

Environmental Geosciences Graduate Curriculum

| No. | title | faculty | Time offered* |
|--|---|----------------|---------------|
| All students will take the following graduate courses: | | | |
| 501 | Research Methods* | Allen-King | Fall |
| 514 | Hydrogeology | New Hire | Fall |
| 529 | Analysis of Geologic Data | Giese | Fall |
| All students will take at least one course from each of the following categories: | | | |
| Note: Most of these courses are taught alternate years and coordination should provide all MS students with opportunities to take many of these courses during their careers. | | | |
| Geochemical processes | | | |
| 562 | Advanced Environmental Geochemistry | Allen-King | Spring, Alt |
| 569 | Biogeochemistry | Bank | Spring, Alt |
| 568 | (Advanced) Environmental Organic Geochemistry | Allen-King | Fall, Alt |
| Geophysical processes | | | |
| 519 | Environmental Geophysics | Hou | Fall, Alt? |
| 5xx | Geophysical Data Analysis | Hou | ?/alt |
| 521 | Hydrogeophysics | Hou? | S/Alt+? |
| Other grad level courses taught by Environmental Geology faculty | | | |
| 505 | Economic Geology | Bank | Spring, Alt |
| 515 | Clay Mineralogy | Giese | F/Alt? |
| 563 | Advanced Environmental Hydrogeology 1 (Transport)† | Becker | W '08, Alt |
| Other grad courses at UB | | | |
| CIE 569 | Hazardous Waste Management | Rabideau | Fall |
| CIE 556 | Physiochemical Unit Processes (Waste water treatment) | Van Benschoten | Spring |
| CIE 541 | Groundwater Engineering | Jankovik | Spring |
| CIE 641 | Advanced Groundwater | Jankovik | Fall |

*Taken in first semester of graduate enrollment

Courses by Environmental Geosciences Faculty:

GLY 405/505 ECONOMIC GEOLOGY

This course will describe the nature and origin of the raw materials that sustain modern life styles and developed societies. Lectures will emphasize the formation of economic deposits of metallic and non-metallic minerals, methods of mineral exploration and exploitation, and the environmental consequences of utilizing mineral resources. The laboratory will focus on identification of ore and associated gangue minerals using microscopic and macroscopic methods. (Bank, LEC & LAB, 3)
Suggested prerequisite knowledge: mineralogy

GLY 501 RESEARCH METHODS

A course appropriate for most incoming graduate students. It includes literature review techniques using the latest library data base tools, proposal writing, scientific review and publishing, effective oral and poster presentation methods. The most important product of this course is the completed thesis or research project (MA students) proposal. (Allen-King, LEC, 3).

GLY 514 HYDROGEOLOGY

Occurrence and movement of water in the shallow subsurface, and its importance to water resource development and environmental pollution. Basic quantitative techniques for the prediction of water flow through porous and fractured geologic media. Laboratory includes hands on experience with aquifer testing methods, using wells located on campus. Designed primarily for students interested in the fields of hydrogeology, hydrology, environmental geology and environmental and

geotechnical engineering, who have not completed a previous quantitative undergraduate course in hydrogeology. (Becker, LEC & LAB, 3) Suggested prerequisite knowledge: differential equations

GLY 515 CLAY MINERALOGY

Clay minerals are the most abundant minerals at the surface of the earth. As such, they are of extreme importance in understanding environmental problems. In addition, clay minerals have interesting and useful properties that give them important technological value. This course examines the structure and chemistry of clay minerals and attempts to relate these to their properties, both geological and technological. (Giese, LEC & LAB, 4) Suggested prerequisite knowledge?

GLY 519 ENVIRONMENTAL GEOPHYSICS

The course will introduce the theoretical background and methods of application for several noninvasive near-surface geophysical imaging techniques, including: seismic reflection/refraction, microgravity, magnetics, electromagnetics, resistivity, and ground-penetrating radar. (Hou, LEC, 3) Suggested prerequisite knowledge: differential equations and calculus based physics

GLY 520 ENVIRONMENTAL GEOPHYSICS LAB

The course will provide students with hands-on experience in experimental design, acquisition, data processing, and interpretation using several noninvasive, near surface geophysical imaging techniques, including: seismic reflection/refraction, microgravity, magnetics, electromagnetics, resistivity, and ground-penetrating radar. (LAB, 1)

GLY 521 HYDROGEOPHYSICS

The course will provide a hands-on introduction to collection, processing, and interpretation of the most frequently used geophysical and hydrological data. The geophysical component will cover seismic refraction, ground-penetrating radar, and electrical resistivity. The hydrological component will cover hydrogeologic data collection and the numerical modeling of ground-water flow (Becker, LEC, 3)

GLY 525 GEOCHEMISTRY SEMINAR

Various topics related to the environmental geochemistry research program. (Allen-King, Bank, Giese LEC & LAB, 1-4)

GLY 562 ADVANCED ENVIRONMENTAL GEOCHEMISTRY

(Allen-King, LEC/LAB, 3) Suggested prerequisite knowledge: a one year sequence of introductory university chemistry

GLY 563 ADVANCED ENVIRONMENTAL HYDROGEOLOGY 1

Addresses the movement and behavior of contaminants in ground water. The underlying physics of water, solute, and particle transport will be emphasized in lecture, hands-on numerical simulation or field experiments are emphasized in the lab. Prior completion of an introductory hydrogeology course is highly recommended. (Becker, LEC/LAB, 3)

GLY 568 ENVIRONMENTAL ORGANIC GEOCHEMISTRY

In this course, students will learn about the processes that affect the fate and transport of organic chemicals in the hydrosphere. Course content will emphasize the study of the behavior of both organic contaminants in surface and ground water environments, with some coverage of the behavior of natural organic geochemical cycles. Upon completion of the course, students are expected to be confident in their use of physical and biogeochemical data to predict the important processes that will affect a particular organic compound in the hydrosphere. (Allen-King, LEC, 3) Suggested prerequisite knowledge?

GLY 569 BIOGEOCHEMISTRY

Reviews the importance of bacteria in geologic systems. Focuses on bacterial metabolism, including aerobic and anaerobic organisms, and their role in bioremediation of toxic metals. (Bank, LEC,3)

GLY 595 HYDROGEOLOGY SEMINAR

Reviews in advanced hydrogeology based upon published literature, ongoing research, or the participation of visiting scientists. Specific topic will vary according to the interests of participating faculty and students. (Becker, Allen-King, SEM, 1-3)