Aquatic Chemistry
Fall 2016

Course Id:	CHEM 605 (3 cr.)	
Lecture:	TR 2-3:30pm, REIC 165	
Instructor:	Tom Trainor	
	Rm 176 Reichardt	
	474-5628	
	tptrainor@alaska.edu	
Office Hours:	TR 10-11:30am	
Grading:	Problem Sets	40%
	Mid-term	20%
	Final	20%
	Project	20%
		100%

Course description and goals:

The goal of this course is to introduce students to the concepts and models used in aquatic chemistry while providing a foundation in the basic principles used in the chemical aspects of environmental science. The course content is centered on the chemical equilibrium and kinetic analysis of the speciation, transformation and partitioning of (primarily) inorganic chemical species in aqueous systems; including the aqueous components of surface and groundwater systems, soils, and the atmosphere. Emphasis is on the study of acid-base chemistry, complexation, precipitation-dissolution and reduction-oxidation reactions.

Student Learning Outcomes

Students will learn to utilize both graphical and computational methods for determining the speciation of multi-component aqueous systems. These skills will be developed through problem sets. Problem sets will emphasize problem solving skills with examples spanning applications in environmental chemistry and engineering, geochemistry and biogeochemistry. Concepts and methods developed during the semester will be utilized in a term project which reviews recent literature on a specific problem within the scope of aquatic chemistry.

Text

F.M.M. Morel and J.G. Hering, Principles and Applications of Aquatic Chemistry, Wiley-Interscience

Additional Sources:

W. Stumm and J. Morgan, Aquatic Chemistry 3rd ed., Wiley-Interscience
M.M. Benjamin, Water Chemistry, McGraw-Hill
F.J. Millero, Physical Chemistry of Natural Waters, Wiley-Interscience
J.I. Drever, The Geochemistry of Natural Waters, Prentice-Hall

Topics:

- Conservation principles
- Review of chemical thermodynamics
  - Free energy, chemical potential and equilibria
- Review of chemical kinetics
  - Reaction rates, mechanisms, box models
- Aqueous speciation
  - Acid-Base equilibria
  - pC/pH diagrams
- Carbonate chemistry
  - Buffering and Alkalinity
- Chemistry of aqueous metals
  - Complexation
  - Solubility and precipitation
  - Redox chemistry
  - pE/pH predominance diagrams
- Heterogeneous chemistry
  - Environmental interfaces and adsorption reactions
  - Weathering and growth (time permitting)

Class Projects

Your project will be a literature review based on a topic of your choosing (in consultation with the instructor). The paper should be 12-15 pages in length (1.5 spacing, not including references). The following are essential:

- The introduction must provide a concise description of the chosen topic and the broader environmental context.
- The body of the paper should provide a review of information from the literature relevant to understanding the problem from a chemical perspective (structure, thermodynamics, kinetics).
- Your conclusions must include a critical assessment of the literature on your topic.

Important Dates:
Sept 9 – Deadline for late registration
Sept 9 – Deadline for drop
Nov 4 – Deadline for withdrawal

Computer Lab:
Your enrollment in Chem 605 gives you user privileges in the department's computer lab. Information and policies are available at:
http://www.uaf.edu/chem/instrumentation/policies/

Student with Documented Disabilities:
Student with a physical or learning disability who may need academic accommodations, should contact the Disability Services office (203 WHIT, 474-7043). Disability Services will then notify the instructor of special arrangements for course work.

Ethical Considerations:
The Chemistry Department Policy on Cheating is: "*Any student caught cheating will be assigned a course grade of F. The student will not be allowed to drop the course*."
The UAF Honor Code states: "*Student will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations. Student will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrase) in compositions, these and other reports. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion*"

In this course students may collaborate on homework assignments, however, each individual should submit their own copy showing all their work. Exams and projects are to be completed independently.