

CEE 6312 Chemical Principles in Environmental Engineering

Fall, 2004
Monday & Wednesday 12:05 – 01:25 PM
SEB 110

Instructor: Dr. Ching-Hua Huang
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Office Hour: Monday & Wednesday 1:25 – 2:00 PM (3226 ES&T)

Teaching Assistant: Wan-Ru Chen, E-mail: gtg351p@mail.gatech.edu
Office Hour: Wednesday 11 AM -12 PM (3324 ES&T)

Course Description: This course is designed for students to apply thermodynamic and chemical equilibrium principles to the processes in natural waters and in water quality engineering. Upon completion of this course, the students will have demonstrated an understanding of aquatic chemical reactions and be capable of applying fundamentals and modeling tools to quantitatively assess chemical speciation in environmental engineering systems.

Topics to be covered:

- Chemical Equilibrium and Thermodynamics
- Acid-Base Chemistry
- Chemistry of Dissolved CO₂ systems
- Coordination Chemistry
- Precipitation and Dissolution
- Oxidation and Reduction Reactions
- Adsorption Reactions
- Chemical Equilibrium Software

Course Website: <http://courses.ce.gatech.edu/>

Textbook: “*Water Chemistry*”, Mark. M. Benjamin, 2001, McGraw-Hill, New York

References:

1. “*Aquatic Chemistry*”, W. Stumm and J. J. Morgan, 1996, John Wiley & Sons, New York.
2. “*Water Chemistry*”, V. L. Snoeyink and D. Jenkins, 1980, John Wiley & Sons, New York
3. “*Principles and Applications of Aquatic Chemistry*”, F. M. M. Morel and J. G. Hering, 1993, John Wiley & Sons, New York
4. “*Aquatic Chemistry Concepts*”, James F. Pankow, 1991, Lewis Publishers, Chelsea, MI

Grading:

Exam #1	20%	In the week of 9/27
Exam #2	25%	In the week of 10/25
Exam #3	30%	12/1
Homework	25%	8-9 assignments

CEE 6312 Tentative Course Schedule:

# of Hours	Topics	Text	Ref (1)
	Organization		
1	Overview	Ch 1	Ch 1
4	Chemical equilibrium and thermodynamics	Ch 2	Ch 2
5	Acid/Base chemistry Quantitative equilibrium calculations: HA, H ₂ A and H ₃ A systems Titrations of acids and bases	Ch 3-5	Ch 3
5	Chemistry of dissolved CO ₂ – closed & open systems Alkalinity Air-water exchange	Ch 3-5 Ch 7	Ch 4
3	Metal ions in aqueous solution: aspects of coordination chemistry	Ch 8	Ch 6
8	Precipitation and Dissolution Solubility of metal hydroxides Solubility of metal carbonates in closed & open systems Other metal precipitates	Ch 8	Ch 7
3	Chemical equilibrium software	Ch 6	
9	Redox reactions pe and E _H ; pe-pH diagrams pe and natural systems	Ch 9	Ch 8
4	Introduction to adsorption reactions	Ch 10	Ch 9

Course Policy: Important!!

- Learning should be an active process. You are expected to come to each class and prepare to participate in questions and activities.
- All cell phones or pagers are required to be turned off or muted throughout the class.
- All the exams in this course are in-class, closed books and closed notes. Non-programmable calculators are allowed. All other electronic devices (e.g., cell phone, PDA, etc.) are not permitted during the exam.
- All students should work on his/her homework assignments **as independently as possible**. This means that you may discuss the homework with your colleagues, but should solve the problems on your own.
- Homework assignments are to be handed in at the beginning of the class on the day they are due. Assignments **will not be accepted** past the due time. The instructor is responsible for providing homework solutions and returning the graded assignments and exams in a timely manner. Late homework or exam make-ups will only be permitted if prior permission has been given or a documented excused absence has occurred.
- Deadline for the distance-learning students (CEE 6312Q): A maximum 2 weeks of extension in deadline for homework and exams is acceptable if needed. However, the distance-learning students are strongly encouraged to complete and submit your homework and exams before the extended deadline.
- MINEQL+ software will be provided and utilized in this class. All students are prohibited from illegally copying/distributing this software, and must return his/her software copy at the end of the semester. Otherwise, the final grade of the course will not be given.
- **All students are required to follow the Georgia Tech Student Honor Code.**