

CE 5316: Current Topics in Environmental Engineering

Spring 2015

Instructor(s): Hyeok Choi (Co-instructor: Melanie Sattler)

Office Number: Room 437, Nedderman Hall (Room 406, Nedderman Hall)

Office Telephone Number: 513-272-5116 (817-272-5410)

Email Address: hchoi@uta.edu (sattler@uta.edu)

Faculty Profile:

<http://www.uta.edu/profiles/hyeok-choi> (Dr. Choi)

<https://www.uta.edu/profiles/melanie-sattler> (Dr. Sattler)

Office Hours:

Monday 13:30-15:30 and Thursday 09:30-11:30 or by appointment (Dr. Choi)

Monday 13:00-15:00, Tuesday/Thursday 09:30-12:00 or by appointment (Dr. Sattler)

Section Information: CE 5316-001 (22181) and CE 5316-002 (23264)

Class Time: Mon/Wed/Fri 11:00-11:50

Classroom: Nedderman Hall 109

Description of Course Content: The course provides graduate students with background, knowledge, technology, theory, and application on some 'emerging topics' in environmental engineering fields, including water pollution, water and wastewater treatment, post-treatment issues, remediation of contaminated groundwater, soil and sediment, anaerobic processes for waste treatment and energy generation, life cycle analysis, and energy and the environment. Introduction will be first provided to each selected topic and then selected articles will be discussed.

Student Learning Outcomes:

This course will enhance students' ability to:

- Knowledgeably discuss emerging environmental issues
- Describe the scientific and technological principles underlying state-of-the-art technologies for environmental remediation and renewable energy production, as well as their advantages and limitations
- Solve current environmental problems
- Write and peer-review technical articles
- Think creatively
- Design anaerobic systems for energy production
- Assess environmental impacts using life cycle analysis software

Requirements: Course prerequisites CE 3334/CE 3131 (those who did not take these courses, please consult with Drs. Choi and Sattler)

Required Textbook: Not applicable.

References:

- 1) *Water Quality and Treatment*, Fifth Edition, AWWA, McGraw-Hill, 1999.
- 2) *Water Treatment Principles and Design*, MWH, Wiley, 2005.
- 3) *Wastewater Engineering*, Fourth Edition, Metcalf and Eddy, Inc., McGraw-Hill, 2003.
- 4) *Aquatic Chemistry*, Third Edition, Stumm and Morgan, Wiley Interscience, 1996.
- 5) *Handbook of Water Analysis*, Second Edition, Loe Nollet, CRC Press, 2007.
- 6) *Biogas from Waste and Renewable Resources: An Introduction*, edited by Dieter Deublein and Angelika Steinhauser, Wiley-VCH, 2008.
- 7) *Environmental Life Cycle Assessment of Goods and Services: An Input-Output Approach*. Hendrickson, C. T., Lave, L. B., Matthews, H. S. Resources for the Future Press, 2006.

Course Materials: For Dr. Choi's part, course materials will be posted in my MavSpace prior to each class and/or given to student one week in advance (Ticket Link : Ticket Link : https://mavspace.uta.edu/xythoswfs/webui/xy-3718159_1-t_a8HV2I2N). For Dr. Sattler's part, course materials will be posted on Blackboard prior to each class.

Modern Teaching Tools and Assistances: Power point presentations, course summary and handouts, video clips, lab visit, etc.

Major Assignments and Examinations:

3 assignments (2 from Dr. Sattler and 1 from Dr. Choi)
2 exams (midterm from Dr. Sattler and final from Dr. Choi)

Grading Policy: I reserve the right to vary slightly from the grade schedule listed below.

Assignments (Sattler)	25% (anaerobic processes 15%; life cycle analysis 10%)
Midterm exam (Sattler)	25%
Assignment (Choi)	15% (remediation of contaminated soil)
Final exam (Choi)	35%
Total	100%

90 - 100%	A
80 - 89%	B
70 - 79%	C
60 - 69%	D
< 60%	F

Homework is due at the beginning of class (11:00 a.m.) for both regular and distance learning students. Homework turned in at the end of class will be counted late (25% off). Written homework will be accepted after the class period in which it is due with penalties as follows: 25% penalty if submitted by the beginning of the next class; 50% if submitted by the beginning of the second class period following the due date. Homework submitted thereafter will not be accepted.

Attendance: At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, attendance is not mandatory; however, no special accommodations will be made for incomplete or missed assignments and exams due to unexcused absences.

Make-up Exams: No make-up exams are given except for medical or other similar hardships where advanced arrangements are made with the instructor; or in case of non-selective medical

emergencies with appropriate physician's note or documentation. Other than circumstances described above, failure to take the exam at the scheduled time will constitute a grade of zero in the exam.

Expectations for Out-of-Class Study: Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 6-9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc.

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog at <http://catalog.uta.edu/academicregulations/grades/#graduatetext>.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. Students will not be automatically dropped for non-attendance. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX: The University of Texas at Arlington is committed to upholding U.S. Federal Law "Title IX" such that no member of the UT Arlington community shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity. For more information, visit www.uta.edu/titleIX.

Academic Integrity: Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code: *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence. I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.* UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be

referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University. "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts" (Regents' Rules and Regulations, Series 50101, Section 2.2). You may not copy any portion of another student's homework or the homework solutions from last year, including sharing spreadsheet formulas and output. You may discuss homework and solution techniques with a fellow classmate only after you have attempted to solve the problem. After the discussion you must work the problem by yourself.

Lab Safety Training: Not required for this course.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>. Students are responsible for checking their email regularly.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located at either the right or left hall way. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals. We will discuss in detail during the first class.

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. For non-emergencies, contact the UTA PD at 817-272-3381.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Writing Center: The Writing Center, 411 Central Library, offers individual 40 minute sessions to review assignments, *Quick Hits* (5-10 minute quick answers to questions), and workshops on grammar and specific writing projects. Visit <https://uta.mywconline.com/> to register and make appointments. For hours, information about the writing workshops we offer, scheduling a classroom visit, and descriptions of the services we offer undergraduates, graduate students, and faculty members, please visit our website at www.uta.edu/owl/.

Librarian to Contact: Sylvia George-Williams, 817-272-7519, sylvia@uta.edu.

Professional Code of Conduct: Students are expected to act in a manner consistent with a professional civil engineer. You are responsible for learning the material that makes up this course. I am responsible for helping you to learn it and determining if you have done so. Most people must do the assigned homework to learn the material of this course. My tests are designed to determine how much you have learned. To me, "learning" means understanding the material well-enough that 1) you can explain it to others so they can understand it and 2) solve problems you have not seen before. I welcome all pertinent questions in class and I am willing to spend many hours outside of class to help you learn. I also welcome any suggestions you have on how I can better help you to learn and/or determine if you have learned the material of this course. You are expected to attend every class and to show up on time.

Office Hours: In addition to my posted office hours I am also available to meet with students most times when I am in my office and the door is open. However, the surest way to meet with me is to make an appointment by phone. I will normally be in my office during office hours, but if I do not have an appointment scheduled, I will not hesitate to leave my office during office hours to attend an important meeting.

Important: Prior to each class, the course materials including handouts and homework will be posted in my MavSpace. Visit the link and then click CE 5316, which is open to students. You will need your NetID and corresponding password. Students need to check the MavSpace regularly before coming to class. The students also need to print out them and bring the materials (plus one chapter in advance) to the class. No hard copies for the course materials will be given to the students. I will try to send an email to students with updated information on course materials. However, it is students' responsibility to visit the MavSpace regularly and update course materials.

Copyright: All right reserved. No part of the course materials including handouts, homework, exams may be reproduced or transmitted in any form or by any means. The materials should be used for the class only and kept confidential. You cannot use them for any other purposes than the class. You cannot give them to anybody.

Other Useful Websites

Library Home Page <http://www.uta.edu/library>
Subject Guides <http://libguides.uta.edu>
Subject Librarians.....<http://www.uta.edu/library/help/subject-librarians.php>
Database List<http://www.uta.edu/library/databases/index.php>
Course Reserves.....<http://pulse.uta.edu/vwebv/enterCourseReserve.do>
Library Tutorials<http://www.uta.edu/library/help/tutorials.php>
Connecting from Off- Campus<http://libguides.uta.edu/offcampus>
Ask A Librarian<http://ask.uta.edu>

The following URL houses a page where we have gathered many commonly used resources needed by students in online courses: <http://www.uta.edu/library/services/distance.php>.

The subject librarian for your area can work with you to build a customized course page to support your class if you wish. For examples, visit <http://libguides.uta.edu/os> and <http://libguides.uta.edu/pols2311fm> . If you have any questions, please feel free to contact Suzanne Beckett, at sbeckett@uta.edu or at 817.272.0923.

Course Schedule: As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.

Tentative Schedule

Dr. Sattler (Week 1-8)

- Chapter 0. Course introduction and assignment explanation

Part 1. Anaerobic Processes for Waste Treatment and Energy Production (3 Weeks)

- Chapter 1. Anaerobic Process Fundamentals
- Chapter 2. System Design
- Chapter 3. Benefits and Limitations

Assignment I: Anaerobic System Design (15%)

Part 2. Life Cycle Assessment (2.5 Weeks)

- Chapter 4. Life Cycle Assessment Introduction
- Chapter 5. Sustainable Design Tables
- Chapter 6. EIO Software
- Chapter 7. Life Cycle Cost Analysis

Assignment II: Life Cycle Environmental Impact and Cost Analysis (10%)

Part 3. Environmental Impacts of Energy Systems (2.5 Weeks)

- Chapter 8. Energy Basics & Fundamentals
- Chapter 9. Fossil Fuels (coal, natural gas, oil)
- Chapter 10. Renewable Power
- Chapter 11. Energy and the Environment

Midterm Exam (End of Week 8) (25%)

Dr. Choi (Week 9-15)

Part 4. Water Pollution, Water and Wastewater Treatment (2.5 Weeks)

- Chapter 13. Water fluoridation and Fe and Mn removal
- Chapter 14. Post-treatment issues (residual management and distribution systems)
- Chapter 15. Biological toxins in water resources
- Chapter 16. Membrane bioreactors

Part 5. Remediation of Contaminated Groundwater, Soil, and Sediment (2.5 Weeks)

- Chapter 17. TCE and PCE contamination
- Chapter 18. PAHs and PCBs contamination
- Chapter 19. In situ remediation strategy
- Chapter 20. Electrochemical approach

Assignment III: Cost Comparison between In-Situ and Ex-Situ Strategies (15%)

Part 6. Emerging issues (2 Weeks)

- Chapter 21. Bisphenol A and perfluoroalkyl compounds
- Chapter 22. Environmental nanotechnology
- Chapter 23. Fate and transport of engineered nanomaterials

Final Exam (Final Exam Week) (35%)