

## **Aqueous and Environmental Geochemistry**

**Course Id:** CHEM 609/GEOS 633  
**Credits:** 3  
**Lecture:** TR 11:30 – 1:00 (REIC 138 and/or via zoom)  
**Instructor:** Tom Trainor  
Rm 176 REIC  
474-5628  
tptrainor@alaska.edu  
**Office Hours:** Email to setup an appointment  
**Grading:** Problem Sets 50%  
Mid-term 25%  
Project 25%  
100%

**Prerequisite:** CHEM 331 or Graduate Standing

### **Course description and goals:**

Chemistry of aquatic and terrestrial environments including thermodynamic, kinetic and structural principles applied to aqueous geochemical systems. Emphasis on aqueous speciation and heterogeneous interactions (e.g. dissolution/precipitation and sorption) involved in the partitioning, transformation and transport of chemical species in the environment.

### **Student Learning Outcomes**

Students will learn to utilize both graphical and computational methods for determining the speciation of multi-component aqueous geochemical systems. These skills will be developed through problem sets that emphasize problem solving skills. Students will also gain conceptual background required for critical review and interpretation of current literature in the fields of aqueous and environmental geochemistry.

### **Text**

D. Langmuir, Aqueous Environmental Geochemistry, Prentice Hall

### **Additional Sources**

J. Drever, The geochemistry of Natural Waters, Prentice Hall  
G. Sposito, The Chemistry of Soils, Oxford University Press  
W. Stumm and J. Morgan, Aquatic Chemistry 3<sup>rd</sup> ed., Wiley-Interscience  
F. Morel and J. Hering, Principles and Applications of Aquatic Chemistry, Wiley-Interscience  
C. Bethke, Geochemical Reaction Modeling, Oxford University Press  
H.L. Ehrlich, Geomicrobiology, Marcel Dekker

### **Problem Sets**

Approximatley 10 problem sets will be assigned during the semester. These account for 50% of the class grade. Problem sets will include exercises to practice the application of principles covered in class, as well as computational exercises using aqueous geochemical modeling software. Students may collaborate on homework assignments, however, each individual should submit their own copy showing all their work.

### **Midterm Exam**

In class exam that will include topics covered in the first half of the course.

### **Class projects**

Class projects will involve performing a literature search for geochemical data associated with a particular system and/or process of interest (e.g. a particular watershed / river, or results of an experiment). Students will be expected to:

- I) Compile data (extract / generate electronic version of data)
- II) Use data to classify the system and look at correlations (as applicable)
- III) Build simple models for the system of interest using data as an input

The end product will include a term paper (~10 pages max) and an in-class presentation. The project will be assessed based on the appropriateness/correctness of the analysis (33%), the quality of the writing (33%), and the clarity of the in-class presentation (33%).

### **Grade Policy**

If you get at least 90% of the total points available you are guaranteed an "A". I may elect to set the grade cutoffs lower, but will not set them higher. The course will not use +/- grades. The tentative grade cutoffs are:

Grade	<u>Percentage</u>
A	90
B	80
C	70
D	60

### **Important Dates:**

Jan 22	Last day for student and faculty initiated drops
March 8-12	Spring Break
March 26	Last day for student and faculty initiated withdrawals "W"
April 26	Last day of classes

**Student protections statement:**

UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site:

<https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/>.

**Student with Documented Disabilities:**

I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities.

**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"*