CEE 6312 Chemical Principles in Environmental Engineering

Fall, 2026
Tuesday & Thursday 9:30–10:45 AM
Room Location TBA

Course Description: This course is designed to teach students a fundamental understanding of the chemical and related processes that affect the chemistry of water resources, and develop their ability to apply chemical equilibrium and kinetic principles to solve quantitative problems regarding the behavior of chemical substances in water.

Key Topics:

I. Background fundamentals: *thermodynamics; chemical equilibrium; activity-concentration relationship; reaction kinetics; compositions and reactions of natural waters*
II. Water chemistry: *acid-base systems; chemical speciation; air-water exchange; complexation/solubility of metals in water; redox reactions*
III. Advanced topics: *chemistry of oxidants in water treatment; adsorption; speciation modeling*

Prerequisites: college-level general chemistry is a minimum requirement; exposure to additional content in organic, inorganic, biological and/or environmental chemistry may also be helpful.

Instructor: Dr. Ching-Hua Huang, Professor
E-mail: ching-hua.huang@ce.gatech.edu; Office: DEEL 306

Teaching Assistant: TBA

Office Hours:
Prof. Huang: TBA, or email for appointment.
TA: TBA, or email for appointment.

Course Website: http://canvas.gatech.edu/

Useful books:

1. **"Water Chemistry: The Chemical Processes and Composition of Natural and Engineered Aquatic Systems", Patrick L. Brezonik and William A. Arnold, 2022, Second Edition, Oxford University Press. (On-line book available via GT Library, link)**
2. "Water Chemistry: An Introduction to the Chemistry of Natural and Engineering Aquatic Systems", Patrick L. Brezonik and William A. Arnold, 2011, Oxford University Press. (On-line book available via GT Library, link)
3. "*Water Chemistry*" by Mark M. Benjamin, 2015, Second Edition, Waveland Press Inc., ISBN: 978-1-4786-2308-3.
4. "*Aquatic Chemistry*", W. Stumm and J. J. Morgan, 1996, John Wiley & Sons, New York. (on-line book available via GT Library)

Grading:

Weekly problems & class participation	20 %
Group project & presentation	12 %

Exam I	20 %
Exam II	24 %
Exam III	24 %

Course Policies:

Classroom Expectations:

- All the corresponding lecture materials will be posted on the course website prior to the class time. Students in this class are required to download the materials and bring them to the class.
- Learning should be an active process. Students in this class should make the best effort to attend every lecture, review the required materials and be prepared to participate in questions. For instance, take-home example problems will be given on a weekly basis; students are expected to solve these problems and ask questions in the following lectures.
- All cell phones or other electronic devices should be kept silent throughout the class.

Communications:

- Weekly agenda
- Students are encouraged to submit the "muddiest point" questions in class or Canvas
- Tue/Thur class time and office hours
- Emails via Canvas
- Study groups
- Course surveys

Weekly Problems, Group Project and Exams:

- Weekly problem set will be given at the beginning of the week, and is due by the following week's Thursday. The objective of problem sets is to hone students' skills in applying fundamental principles to solve problems. Discussion with peers about problem sets is encouraged, but to maximize the learning objective, each student should attempt to solve the problem sets as independently as possible, and must submit individually completed work. The solutions should be in neat handwriting or typed, with the student's name shown on the first page. In the solution, clearly show your calculations, state employed assumptions, and mark the final answer in each question.
- A group project will be given to work on in teams. At the end of the semester, each team will give a presentation on the assigned project and submit a file of PowerPoint slides. For the written part of the project, it should be typed in an MS Word file, including a cover page that contains the project title and student names. More specific instructions will come with the assignment.
- Three in-class, closed-book exams will be conducted. A general scientific calculator is needed for the exam.

Late assignments:

- The default policy is that late assignments **will not be accepted past the due time**. However, each student is allowed to have up to 3 free late days without penalty on the weekly problem sets (exams and project not included) in this semester. If you wish to

apply the free late day(s), you must indicate so in the submission to inform the TA. Note that if an assignment is submitted in the next day after the due day, it is counted as one-day late regardless what time the assignment is submitted in the next day. Exceptions to this policy may be made if prior permission has been granted by the instructor or an emergency with a persisting impact has occurred with qualified documentation.

Academic Integrity:

- Students in this class are expected to abide by the Georgia Tech Honor Code and avoid any instances of academic misconduct.
- Plagiarizing is defined by Webster's Dictionary as "to steal and pass off (the ideas or words of another) as one's own: use (another's production) without crediting the source." If caught plagiarizing, you will be dealt with according to the GT Academic Honor Code.
- Cheating off of another person's quiz, problems or report is unethical and unacceptable. Cheating off of anyone else's work is a direct violation of the GT Academic Honor Code, and will be dealt with accordingly.
- Unauthorized use of any previous semester course materials, such as exams, homework, problems, reports, and any other coursework, other than that provided by the instructor, is prohibited in this course. Using these materials will be considered a direct violation of academic policy and will be dealt with according to the GT Academic Honor Code.
- Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Generative AI (GenAI) Policy:

In this course, we treat AI-based assistance, such as Microsoft Copilot or ChatGPT Edu, the same way we treat collaboration with other people: you are welcome to talk about your ideas and work with other people, both inside and outside the class, as well as with AI-based assistants. However, all work you submit must be your own. You should **never** include in your assignment anything that you did not write directly without proper citation (including quotation marks and in-line citation for direct quotes). Including anything you did not write in your assignment without proper citation will be treated as an academic misconduct case.

If you are unsure where the line is between collaborating with AI and copying AI, we recommend the following heuristic:

Never hit "Copy" within your conversation with an AI assistant. You can copy your own work into your own conversation, but do not copy anything from the conversation back into your assignment. Instead, use your interaction with the AI assistant as a learning experience, then let your assignment reflect your improved understanding. Deviating from this heuristic does not automatically qualify as academic misconduct; however, following this heuristic essentially guarantees your collaboration will not cross the line into misconduct. (Adapted from the School of Computer Science, Georgia Institute of Technology, Spring 2025)

Accommodations for Students with Disabilities:

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Resources:

The **CARE Center** and the **Counseling Center**, Stamps Health Services, and the Dean of Students Office will offer both in-person and virtual appointments. Student Center services and operations are available on the **Student Center** website. For more information on these and other student services, contact the Dean of Students or the **Division of Student Life**.