

CE 5317 - Environmental Engineering Process and Analysis Lab

The University of Texas at Arlington Civil Engineering Department Fall 2014

Instructors: Melanie Sattler, Ph.D., P.E. Hyeok Choi, Ph.D.

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Office hours: Sattler: Tue. 9:00-12:00; Wed. 9:00-10:00; Th. 9:00-12:00
Choi: Mon. 14:00-16:00; Wed. 14:00-16:00

Section Information: CE 5317, Sec. 001 and 002

Time and place of class meetings: Lecture: M,W 10:00-10:50 a.m./ERB 130
Lab: Friday, 9:00-11:50 a.m./NH B08 & B09

Description of Course Content: The course meets for 2 hours of lecture and 3 hours of lab each week. Lectures will cover advanced analytical procedures for the analyses of air, liquid, and other wastes, including optical, chromatographic, electrical, and other instrumental methods of analysis. Lectures will also review the basics of physical/chemical processes. In the laboratory, students will demonstrate and analyze basic reactor types (CSTR, plug flow, and reactors in series) and kinetics, as well as environmental engineering processes (physical/chemical) for treatment of contaminants, including gas transfer, adsorption, advanced oxidation processes, and membrane separation.

Student Learning Outcomes:

- 1) Students will be able to explain and analyze data from basic reactor types (CSTR, plug flow, and reactors in series) and kinetics experiments.
- 2) Students will be able to explain and analyze data from basic environmental engineering processes (physical/chemical) for treatment of contaminants, including gas transfer, adsorption, advanced oxidation processes, and membrane separation.
- 3) Students be able to explain and analyze data from basic methods of environmental analysis (optical, chromatographic, and electrical).

Optional Texts:

Chemistry for Environmental Engineering and Science by Clair N. Sawyer, Perry L. McCarty, and Gene F. Parkin, 2003.

AEESP Environmental Engineering Processes Laboratory Manual, 2001

The Sawyer et al. text will be placed on reserve in the Science and Engineering Library.

Other Course Materials

Handouts will be provided in class and via Blackboard (Sattler).

Handouts will be distributed through MavSpace at

Ticket Link: https://mavspace.uta.edu/xythoswfs/webui/xy-4103860_1-t_nB4p99wd

(Password: hchoi) (Choi)

Major Assignments/Exams and Grading

| Assignment/Exam | Weighting, % |
|---------------------------------------|-----------------|
| Lab Reports Sattler (4 at 8 pts each) | 32 |
| Lab Reports Choi (3 at 10 pts each) | 30 |
| Exam #1 (Week 8) | 18 |
| Exam #2 (Final) | 20 |

Grade Basis

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

Lab Reports to Submit and Due Dates (Sattler)

| Lab | Due Date |
|--------------------------------|----------|
| Kinetics lab | 9/12 |
| Reactor lab of your choice #1 | 9/26 |
| Reactor lab of your choice #2 | 10/3 |
| Gas transfer lab (your choice) | 10/20 |

Lab reports will be accepted after the class period in which they are due with penalties as follows: 10% penalty if submitted by the next class; 20% if submitted by the second class period following the due date; etc.

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, I expect that you will attend classes and labs. Students will NOT be able to submit a lab report on a lab they did not attend.

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.

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://wweb.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.

Lab Safety Training: Students registered for this course must complete all required lab safety training prior to entering the lab and undertaking any activities. Once completed, Lab Safety Training is valid for the remainder of the same academic year (i.e., through the following August) and must be completed anew in subsequent years. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in any lab activities, including those for which a grade is assigned.

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>.

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 to the left and down the hall from ERB 130, and to the right and up the stairs from NH B08/B09. 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 individuals with disabilities.

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/.

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.

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.

| Week | Lecture | | | Lab | | |
|------|--|--|-----------------------------|--|-------------------------|---------------------------------------|
| | Physical/Chemical/Biological Process Topic | Analysis Topic | Text Reference ^a | Title | Analysis Method | AEESP Lab Manual Section ^b |
| 0,1 | N/A | Syllabus, Lab Safety, Statistical Analysis of Analytical Data | Ch. 10 | | | |
| 2 | Kinetics | N/A | 3.10 | Kinetics of the Perdisulfate-Iodide System | N/A | handouts |
| 3 | CSTR Reactors | Electrical Methods of Analysis (Potentiometric analysis: electrodes) | 12.3 | Laboratory Study of Completely Mixed Flow Reactors Using Ion Specific Electrodes | Ion Specific Electrodes | 1-2-1 |
| 4 | Plug Flow Reactors | Electrical Methods of Analysis (Potentiometric analysis: electrodes) | 12.3 | Laboratory Study of Plug Flow Reactors | Ion Specific Electrodes | 1-2-2 |
| 5 | Non-Ideal Reactors | Electrical Methods of Analysis (Potentiometric analysis: electrodes) | 12.3 | Reactors in Series | Ion Specific Electrodes | 1-2-3 |
| 6 | Gas Transfer | Chromatographic Methods of Analysis (GC) | 12.4 | Measurement of Henry's Law Constants for Volatile Organics | Gas chromatography | 1-3-4 |
| 7 | Gas Transfer | Chromatographic Methods of Analysis (GC) | 12.4 | Air Stripping | Gas chromatography | 1-4-4 |
| 8 | Review for Mid-Term, Mid-Term | | | N/A | | |

^a Sawyer, McCarty, and Parkin.

^b AEESP Environmental Engineering Processes Laboratory Manual

| Week | Lecture | | | Lab | | |
|-------|---|---|----------------------|---|---|---------|
| | Physical/Chemical/ Biological Process Topic | Analysis Topic | Handout ^c | Title | Analysis Method | Handout |
| 9 | Advanced Oxidation Processes | | Yes | Chemical Decomposition of Organic Contaminants (Sulfamethoxazole) Using Fenton Reaction | | Yes |
| 10 | | High Performance Liquid Chromatography (HPLC) | Yes | | Chromatographic Analysis of Organic Contaminants (Sulfamethoxazole) | Yes |
| 11 | Membrane Separation Technology | | Yes | Physical Separation of Biological Suspension Using Membrane Technology | | Yes |
| 12 | | TOC Analyzer | Yes | | Measurement of Total Organic Carbon | Yes |
| 13 | Activated Carbon Adsorption | | Yes | Physical Removal of Organic Dyes (Methylene Blue) Using Activated Carbon | | Yes |
| 14 | Thanks Giving | | | | | |
| 15 | | UV-Vis Spectrophotometer | Yes | | Optical Determination of Organic Dyes (Methylene Blue) ^d | Yes |
| Final | | | | | | |

^c Handouts will be distributed through MavSpace at
Ticket Link: https://mavspace.uta.edu/xythoswfs/webui/_xy-4103860_1-t_nB4p99wd (Password: hchoi)

^d This lab will be very short. Depending on remaining schedule, this lab can be done on Monday and Wednesday (not Friday; Dec 3 (Wednesday) is the last day of the class).