

GEOSCIENCES

Greenquist 345 • 262-595-2327 • Keyword: *Geosciences*

Degree Offered:

Bachelor of Science.

Professor:

Li, Ph.D. (Chair)

Associate Professor:

Skalbeck, Ph.D.

Assistant Professor:

Cleary, Ph.D.

Student Organizations/Clubs:

Geosciences Club; Sigma Gamma Epsilon.

Career Possibilities

Students in the Geosciences Department select between two concentrations: environmental geosciences or earth science, depending on their career goals.

The environmental geosciences concentration will prepare students for employment in private sector and various governmental agencies. Students completing this concentration will also have appropriate course work to be eligible for the certification exam as a professional geologist and/or professional hydrogeologist in Wisconsin. The expertise in hydrogeology and contaminant fate and transport afforded by this concentration can lead to employment as an environmental geoscientist in a variety of governmental and private organizations. Students interested in taking certification exams as professional soil scientists in Wisconsin may choose electives in soil science. Graduates with this background may work with governmental and private agencies in such applied fields as water resource management, soil conservation, and land-use planning.

The earth science concentration is extraordinarily flexible, as 15 credits of support courses are built into the major. These courses will be selected by the students and their advisers in order to develop a focal point related to their geosciences curriculum. The 15 credits are part of the major; therefore, a student electing to complete a minor cannot use these credits for that minor. Typical uses for the support courses include preparation for teacher licensure, law school, M.B.A. or M.P.A. programs.

Department Overview

The department's primary activities center around providing UW-Parkside students with a high-quality major program that will enable them to satisfy their specialized employment objectives. Toward this end, the Geosciences Department provides a core curriculum plus concentrations in environmental geosciences and earth science. Students electing the first concentration may choose to fulfill curricular requirements preparatory to professional certification by the state of Wisconsin as a geologist, hydrogeologist, or soil scientist. The earth science concentration provides a broad and flexible foundation for students with wide-ranging interests in the sciences, education, and the liberal arts. Furthermore, upper-level courses are intensively hands-on, enabling students to generate and analyze real-time data while gaining experience with innovative methods and instrumentation used by environmental professionals. The department has installed and maintains a network of ground water monitoring wells on campus and at other university properties in the community. These sites will serve students as hands-on learning sites, through which they can provide environmental quality assessment data that will assist surrounding communities in recognizing and interpreting long-term effects of land use changes. The department has also established an ozone monitoring program in Kenosha that tracks differences between off-shore and on-shore levels on a daily and seasonal basis.

It is the purpose of the Geosciences Department to become a key resource for environmental earth-system science at the UW-Parkside, and in Kenosha and Racine counties. To this end, the department fosters faculty, student, and staff involvement and investment in local and regional environmental issues. Geosciences faculty are also taking leadership roles in the establishment of the Root River Environmental Education Community Center (REC) in Racine, and the Center for Environmental Education and Research (CEDAR) in Kenosha.

The Geosciences Department encourages and supports research and publication by students in cooperation with faculty. The department also supports a program of student research projects on local environmental problems as part of the introductory and advanced courses. The department encourages and aids advanced students to attend professional society meetings at national, regional, and local levels. Departmental faculty members are actively engaged in research and continue to seek and obtain research support from appropriate federal, state, University of Wisconsin

System, and campus sources. Currently, the geosciences faculty is supported by UW System groundwater funding to do work related to remediation of heavy metal, organic, and anionic contaminants, and pharmaceuticals and personal care products in water.

Preparation for Graduate School

The environmental geosciences curriculum provides a strong background in mathematics and the physical sciences that prepares students for graduate work in the natural and environmental sciences. The earth science concentration—with an appropriate support course plan—is good preparation for advanced degree programs in law, public administration, education, and library science.

Requirements for the Geosciences Major (66-70 credits)

The Geosciences major requires a selection of core courses and courses in a concentration. Students select between two concentrations: environmental geosciences or earth science.

Core Courses required for all majors (16 credits):

GEOS 102	Origin and History of the Earth.....	3 cr
GEOS 104	Introductory Geology Laboratory	2 cr
GEOS 200	Minerals and Rocks	4 cr
GEOS 355	Stratigraphy and Sedimentation	3 cr
GEOS 495	Senior Seminar.....	1 cr
GEOS 496	Geoscience Applications	3 cr

Requirements for the Environmental Geosciences Concentration (51-54 credits)

GEOS 101	Introductory Geology.....	3 cr
GEOS 106	Great Lakes Water Resources.....	3 cr
OR		
GEOS 109	Fundamentals of Global Climate Change.	3 cr
GEOS 331	Introduction to Geochemistry	3 cr
GEOS 345	Geophysics	3 cr
OR		
GEOS 330	Environmental Geology.....	4 cr
GEOS 361	Hydrogeology.....	3 cr
GEOS 431	Aqueous & Contaminant Geochemistry.....	3 cr
GEOS 470	Remediation Science and Technology	3 cr
OR		
GEOS 440	Contaminants in Terrestrial Systems ..	3 cr
GEOS 445	Environmental Sampling, Monitoring, & Assessment.....	4 cr
GEOS 465	Applied Hydrogeology	4 cr
MATH 114	College Algebra II w/Trigonometry	5 cr
MATH 221	Calculus & Analytic Geometry I.....	5 cr

OR		
GEOS 295	Math for Geosciences	3 cr
CHEM 101	General Chemistry I.....	5 cr
CHEM 102	General Chemistry II	5 cr
PHYS 101	Principles of Physics.....	4 cr

Requirements for the Earth Science Concentration (47 credits)

Required courses (32 credits):

GEOS 100	Earth in Perspective	3 cr
OR		
GEOS 101	Introductory Geology.....	3 cr
OR		
GEOS 103	Environmental Science: An Earth Resources Approach	3 cr
GEOS 106	Great Lakes Water Resources.....	3 cr
GEOS 109	Fundamentals of Global Climate Change	3 cr
GEOS 207	Field Methods	2 cr
GEOS 301	Geomorphology	3 cr
GEOS 330	Environmental Geology.....	4 cr
GEOS 420	Glacial Geology	4 cr
GEOG 382	Soil Ecosystems and Resources.....	4 cr
ENVS 335	Energy.....	4 cr
MATH 102	Survey of Mathematics.....	3 cr
	(or higher)	
CHEM 100	The World of Chemistry.....	3 cr
OR		
CHEM 109	Environmental Chemistry.....	3 cr

Elective courses (15 credits):

Supporting geosciences courses must be 300 and above.

Requirements for the Geosciences Minor (18 credits)

The geosciences minor offers students who are majoring in other academic disciplines, either in science or non-science areas, the opportunity to acquire an appreciation and basic knowledge of geology. This may enhance and add flexibility regarding career opportunities.

Students must complete a minimum of 18 credits in geosciences as follows:

Required courses (12 credits):

GEOS 101	Introductory Geology (or acceptable substitute)	3 cr
GEOS 102	Origin and History of the Earth.....	3 cr
GEOS 104	Introductory Geology Laboratory	2 cr
GEOS 200	Minerals and Rocks.....	4 cr

Elective courses (6 credits):

Six additional geology credits; 3 of the 6 credits must be upper level (300/400).

Courses in Geosciences (GEOS)

100 Earth in Perspective..... 3 cr

Prereq: None. Freq: Fall, Summer.

Survey of the physical environment, including Earth's place in space, atmospheric processes, the oceans, and the solid earth; humanity's place in the system. Three-hour lecture.

101 Introductory Geology..... 3 cr

Prereq: None. Freq: Fall.

Origin, age, and structure of the Earth; mountain building, volcanism, and continental drift; earth materials; rocks, minerals, and mineral and fossil fuel resources. Field trips. Three-hour lecture.

102 Origin and History of the Earth..... 3 cr

Prereq: A 3-credit college level geosciences course.

Freq: Fall (even years).

Origin of the solar system and Earth; age of the Earth; origin of the oceans, atmosphere and life; geologic and life history. Field trips. Three-hour lecture.

103 Environmental Science:

An Earth Resources Approach 3 cr

Prereq: None. Freq: Fall.

Interactions between earth system processes and human activities: geologic hazards, water quality, pollution, land use, energy, mineral resources. Uses the physical earth to enable student consideration of the settings and values that produce environmental quality. Meets DPI content requirement in environmental education.

104 Introductory Geology Laboratory 2 cr

Prereq: GEOS 101 (or acceptable substitute).

Freq: Spring (even years).

Rock, mineral, and fossil identification; topographic and geologic map interpretation; aerial photographs; hydrology, soils, and environmental geology. Field trips. Six-hour lab.

105 Oceanography..... 3 cr

Prereq: None. Freq: Spring.

Origin of ocean basins; nature of seawater; ocean circulation; waves and tides; life in the sea; marine resources. Course specifically intended for non-majors. Three-hour lecture.

106 Great Lakes Water Resources 3 cr

Prereq: None. Freq: Spring.

Physical and geologic history and description of the Great Lakes region. Emphasis on hydrologic cycle, economic resources of the Great Lakes, pollution and other environmental issues. Three-hour lecture.

108 Dirt Appreciation: Soils for Survival..... 3 cr

Prereq: None. Freq: Occasionally.

Provides an understanding of the critical role of soils in determining and maintaining environmental quality. Also introduces the scientific foundations for using soil surveys in land-use planning. Three-hour lecture.

109 Fundamentals of Global Climate Change..... 3 cr

Prereq: None. Freq: Spring.

Survey of current state of climate science including Earth's energy budget, the atmosphere, the greenhouse effect, ocean circulation, climate feedbacks, climate modeling and Earth's past climate. Also considers uncertainty in projections of future climate and solutions involving carbon sequestration, carbon-trade markets and energy efficiency. Three-hour lecture.

200 Minerals and Rocks 4 cr

Prereq: GEOS 104 or consent of instructor. Freq: Fall (odd years).

Internal order of crystals; physical, chemical, and optical properties of minerals; mineral identification; mineral associations and the classification of igneous, metamorphic, and sedimentary rocks; ore deposits. Field trips. Three-hour lecture, three-hour lab.

207 Field Methods..... 2 cr

Prereq: GEOS 101, 104. Freq: Spring (odd years).

Field methods used in geologic study, including occurrence and contact relations of geologic bodies, geologic mapping, rock, soil and water sampling. Field trips.

290 Special Topics in Geosciences 1-4 cr

Prereq: Consent of instructor. Freq: Occasionally.

Selected topics in the geosciences will be examined.

300 Petrology 3 cr

Prereq: GEOS 102, 200. Freq: Occasionally.

Origins of igneous, sedimentary, and metamorphic rocks. Review of hand sample and microscopic description; chemical analysis; nature and origin of magma; phase equilibria; magmatic series and differentiation; deposit and diagenesis of sediments; metamorphism. Field trips. Two-hour lecture; four-hour lab.

301 Geomorphology..... 3 cr

Prereq: GEOS 102, 200; or consent of instructor.

Freq: Spring (even years).

Analysis and description of landforms; emphasis on genesis, surficial processes, and relation to geologic structure. Includes some regional treatment of landscapes. Field trips. Two-hour lecture; three-hour lab.

309 Paleontology 3 cr

Prereq: GEOS 102 or BIOS 102 or consent of instructor.

Freq: Occasionally.

Principles, practices, and procedures applied to important fossil invertebrate groups; generalized discussion of plants and vertebrates; elements of biostratigraphy; paleoenvironmental interpretations. Field trips. Two-hour lecture; four-hour lab.

310 Structural Geology..... 3 cr

Prereq: GEOS 102, 200, or consent of instructor.

Freq: Occasionally.

Formation and description of folds, faults, joints, and foliation; tectonic processes; structures related to intrusive and extrusive igneous rocks; interpretation of geologic maps; field techniques. Field trips. Two-hour lecture; three-hour lab.

320 Soils, Weathering, and Surficial Processes 4 cr

Prereq: GEOS 104, CHEM 101. Freq: Occasionally.

Presentation of soils as natural entities in a process-based context. Methods and terminology of soil description and classification. Evaluation of environmental capacity of soils on a quantitative basis. Three-hour lecture; three-hour lab.

330 Environmental Geology..... 4 cr

Prereq: GEOS 104. Freq: Spring (odd years).

Application of basic geologic concepts to environmental problems; emphasis on geologic hazards, waste disposal, urban planning, resource policy issues, and environmental trends and programs. Field trips. Three-hour lecture; three-hour lab.

331 Introduction to Geochemistry 3 cr

Prereq: CHEM 102 or equivalent. Freq: Spring (even years).

Chemical principles and their application to various geologic environments; chemical weathering, geochemical prospecting; phase equilibria; geochronology. Field trip. Three-hour lecture.

345 Geophysics..... 3 cr

Prereq: GEOS 102, MATH 114 or consent of instructor.

Freq: Spring (even years).

Surface and subsurface geophysics; principles and procedures of magnetics, gravity, seismology, electromagnetics, ground penetrating radar; applications in hydrogeology, petroleum and mineral exploration, environmental and water resource investigations. Field trips. Three-hour lecture.

355 Stratigraphy and Sedimentation 3 cr*Prereq: GEOS 102, 200 or consent of instructor.**Freq: Spring (odd years).*

The sedimentary rock record, correlation, nomenclature, paleotectonics, subsurface techniques, sedimentary processes and environments, recent sediments. Field trips. Two-hour lecture; three-hour lab.

361 Hydrogeology 3 cr*Prereq: GEOS 200, MATH 114 or consent of instructor.**Freq: Spring (even years).*

Surface water hydrogeology; runoff and stream flow; ground water hydrogeology; distribution of ground water, aquifer properties, local and regional ground water flow, geology of ground water occurrence; aqueous chemistry, and water quality. Field trips. Three-hour lecture.

370 Field Studies in Regional Geology 1-4 cr*Prereq: GEOS 102 and consent of instructor.**Freq: Occasional summers.*

Intensive study of the geology of selected regions. Application of field methods. Based upon a field trip of up to several weeks duration to a selected region. May be repeated for credit. Additional fees required.

390 Special Topics 1-4 cr*Prereq: None. Freq: Occasionally.*

Selected topics in the geosciences will be examined. May be repeated for credit with different topic.

420 Glacial Geology 4 cr*Prereq: GEOS 102 or consent of instructor.**Freq: Spring (odd years).*

Regimen and flow of glaciers; glacial erosion and deposition; glacial landforms; Pleistocene history in glaciated and nonglaciated regions; stratigraphy and chronology of Pleistocene deposits in the Midwest and Great Lakes. Field trips. Three-hour lecture; three-hour lab.

431 Aqueous and Contaminant Geochemistry 3 cr*Prereq: GEOS 331 or equivalent. Freq: Fall (even years).*

Solution chemistry; aqueous chemical speciation, organic chemistry; contaminant-sediment interaction; contaminant fate and transport. Field trip. Two-hour lecture; three-hour lab.

440 Contaminants in Terrestrial Systems 3 cr*Prereq: GEOS 331. Freq: Occasionally.*

Sources, transport, and fate of major environmental contaminants; natural and anthropogenic processes affecting contaminant mobility and bioavailability; cycling of contaminants through terrestrial ecosystems and the vadose zone. Three-hour lecture.

445 Environmental Sampling, Monitoring, and Assessment 4 cr*Prereq: GEOS 361, 440. Freq: Fall (odd years).*

A hands-on methods survey course, using EPA-referenced field and laboratory methods for evaluating contaminant levels in terrestrial and ground water systems. Students learn and practice sampling and monitoring techniques and gain experience with chromatographic and spectroscopic techniques. Two-hour lecture; six-hour lab.

465 Applied Hydrogeology 4 cr*Prereq: GEOS 361. Freq: Fall (even years).*

Mass transport in vadose and saturated zones; origin and behavior of inorganic and organic contaminants; investigative techniques; ground water models; site remediation; ground water resource development and management; water law. Field trips. Three-hour lecture, three-hour lab.

470 Remediation Science and Technology 3 cr*Prereq: GEOS 430. Freq: Spring (even years).*

Methods and techniques for reducing, removing or immobilizing metals and radionuclides, including natural attenuation, *in situ* stabilization, phytoremediation and bioremediation. Each student will propose and test a new method or a new application of an established method, devised with guidance from research faculty. Three-hour lecture.

490 Special Topics in Geosciences 1-4 cr*Prereq: Consent of instructor. Freq: Occasionally.*

Intensive treatment of specialized areas in the geosciences.

495 Senior Seminar 1 cr*Prereq: Senior standing, GEOS 355. Freq: Spring.*

Individual student preparations and detailed oral and written presentations, in professional-style format, on knowledge of specialized topics acquired through library, laboratory, and/or field research. May be repeated for credit.

496 Geoscience Applications 3 cr*Prereq: Senior standing, GEOS 355, or consent of instructor.**Freq: Fall (even years).*

Course in which students apply their knowledge in service to the community. Project may involve teamwork on environmental assessment, land-use planning, etc., or individual internships with corporate or governmental agencies. Culminates in report/recommendation based on investigations.

497 Senior Thesis 1-2 cr*Prereq: Senior standing and consent of instructor.**Freq: Fall, Spring.*

Familiarization with the processes of research and scientific writing based upon laboratory, field, and literature study; oral defense of the thesis. Course may be repeated for up to 4 credits.

499 Independent Study 1-2 cr*Prereq: Consent of instructor and department chair.**Freq: Fall, Spring.*

Individual investigation of selected problems in the geosciences. Allows students to pursue independent field, laboratory, or library research interests under supervision of faculty members. Maximum 6 credits.

Graduate Courses

570 Field Studies in Regional Geology 1-4 cr*Prereq: Consent of instructor and department chair.**Freq: Occasional summers.*

Intensive study of the geology of selected regions. Application of field methods. Based upon a field trip of up to several weeks duration to a selected region. May be repeated for credit. Additional fees required.

690 Special Topics in Geosciences 1-4 cr*Prereq: None. Freq: Occasionally.*

Intensive treatment of specialized areas in the geosciences.