality	401-425
3/30	F	MID-TERM EXAM	--
4/2	M	CO_2 and Climate Change	501-544
4/4	W (H10)	CO_2 and Climate Change	"
4/6	F (Q9)	Quiz & Lab 3	--
4/9	M	Stratospheric Ozone Depletion	545-587, 553-555
4/11	W (H11)	Stratospheric Ozone Depletion	"
4/13	F (Q10)	Quiz & Discussion	--
4/16	M	Hot Topics in the Atmosphere	--
4/18	W (H12)	Solid Waste Management	601-612, 624-682
4/20	F (Q11)	Quiz & Discussion	--
4/23	M	Solid Waste Management & Review	--
5/2	W	FINAL EXAM: 9:50 am – 11:40 am	--

Notes: H indicates that a homework assignment is due by the end of class. Q indicates that a quiz will occur at the beginning of the lab/discussion period and on the subject matter of the homework assignment having the same number. Lab indicates likely dates of laboratory exercises.