August – December, 2005

GEOS 3450 Principles of Geochemistry

Description: (From the calendar) - Applications of chemistry to understanding the earth and geochemical cycles. Topics include composition of the earth and the solar system, evolution of the hydrosphere and behavior of low-temperature aqueous solutions, formation of hydrocarbons, chemical changes accompanying diagenesis and evolution of high temperature silicate melts. Introduction to isotope geochemistry.

The previous statement notwithstanding, this course will be taught primarily from the perspective of aqueous geochemistry. Aqueous systems will serve as a metaphor for all geochemical systems. The primary reason for this is so that what we do in the field and in the laboratory (with the understanding that this is, for now, only a 3 crdeit hour course) will be more tightly integrated with what we do in the lecture part of the course.

The objective of this course is to enable you to develop an understanding of geochemical principles through traditional lecture, group discussions and especially through hands-on field sampling and laboratory determinations of aqueous samples. Through building an understanding of aqueous geochemical principles and processes, by the end of this course you will have the skills necessary to allow you to interpret and analyze geochemical data, in aqueous systems and, by analogy, other geological systems.

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Time: Lectures: Tuesday and Thursday, 11.00 am – 12.15 pm

Location: FN 2.202 (at times we will also meet in the Geochemistry labs, FO 2.624 and FO 2.606)

Textbooks: Required: Principles of Environmental Geochemistry, G. Nelson Eby.
Recommended: Drever, J.I., The Geochemistry of Natural Waters

Recommended: Brownlow, A.H., Geochemistry.

Alternatively, there are several other very good aqueous geochemistry textbooks including Langmuir (Aqueous Environmental Geochemistry – very good book), and Stumm and Morgan (Aquatic Chemistry). Faure's Principles and Applications of Geochemistry is a viable substitute for Brownlow. Also very good to have on one's bookshelf, old (1965) but still in print is Garrels and Christ, Solutions, Minerals and Equilibria.

Field Trips: As we will discuss, one of the major activities in this course will be a series of field trips to Lake Texoma. These trips will be day-long and/or weekend long depending on weather, timing and logistics. It is my intention to have 4 days or so of sample and data collection on Lake Texoma and possibly another lake closer to Dallas.

Assessment:

Quizzes (5 @ 5% each)	25%
Research Paper	25%
Final Exam	25%
Homework assignments	25%

Final exam will be on Tuesday Nov 29th at 11.00 am in lecture room

Syllabus

The course will be taught in 6 modules, each of 4-6 lectures.

Module 1	**Basic principles and thermodynamics**	**(1, 2)**
Module 2	**pH, alkalinity, the carbonate system, redox**	**(3, 4)**
Module 3	**Analytical methods**	
Module 4	**Weathering, mineralogy**	**(7, 9)**
Module 5	**Geochemistry of waters, isotopes, adsorption, complexation**	**(6, 8, 9)**
Module 6	**Interpretation of geochemical data and scientific communication**	