Department of Geosciences

UMKC 2007-08 Graduate and Professional Catalog (1.0)

June 12, 2007

Contents

Department of Geosciences

Atmospheric Sciences-Environmental Studies-Geography-Geology
Robert H. Flarsheim Science and Technology Hall
5110 Rockhill Road, Room 420
(816) 235-**1334**
Fax: (816) 235-**5535**
geosciences@umkc.edu
http://cas.umkc.edu/geo

Mailing Address
University of Missouri-Kansas City
Department of Geosciences
RHFH 420
5100 Rockhill Road
Kansas City, MO 64110-2499

Department Chair:
Syed E. Hasan
Director of Environmental Studies:
Caroline P. Davies
Professors:
Raymond M. Coveney, Jr., Steven L. Driever (director, urban studies), Syed E. Hasan (chair and director, CAER), Wei Ji (graduate geography adviser)
Associate Professors:
Jimmy O. Adegoke (principal undergraduate geography adviser), Daniel P. Hopkins (undergraduate environmental studies adviser), James B. Murowchick (principal graduate adviser), Tina M. Niemi (principal undergraduate geology adviser)
Assistant Professors:
Caroline P. Davies (undergraduate environmental studies adviser and director, environmental studies program), Jejung Lee
Professors Emeriti:
Richard J. Gentile, Edwin D. Goebel, Paul L. Hilpman, Eldon J. Parizek

Department Description

The Department of Geosciences offers programs of study leading to bachelor of science and bachelor of arts degrees in environmental studies, geography and geology. The department offers a unique master of science degree program in environmental and urban geosciences.

Faculty members also participate in the Interdisciplinary Ph.D. program. The department also offers a graduate-level Waste Management Certificate Program. Those who designate geosciences (geology or geography focus) on their application for admission to the doctoral program must meet admission and other requirements available from the department. See the School of Graduate Studies section of this catalog for more information about doctoral programs. The department takes a lead role in the undergraduate interdisciplinary environmental studies program. Courses offered by the department can be used to fulfill the requirements of the Missouri Department of Education for earth science and science-math teaching specialties.

All students in the Department of Geosciences must maintain a minimum grade-point average above 3.0 in each course taken to fulfill departmental degree requirements. This minimum GPA applies to all UMKC courses and to all credit hours transferred from other institutions and accepted by the department.

Special Resources/Services

Geosciences Museum
The Geosciences Museum, founded by Richard L. Sutton, M.D., located in Room 271, R.H. Flarsheim Hall, contains relief models and interactive displays along with a full range of 2,500 spectacular specimens from all over the world. Hours of operation are 8:30 a.m. to 4:30 p.m. weekdays and 10 a.m. to 4 p.m. on Saturdays, whenever school is in session. Admission is free.

Center for Applied Environmental Research (CAER)
The Center for Applied Environmental Research http://cas.umkc.edu/caer is administered by the Geosciences Department (professor Syed E. Hasan, director). The center is a resource for governmental agencies, private firms and the general public in matters of the environment. Its programs address such matters as applied geophysics, environmental geochemistry, underground space, foundation stability, waste management, geologic hazards, environmental justice, natural resource assessment and land-use planning.

Student Learning Outcomes

Students in all graduate programs in which the Department of Geosciences participates are required to complete and publicly defend their thesis or dissertation before they can be awarded their M.S. or doctoral degree. Doctoral students must also pass a comprehensive examination.

Graduate Certificate in Waste Management

In keeping with the demand for trained professionals in the field of waste management, a new *Graduate Certificate Program in Waste Management* was launched in 2003. The program is designed for professionals working in the waste management industry who desire advanced knowledge in the field but do not have the time to enroll in a graduate degree program that may take up to two years to complete. The graduate certificate program is designed to meet this need and also to enable students holding a bachelor's degree in an appropriate discipline to improve their knowledge in the waste management field and to prepare them to enter the waste management industry with advanced knowledge at the graduate level. The carefully designed curriculum for this program consists of 15 credit hours of course work that covers every important aspect of waste management. Field visits to waste disposal facilities and a 5-day OSHA-approved Hazardous Waste Operator Training (HAZWOPER) course are included in the curriculum.

Required Courses
ENVS 310 Field Experience in Waste Management
GEOL 335 Introduction to Waste Management
GEOL 5512 Geology and Hazardous Waste Management
GEOL 5534 Hazardous Waste Operation Management
GEOL 5570 Hydrogeology
GEOL 5597 Graduate Seminar

Master of Science: Environmental and Urban Geosciences

The Department of Geosciences offers a master of science degree in environmental and urban geosciences, the only such program in North America. This unique program prepares students, depending on their emphasis area, for advanced study of different facets of the environment including: environmental issues and geospatial methods (GIS and Remote Sensing), natural hazards, environmental remediation, waste management, air and water pollution, resource evaluation and management, geoarchaeology, historical geography, and urban land use and planning. Although the program allows students

to select an emphasis area for more intensive study, all students are required to complete a core curriculum and a thesis.

Admissions Requirements

For full admission to the graduate degree program in environmental and urban geosciences (Code 6, degree-seeking status), the following requirements must be met:

1. Completion of an undergraduate degree with a major in a geosciences field (such as environmental studies, geography or geology) and a grade-point average of at least 3.0 (A = 4.0) overall, as well as in the major.
2. A satisfactory score on the Graduate Record Examination (combined Verbal and Quantitative test score of 1000 or higher; Analytical Writing score 4.0 or higher). Lower scores may be accepted in certain cases.

With department approval, students with non-geoscience undergraduate degrees may be admitted on a non-regular degree-seeking basis (Code 6-V). After successfully completing recommended courses for the appropriate undergraduate geoscience degree, including prerequisites, these students may be granted degree-seeking status.

Graduate Assistantships

Teaching and research assistantships are awarded on a competitive basis to incoming graduate students. Assistantship applications and all supporting materials should be submitted by March 15 for fall enrollment.

Core Curriculum

		Hours
GEOG 5544	Geo-Computation Methods for Earth and Environmental Sciences	3
GEOG 5595 /GEOL 5595	Graduate Seminar I	1
GEOG 5597 /GEOL 5597	Graduate Seminar II	3
GEOG 5599 /GEOL 5599	Research and Thesis	3-6

Emphasis Areas

Students must select one of the following emphasis areas:

Environmental Geography and Geographic Information Science

The Environmental Geography and Geographic Information Science emphasis area will prepare students with a wide range of knowledge on environmental issues and geospatial methods (GIS, remote sensing, and environmental modeling). Required courses for students in this area are:

		Hours
GEOG 5502	Environmental Remote Sensing	3
GEOG 5506	Global Environmental Change	3
GEOG 5507	Advanced Geographic Information Science	3

Based on student interest and departmental research priorities, students may also take courses in such areas as biogeography, climatology, ecosystem management, hydrology, and quaternary environments.

Environmental Geology

The Environmental Geology emphasis area provides opportunities for advanced study of geology with emphasis on human interaction with the environment. Hydrogeology, neotectonics, geochemistry, and environmental hazards and remediation are among the possible specialties a student could pursue in this emphasis area. Required courses for students in this area are:

		Hours
GEOL 5551	Geotechnics	4
GEOL 5570	Hydrogeology	3
One of the following:		
GEOL 5531	X-ray Methods in Geosciences	
-and- GEOL 5532	ICPMS Applications	4
GEOL 5535	Aqueous Geochemistry	3
GEOL 5541	Environmental Geophysics	3

Other coursework may include appropriate geology courses, as well as related departmental courses, especially those in geographic information science.

Urban and Cultural Geography

Students choosing this emphasis area can pursue studies in cultural geography, historical geography, history of cartography, geoarchaeology, regional analysis and development, and urban geography and planning. Required courses for students in this area are:

		Hours
GEOG 5503	History and Philosophy of Geography	3
GEOG 5507	Advanced Geographic Information Science	3
GEOG 5509	Urban Geography	3

Other coursework may include appropriate geography courses, as well as related departmental courses and cognate courses in other departments.

Requirements for Retention

1. For newly admitted graduate students, elimination of all undergraduate deficiencies (if any) in the undergraduate major and its supporting prerequisites is required upon or before the completion of the first 12 hours of coursework for graduate credit. No graduate credit can be given for undergraduate courses taken to remove deficiencies.
2. All students are required to pass a qualifying examination administered by the department during their first year.
3. A 3.0 (B) average or better must be maintained in all graduate coursework. In addition, a 3.0 (B) average and a satisfactory balance of grades must be maintained in the approved program of study, or the student will be subject to either probationary status or dismissal from the program.

Requirements for Graduation

1. Formal acceptance of a planned program of study and research is required by the department and the graduate officer of the College. Such a program must comprise at least 30 graduate credit hours (approved by the supervisory committee), including 3 to 6 hours of thesis credit, and completion of the core curriculum and emphasis area requirements. No more than 40 percent of the program may be 300- to 400-level courses, and at least 18 credit hours must be at the 5500 level or above.
2. A formal written thesis is required of all students, and its format must be in accordance with guidelines of School of Graduate Studies.
3. A final examination is required, including oral examination of thesis research and related coursework.
4. Satisfactory compliance with all applicable requirements of the School of Graduate Studies is required, including continuous enrollment and residency.

Geography (GEOG) Courses

5502 Environmental Remote Sensing And Digital Image Analysis (3). This course will provide students with innovative techniques for landscape-level environmental analysis, geographic and geological studies, earth science research, and environmental resources management using remotely sensed data including satellite images. Students will be taught basic remote sensing concepts and technical skills, including energy radiative transfer processes, in remote sensing, sensors and resolutions, computer-based image processing and classification, and remote sensing/GIS integration. Prerequisite: Geog 203 or permission of instructor

5503WI History And Philosophy Of Geoscience (3). A survey of geoscientific thought since antiquity. The substance of geography will be sought primarily in scholarly treatises, formal analytical systems, and cartography, but the course also addresses geographical principles emerging from the history of such matters as government, law economy, religion, and material culture. Readings, lectures, discussions, research, writing. Prerequisite: Baccalaureate degree or permission of the instructor. On demand. Also offered as Geography 403WI. Prerequisites: Baccalaureate degree or permission of instructor

5504 Biogeography And Landscape Ecology (3). Principles and applications of biogeography and landscape ecology, emphasizing distribution of major ecosystems and related plants and animal species on earth, biodiversity, landscape patterns and processes, and physical, biological, and human interactions. The course explores ecosystem and landscape analyses using advanced GIS, remote sensing, and spatial modeling methods for real problem solving in environmental and biological research, ecosystem conservation, and urban planning and studies. Prerequisites: Geog 203, Geog 402/5502, or permission of instructor.

5506 Global Environmental Change (3). This course will examine the current rates of global environmental change and potential causes in the context of Earth's natural climate variability. The course will follow a seminar format. Students will read and discuss published articles on current and emerging theories of forcing mechanisms in the Earth's systems. Additional in-depth research and written evaluation are required for graduate credit. Prerequistes: None

5507 Advanced Geographic Information Science (3). Prerequisite: Geography 203 or permission of instructor Offered: On Demand

5509 Urban Geography (3). Historical development, morphology and functions of urban places, including intercity relationships and the relationship between cities and their hinterlands; emphasis on American cities. Students will complete a series of reports and a term paper. Offered: On Demand

5510 Landscape, Language, Literature, And Law (3). An examination of the geographic underpinnings and implications of languages, literatures, and jurisprudence. The course explores languages' historic rootedness in the interactions between human beings and their surroundings; the varying geographic expressiveness and discrimination of languages; the effect and significance of literary evocations of landscapes; and the cultural and environmental geographic content of the language of law. Readings, lectures, discussions, writing. Prerequisite: Permission of the instructor. Offered: On demand. Also offered as Geography 410.

5515 History And Philosophy Of Cartography (3). An examination of the techniques, assumptions, psychology, and cultural implications of mapping from the Stone Age to the age of satellites and the computerized Geographic Information System. Readings, lectures, discussions, writing. Prerequisite: Baccalaureate degree or permission of the instructor. Offered: On demand. Also offered as Geography 415.

5526 Paleoecology: Microfossils And Climate Change (3). Paleoecology will focus on questions addressing past environments and past climates based on the ecology of microfossils. Micro-organisms are very sensitive to a wide variety of environmental conditions including temperature, precipitation, hydrology, water chemistry, salinity, habitat, and pollution. The fossil remains of these organisms are used as proxy indicators for reconstructiong past environmental conditions, climate change, vegetation dynamics, and human impacts. Students will have the opportunity to process microfossils and make interpretations based on analysis of data. Offered: Every other Fall Prerequisite: Permission of Instructor

5530 Location Theory (3). An analysis and evaluation of the basic theories that have been developed to account for the spatial arrangements of economic activity. Emphasis on urban areas as nodes of economic interaction. Three hours lecture and discussion per week. Prerequisite: Geography 311 and six hours in economics or urban studies. On demand.

5542 Quaternary Environments (3). This course reviews earth climatic history and focuses on major mechanisms for global and regional climate change. Methods of paleoclimatic reconstruction are examined, including analysis of proxy data and climate modeling. Application of these methods toward prediction of future climate change is also explored. On demand. Also offered as Geography 442.

5544 Geo-Computation Methods For Earth And Environmental Sciences (3). This course will focus on advanced computation methods for the analysis and modeling of complex and often non-deterministic processes in the spatial and environmental sciences. Students will be introduced to innovative techniques for analyzing large datasets with attribute spaces of very high dimensionality, including hyper-spectral remote sensing data. Prerequisites: Geog 402 or permission of instructor.

5548 Satellite Climatology (3). Use of satellite observations to study the climate system. Discussions consider the development of satellite climatology, sensors, platforms and methodologies use to estimate climate variables from radiance measurements. Aspects of climate that are emphasized include cloud climatologies, cloud systems, atmospheric moisture, radiation budget, and land-surface conditions. Prerequisites: Geog 315 or permission of instructor. Offered: Every other Fall

5595 Graduate Seminar In Geosciences I (1). An introduction to graduate research in the Dept. of Geosciences. Students will attend lectures by faculty and become familiar with research techniques, equipment, and thesis opportunities. Prerequisites: Baccalaureate Offered: Every Fall

5597 Graduate Seminar In Geosciences II (3). Graduate students in the Geosciences Department will explore the different components of a research project through readings, lectures, writing, and oral presentations. Offered: Winter

5598 Special Topics In Geography (1-3). Advanced independent research in Cultural or Physical Geography. Prerequisite: Baccalaureate. By arrangement with instructor.

5598A Special Topics In Cultural Geography (1-3). Advanced independent research in Cultural Geography. Prerequisite: Baccalaureate. By arrangement with instructor.

5598B Special Topics In Physical Geography (1-3). Advanced independent research in Physical Geography. Prerequisite: Baccalaureate. By arrangement with instructor.

5598D Special Topics In Advanced Gis And Remote Sensing (1-3). Advanced independent reserch in geographic information science (GIS) and remote sensing. Offered: On Demand Prerequisite: Permission of instructor

5598F Special Topics: Geostatistics And Modeling (1-3). Advanced independent research in geostatistics and modeling techniques. Offered: On Demand Prerequisites: Permission of instructor

5598K Issues In Waste Management (1). This course focuses on the critical problems of managing the waste materials generated in our society. The course includes discussion of various types of waste-municipal solid waste, hazardous (industrial) waste, nuclear and medical wastes. Sources, handling, storage, transportation, treatment and disposal of these wastes are reviewed. Experts from government and the waste management industry give guest lectures. Prerequisites: None. Offered: Fall & Winter.

5599 Research And Thesis Geography (1-9). Students will conduct research and writing in support of a thesis topic, which will have been approved in advance by the appropriate graduate advisory committee. Credit load will also be approved in advance by the student's graduate advisor. Offered: On Demand Prerequisite: Baccalaureate

5690 Special Research Topics (1-3). Student will produce a major research paper suitable for publication under the direction of their instructor.

5699R Research And Dissertation (1-10). Research for dissertation in partial fulfillment of the Geosciences requirements for the Ph.D. degree.

Geology (GEOL) Courses

5512 Geology And Hazardous Waste Management (3). Nature, sources and characterization of hazardous waste; collection, transportation and disposal of hazardous wastes. Fundamentals of toxicology and risk assessment. Application of geologic principles and methods in the assessments and remediation of abandoned hazardous waste sites and contaminated aquifers. Review of selected case histories. Experts from government and private organizations will be invited to deliver guest lectures. An out-of-town field trip to a hazardous waste site is required. A term paper based on library research or an approved experimental project is required for graduate credit. Pre-requisites: Geol 325, 342 & 350 or permission of the instructor.

5525 Quaternary Geology (3). The study of Quaternary processes, surficial deposits, and land forms. Course content will cover both the glaciated and nonglaciated portions of the United States as well as the interrelations between Quaternary geology and urbanization. Three hour lecture. Field trips. Prerequisite: Geology 314, baccalaureate degree in geology or permission of the instructor.

5531 X-Ray Diffraction And Fluorescence Methods: X-Ray Mthds Geol/Anly (2). Theory and practical application of x-ray diffraction and fluorescence methods in characterizing geologic materials. Prerequisite: GEOL 312 or consent of instructor. Two hours lecture and one 2-hour lab per week for 8 weeks.

5532 Icpms Applications In Geology (2). Theory and practical application of Inductively-Coupled Plasma Mass Spectrometry in the geosciences and environmental sciences. Prerequisite: GEOL 312 or consent of instructor. Two hours lecture and discussion, and one 2-hour lab per week for 8 weeks.

5534 Hazardous Waste Operation Management (2). Overview of federal regulations dealing with hazardous waste management, toxicology, hazard communication, site management, air monitoring, operating procedures, and health and safety. The course includes hands-on training on spill control, equipment use and emergency use and emergency response. Practical training involves physical stress and participants must be in good physical health. This course satisfies OSHA's 40 hour training requirement for hazardous waste personel. Prerequisites: Geog/Geol 335 or permission of instructor. Offered: Every Summer

5535 Aqueous Geochemistry (3). This course is directed to two objectives. First it will equip the students with a basic understanding of the geochemical principles and calculations which are directly related to environmental problems and second, it will provide the student with a basic understanding of specific problem areas in environmental geochemistry. Prerequisites: Chem 211 and 212 or equivalents. Baccalaureate degree in geology or permission of the instructor. Offered: On demand.

5541 Seismic And Potential Field Methods In Environmental Geophysics (3). (3) Fundamental theory and near-surface applications of the geophysical methods; (1) seismic refraction, (2) seismic reflection, (3) gravity, and (4) magnetics. Emphasis will be placed on the use of these methods in environmental and engineering investigations, addressing such issues as water resources, contaminant transport, geotechnical properties and archaelogical protection. Course will include a field component illustrating application of selected techniques to a local environmental problem. Prerequisites: Baccalaureate degree in Geology or permission of instructor. Offered: Fall

5542 Electrical Methods In Environmental Geophysics (3). (3) Fundamental theory and near-surface applications of the electrical geophysical methods; (1) electrical resistivity, (2) electromagnetics, (3) ground penetrating radar, and (4) induced polarization. Emphasis will be placed on the use of these methods in environmental and engineering investigations, addressing such issues as water resources, contaminant transport, geotechnical properties and archaeological protection. Course will include a field component illustrating application of selected techniques to a local environmental problem. Prerequisites: Baccalaureate degree in Geology or permission of instructor.

5551 Geotechnics (4). Integration of the basic principles and concepts from material sciences, rock and soil mechanics, and civil engineering. Mechanical properties, geologic aspects and engineering classifications of earth materials and the effects of physical forces on their engineering behavior will be emphasized. Three hours of lecture and two hours of laboratory each week. Field trips. Prerequisite: Physics 210, 220, 230, Geology 350 or permission of the instructor.

5555 Environmental Impact Analysis (3). A systematic analysis of the spectrum of environmental changes related to human use and occupancy in urban settings. Study of the nature of activities such as industrialization, mining, urbanization and transportation, and their effect on the specific site and general region. Methods of measuring aesthetic and economic quality of the urban areas will be explored in an attempt to facilitate writing environmental impact statements. Prerequisites: Baccalaureate degree in geology or permission of the instructor.

5559 Inquiry-Based Field Studies For Teachers (3-6). Inquiry-based studies in environmental science, environmental chemistry and geology involving collaborations between course participants, practicing scientists and professional educators. The course is designed especially for pre- and in-service teachers of all levels and contact areas to enhance critical thinking, problem solving and process skills as defined by state and national standards. Projects will balance field and lab studies with analysis and presentation of results through electronic, oral and written means. Prerequisites: Permission of instructor. Offered: On demand

5561 Geologic Mapping (3). Analysis of the stratigraphic section in the greater Kansas City area by field investigation. Compilation of descriptive data and the construction of detailed geologic maps. Practical problems to determine the most beneficial use of the land in an area that is rapidly becoming urbanized. Prerequisite: Baccalaureate degree in geology or permission of the instructor. Previous field mapping experience highly recommended.

5570 Hydrogeology (3). Geology and hydrologic factors controlling the occurrence, movement, quality, recovery and development of water supply and distribution. Problems relating to urbanization of flood plains. Prerequisite: Baccalaureate degree in Geology or permission of the instructor.

5571 Tectonics (3). A detailed inquiry into plate tectonics and the geophysical and geological data that define the motion of lithospheric plates. Global examples of divergent, convergent, and transform plate boundaries will be studied through lectures, discussions, problem sets, and term papers. Prerequisite: Geology 325 and 350. Offered: On demand.

5572 Earthquake Geology (3). This course is detailed inquiry into the study of present and past earthquakes as they are preserved in the seismological, geophysical, and geological record. Global examples of earthquakes will be studied through lectures, discussions, problem sets,term papers, field trips and field projects. Prerequisite: Geol 350 or permission of the instructor. Offered: On demand.

5595 Graduate Seminar In Geosciences I (1). An introduction to graduate research in the Dept. of Geosciences. Students will attend lectures by faculty and become familiar with research techniques, equipment, and thesis opportunities. Offered: Every Fall Prerequisite: Baccalaureate

5597 Graduate Seminar In Geosciences II (1-3). Graduate students in the Geosciences Department will explore the different components of a research project through readings, lectures, writing, and oral presentations. Offered: Winter Semester Prerequisites: Baccalaureate

5598 Special Topics In Urban Environmental Geology (1-3). Individual research into practical geoscience problems in the urban environment. Provides opportunity for individual research in applied geology. Topic and method to be established by student and academic supervisor prior to enrollment. Instructor: By arrangement.

5598A Special Topics In Urban Environmental Geology: Petroleum Geology (1-3).

5598B Spec Topics In Urban Environmental Geology: Soil/Rock Mechanics (1-3).

5598C Sp Topics In Urban Environmental Geol: Stratigraphy/Paleontology (1-3).

5598D Spec Topics In Urban Environmental Geology-Environmental Geology (1-3).

5598E Special Topics In Energy And Mineral Resources (1-3). This course provides students an opportunity for advanced independent research in energy and mineral resources. Prerequisite: Permission of instructor

5598H Special Topics In Urban Environmental Geology - Geochemistry (1-3).

5598I Special Topics In Urban Environmental Geology (1-3).

5598J Special Topics In Urban Environmental Geology: Environmental Sci (1-3).

5598K Issues In Waste Management (1). This course focuses on the critical problems of managing the waste materials generated in our society. The course includes discussion of various types of waste-municipal solid waste, hazardous (industrial) waste, nuclear and medical wastes. Sources, handling, storage, transportation, treatment and disposal of these wastes are reviewed. Experts from government and the waste management industry give guest lectures. Prerequisites: None. Offered: Fall & Winter.

5598M Special Topics In Geostatistics And Modeling (1-3). Advanced independent research in geostatistics and modeling techniques. Prerequisite: Permission of instructor Offered: On demand

5599 Research And Thesis: Geology (1-9). Individual directed research by the student leading to the preparation of a formal written thesis and oral defense. Instructor: By arrangement.

5690 Special Research Topics (1-3). Student will produce a major research paper suitable for publication under the direction of their instructor.

5699R Research And Dissertation (1-10). Research for dissertation in partial fulfillment of the Geosciences requirements for the Ph.D. degree.

5899 Required Graduate Enrollment (1).