Fundamentals of Environmental Chemistry
Fall 2007

Course Id: CHEM 605 (3 cr.)
Lecture: TR 9:45-11:15 (Reichardt 165)
Instructor: Tom Trainor
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474-5628
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Office Hours: TR 1:00-3:00
Grading:
- Problem Sets 35%
- Midterm exam 20%
- Final exam 20%
- Project 25%
100%
Course web page: http://www.uaf.edu/chem/605f07/

Course description and goals:
The goal of this course is to introduce students to the broad field of environmental chemistry while providing a solid foundation in the basic principles used in environmental chemistry research. The course content is centered on the application of thermodynamics and kinetics to understanding chemical speciation, transformation and partitioning in the aquatic environment including surface water, ground water, and atmospheric systems.

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

Additional Sources:
M.M. Benjamin, Water Chemistry, McGraw-Hill
S. Manahan, Environmental Chemistry 5th ed, Lewis Publishers
J. Seinfeld, S. Pandis, Atmospheric Chemistry and Physics, Wiley-Interscience
http://www-as.harvard.edu/people/faculty/djj/book/
A. Schlesinger, Biogeochemistry 2nd ed., Elsevier.
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.
- Based on this review you must develop a hypothesis that could serve as the basis of a research project. You need to justify the importance of this hypothesis, give a concise description of how this hypothesis can be tested, and what results you might expect. The research suggestion should be ~2 pages of the total paper length.

For performing literature searches and managing your citations I encourage the use of SciFinder Scholar and Endnote respectively. If you are unfamiliar with these see: http://www.uaf.edu/chem/Viewlets/ChemLabHowTo.html
**Important Dates:**

- **Sept 14**  Last day to add; last day for 100% refund tuition & fees
- **Sept 21**  Last day student-initiated and faculty-initiated drops
- **Nov 2**  Last day for student-initiated and faculty-initiated withdrawals “W”
- **Nov 22-25**  Thanksgiving Break
- **Dec 14**  Last day of classes
- **Dec 17-20**  Final Exams

**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/NewNetwork.html](http://www.uaf.edu/chem/NewNetwork.html)

**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 Chem 605 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.