

## **CE 5322: Advanced Physical-Chemical Processes**

**Spring 2017**

**Instructor(s):** Hyeok Choi

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**Faculty Profile:** <http://www.uta.edu/profiles/Hyeok-Choi>

**Office Hours:** Monday/Wednesday 12:00-14:00 pm or by appointment

**Section Information:** CE 5322-001 (24493) and CE 5322-101 (22573)

**Class Time:** Monday/Wednesday/Friday 11:00-11:50 am

**Classroom:** Wolf Hall (WH) 111

**Description of Course Content:** The course represents the fundamentals and applications of various advanced physical and chemical unit operations and processes for controlling drinking water quality. The course will cover i) general overview on the standard, regulations, and goals of drinking water quality, ii) general discussion on organic chemistry for environmental studies, and iii) detailed discussion of the theory, design, and operation of advanced physical and chemical unit processes which have not been discussed in the previous courses (CE 5318 and CE 5319, Physical-Chemical Processes I and II), including but not limited to, sorption, centrifugation, osmotic pressure, membrane separation, chemical oxidation and advanced oxidation, UV technology, and disinfection.

### **Student Learning Outcomes:**

- Being familiar with water quality standards and regulations
- Having a capability of conducting experiments used for the design and operation of water treatment systems and analyzing and interpreting the data
- Applying and extending the theory of unit operations and processes to your area of interest in water quality control
- Extending students' knowledge to more advanced unit operations and processes for water quality control
- Designing several components of engineered systems and processes used for water treatment

**Requirements:** Course prerequisites CE 5318 and CE 5319 (Those who have not taken the courses, please consult with Dr. Choi)

**Required Textbooks:** 1) Water Quality and Treatment: A Handbook of Community Water Supplies, Fifth Edition, AWWA, McGraw-Hill, 1999.

**References:** Wastewater Engineering, Fourth Edition, Metcalf and Eddy, Inc., McGraw-Hill, 2003.

**Course Materials:** Course materials will be posted in my MavSpace prior to each class at: [https://mavspace.uta.edu/xythoswfs/webui/xy-3718161\\_1-t\\_yLI5XQyS](https://mavspace.uta.edu/xythoswfs/webui/xy-3718161_1-t_yLI5XQyS) (password will be given).

**Major Assignments and Examinations:** One assignment, one in-class mid-term exam, one term paper (tentatively presentation), and one in-class final exam. Late submission will not be accepted without the consent of the instructor. ***"If applicable"***, homework/assignment/any works must be done using the typical engineering format of Given, Find, and Solution. Two general presentation formats are acceptable: 1) on engineering paper using pencil and very neat hand printing, or 2) printed output from a computer word processing and/or spread sheet program. In both cases the solution is given on one side only. Spreadsheet solutions must also have hand generated sample calculations. Graphs must be large enough to be easily read (typically half a page) and the axes must be clearly defined and labeled including units. Computer generated graphs should give the equation of the fitted line. Hand generated graphs must be done on engineering paper with a straight edge. Your solutions must be presented linearly down the page so a reviewer can easily follow your solution. Every reasonable step in your solution must be presented. Solutions in which the solve function of a calculator is used are not acceptable. Answers must contain at least 2 but no more than 3 significant digits and appropriate units. Please write your answers, solutions and descriptions in a clear manner (i.e., it is not recommended to write in cursive letters). Your homework must be stapled in the upper left hand corner and your name and submitted date must be given on the first page.

**Grading Policy:** I reserve the right to vary slightly from the grade schedule listed below but it is highly unlikely the deviation will be more than 1 or 2 points up or down.

Midterm Exam	35%
Assignment (Summary of Review Articles on Fenton Reaction)	5%
Term Paper (& Tentatively Presentation)	15%
Final Exam	45%
Total	100%

90.0 - 100%	A
80 - 89%	B
70 - 79%	C
60 - 69%	D
< 59%	F

**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](http://www.uta.edu/disability) or by calling the Office for Students with Disabilities at (817) 272-3364.

**Title IX Policy:** The University of Texas at Arlington ("University") is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit [www.uta.edu/titleIX](http://www.uta.edu/titleIX) or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or [jmhood@uta.edu](mailto:jmhood@uta.edu).*

**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.

**Campus Carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>.

**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 right or left hall way (will be demonstrated during the first two classes). 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.

**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](mailto:resources@uta.edu), or view the information at [www.uta.edu/resources](http://www.uta.edu/resources).

**The IDEAS Center** (2<sup>nd</sup> Floor of Central Library) offers **free** tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UTA. To schedule an appointment with a peer tutor or mentor email [IDEAS@uta.edu](mailto:IDEAS@uta.edu) or call (817) 272-6593.

**The English Writing Center (411LIBR):** The Writing Center Offers free tutoring in 20-, 40-, or 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Our hours are 9 am to 8 pm Mon.-Thurs., 9 am-3 pm Fri. and Noon-6 pm Sat. and Sun. Register and make appointments online at <http://uta.mywconline.com>. Classroom Visits, workshops, and specialized services for graduate students are also available. Please see [www.uta.edu/owl](http://www.uta.edu/owl) for detailed information on all our programs and services.

The Library's 2<sup>nd</sup> floor Academic Plaza offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation. <http://library.uta.edu/academic-plaza>.

**Librarian to Contact:** <http://www.uta.edu/library/help/subject-librarians.php>. Please see the end of this document for additional information about library links.

### **Modern Teaching Tools and Assistances**

Power point presentations, course summary and handouts, video clips, lab visit, etc.

**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.

**Course Update:** Prior to each class, the course materials including handouts and homework will be posted in my MavSpace. Visit the link and then click CE 5318 and CE 4351, which is open to students ([https://mavspace.uta.edu/xythoswfs/webui/xy-3718161\\_1-t\\_yLI5XQyS](https://mavspace.uta.edu/xythoswfs/webui/xy-3718161_1-t_yLI5XQyS) (password will be given)). 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.

**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.

#### **Other Useful Websites**

**Library Home Page** [library.uta.edu](http://library.uta.edu)

#### **Resources for Students**

##### **Academic Help**

- Academic Plaza Consultation Services [library.uta.edu/academic-plaza](http://library.uta.edu/academic-plaza)
- Ask Us [ask.uta.edu/](http://ask.uta.edu/)
- Library Tutorials [library.uta.edu/how-to](http://library.uta.edu/how-to)
- Subject and Course Research Guides [libguides.uta.edu](http://libguides.uta.edu)
- Subject Librarians [library.uta.edu/subject-librarians](http://library.uta.edu/subject-librarians)

##### **Resources**

- A to Z List of Library Databases [libguides.uta.edu/az.php](http://libguides.uta.edu/az.php)
- Course Reserves [pulse.uta.edu/vwebv/enterCourseReserve.do](http://pulse.uta.edu/vwebv/enterCourseReserve.do)
- FabLab [fablab.uta.edu/](http://fablab.uta.edu/)
- Special Collections [library.uta.edu/special-collections](http://library.uta.edu/special-collections)
- Study Room Reservations [openroom.uta.edu/](http://openroom.uta.edu/)

##### **Teaching & Learning Services for Faculty**

- Copyright Consultation [library-sc@listserv.uta.edu](mailto:library-sc@listserv.uta.edu)
- Course Research Guide Development, Andy Herzog [amherzog@uta.edu](mailto:amherzog@uta.edu) or your subject librarian
- Data Visualization Instruction, Peace Ossom-Williamson [peace@uta.edu](mailto:peace@uta.edu)
- Digital Humanities Instruction, Rafia Mirza [rafia@uta.edu](mailto:rafia@uta.edu)
- Graduate Student Research Skills Instruction, Andy Herzog [amherzog@uta.edu](mailto:amherzog@uta.edu) or your subject librarian
- Project or Problem-Based Instruction, Gretchen Trkay [gtrkay@uta.edu](mailto:gtrkay@uta.edu)
- Undergraduate Research Skills Instruction, Gretchen Trkay [gtrkay@uta.edu](mailto:gtrkay@uta.edu) or your subject librarian.

**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**

#### Part I. Overview on Water Quality Control (2 Weeks)

- Chapter 1. Water Quality Standards, Regulations, and Goals
- Chapter 2. Health and Aesthetic Aspects of Water Quality
- Chapter 3. Guide to Selection of Water Treatment Processes
- Chapter 4. Source Water Quality Management

#### Part II. Advanced Unit Operations for Water Quality Control (13 Weeks)

- Chapter 5. Overview on Conventional Unit Operations for Water Quality Control
- Chapter 6. Centrifugation
- Chapter 7. Activated Carbon Adsorption

#### Midterm Exam (35%)

- Chapter 8. Membrane Separation Processes and Osmotic Pressure
- Chapter 9. Chemical Oxidation Processes

#### Assignment (Summary of Review Articles on Fenton Reaction) (5%)

- Chapter 10. Advanced Oxidation Processes and UV-Based Oxidation Processes
- Chapter 11. Disinfection

#### (Part III. Organic Chemistry for Environmental Studies)

- Chapter 12. Organic Chemistry

#### Term Paper Submission (& Tentatively Presentation) (Week 14) (15%)

#### Final Review Week (Week 15)

#### Final Exam (Final Exam Week: May 10, Wednesday 11:00-13:30) (45%)