University of Arkansas – Fort Smith
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General Syllabus

GEOS 43004 Environmental Geochemistry

Credit Hours: 4 **Lecture Hours:** 3 **Laboratory hours:** 2

Prerequisite: CHEM 14203 College Chemistry II or Consent of instructor

Effective Catalog: 2020-21

I. Course Information

A. Catalog Description

Study of chemical composition, speciation, and transport in the natural environment. Topics include soil geochemistry, radioactive and stable isotopes in environmental studies, and geochemistry of surface and ground waters. Lab emphasizes data analysis and environmental problem-solving.

B. Additional Information

This course is an elective for the B.S. degree in Geoscience, but may also be valuable to biology and chemistry majors.

II. Student Learning Outcomes

A. Subject Matter

Upon successful completion of this course, the student will be able to:

1. Use thermodynamic data to analyze chemical equilibria in the environment.
2. Analyze environmental problems related to dioxins, aromatic hydrocarbons, and other organic chemicals in the environment.
3. Apply appropriate radioactive and stable isotope analyses to date marine sediments and carbonates, interpret environmental tracer studies, and determine paleo-temperatures in ancient marine environments.
4. Describe the industrial uses and potential health impacts of clays, zeolites, asbestos, and other naturally-occurring minerals.
5. Describe the natural chemical variations in surface and groundwaters, and analyze potential environmental hazards including the release of heavy metals and radioactive waste into the environment.

B. University Learning Outcomes

This course will enhance student abilities in the following areas.

Analytical Skills
The student will generate solutions/analysis of problems/issues evaluated and will assess and justify the solutions and/or analysis.

Critical Thinking Skills
Students will identify a problem or issue and will research, evaluate, and compare information from varying sources in order to evaluate authority, accuracy, recency, and bias relevant to the problems/issues.

Communication Skills (written and oral)
Students will communicate proficiently. The student will compose coherent documents appropriate to the intended audience and effectively communicate orally in a public setting.

Ethical Decision Making
Students will model ethical decision-making processes. The students will identify ethical dilemmas and affected parties and will apply ethical frameworks to resolve a variety of ethical dilemmas.

Global & Cultural Perspectives
Students will reflect upon cultural differences and their implications for interacting with people from cultures other than their own. The students will demonstrate understanding or application of their discipline in a global environment and will demonstrate how their discipline impacts or is impacted by different cultures.

III. Major Course Topics

A. Equilibrium thermodynamics and kinetics, acid-base equilibria, and oxidation reduction reactions in the environment
B. Carbon compounds in soil, fossil fuels, and natural waters
C. Radioactive and stable isotopes in environmental studies
D. Clay minerals, zeolites, asbestos, and silica in the environment
E. Geochemistry of surface waters and groundwaters
F. Chemistry of seawater and marine sediment