

Department of Geosciences

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The Department of Geosciences offers a graduate certificate in Geoscience. The certificate program consists of 12-16 hours taken from a variety of geography and geology courses. The certificate in Geoscience should be of particular interest to those in the private sector, K-12 and community college education, and government agencies. The department also offers a minor at the graduate level. Hours taken in the certificate program normally can be applied toward the minor.

The required courses for the graduate certificate in Geoscience are

GEOL 5060 Principles of Geoscience, 4 hours

One of the following:

GEOG 5530 Geographic Information Systems, 4 hours

GEOG 5490 Remote Sensing, 4 hours

Required courses total 6–8 hours credit. In addition to the required hours listed above, students will take 6–8 additional hours in geography and/or geology under the guidance of their academic advisors for a total of 12 to 16 hours to complete the graduate certificate in Geoscience.

Courses in Geography [GEOG]

- 5280 **Special Problems and Topics in Geography.** One to six credits. Research participation or guided readings in a particular area or topic appropriate to the student's interests and professional objectives. The type and amount of additional work will be decided upon when student registers for the course.
- 5310 **Resource Management and Conservation.** Three credits. Current problems related to an intelligent use and management of our environmental resources. Additional projects, reports, and/or papers.
- 5320 **Economic Geography.** Three credits. Relationship of the physical factors of the environment to the productive occupations of humans and the distribution of the products produced. Additional projects, reports, and/or papers.
- 5330 **Political Geography.** Three credits. Significance of geographical factors in understanding political relationships within and among nations; spatial implications of political decision-making processes. Additional projects, reports, and/or papers.
- 5340 **Historical Geography.** Three credits. Prerequisite: GEOG 2000 or permission of instructor. The changing human geography of the United States during four centuries of settlement and development. Emphasis on changing population patterns as well as patterns of urban and rural settlement. Additional projects, reports, and/or papers.
- 5360 **Cultural Geography.** Three credits. Prerequisite: GEOG 2000 or permission of instructor. Description and explanation of spatial patterns and ecological relationships in human culture. Emphasis on "reading" the cultural landscapes. An in-depth field component will be required.
- 5370 **Urban Geography.** Three credits. An introduction to the development of towns, cities, and associated urban areas. Environmental problems also examined. Classroom analysis of various theories of urban development and of data collected by field work. Preparation of appropriate land-use map.
- 5380 **Cartography.** Four credits. General knowledge of the field including familiarity with the techniques and tools of professional cartography and graphics. Selected lectures and class discussions. A series of map construction assignments; a specialized map assignment supported by written analysis. Three hours lecture and one two-hour laboratory per week.
- 5401- **Field Course.** Four credits. Supervised study in some geographical area, preceded by classroom preview and concluded by a time of evaluation. Emphasis on the natural and cultural elements of the environment, with special attention directed toward the pattern of human occupancy. An intensive period of study and research on a full-time basis. Work required will depend on area researched and time involved. Consult department chair for specific fees.
- 5410 **Geography of the United States and Canada.** Three credits. Natural, cultural, and geographic environment of these regions. Additional projects, reports, and/or papers.
- 5420 **Geography of Latin America.** Three credits. Geographic regions of Mexico, Central America, the West Indies, and South America. Policy analysis and supporting data.
- 5430 **Geography of Europe.** Three credits. General distribution of natural and cultural features of Europe followed by a detailed study of the regions and countries of the southern, central, and northwestern parts of the continent. Policy analysis of a European-oriented problem.
- 5460 **Geography of the Former Soviet Union.** Three credits. Analysis of the natural, cultural, and human use regions of the former Soviet Union. A policy analysis of an aspect of the region's geography is required.
- 5470 **Rural Settlement.** Three credits. Prerequisite: GEOG 2000 or permission of instructor. A geographical analysis of forms, structures, and distribution of rural settlements in distinctive parts of the earth based upon their origin, function, and development. Special emphasis given in analyzing rural settlements of middle Tennessee. Additional projects, reports, and/or papers.
- 5490 **Remote Sensing.** Four credits. Prerequisites: GEOG 1030 and 4380 (or 5380). Various vehicles of remote sensing such as radar, satellite imagery, and infrared data. Use of data in preparation of maps and applications to land use and environmental problems examined. Selection of data from either a numeric or image remote sensing system, interpreting, and developing a report from the interpretations. Three hours lecture and one two-hour laboratory per week.
- 5500 **Geography of the Middle East.** Three credits. An analysis of the problems, issues, and theories involved in understanding the physical, cultural, and regional geography of the area. Additional projects, reports, and/or papers.

- 5510 Laboratory Problems in Remote Sensing.** Four credits. Computer processing of selected satellite imagery. Laboratory will provide practical experience through design, execution, and completion of applied remote sensing projects, one of which will be the effects of an environmental impact.
- 5520 Image Interpretation.** Four credits. Principles, methods, and techniques of image interpretation including maps, satellite data, and aerial photos. Environmental impact of a special project. Three hours lecture and one two-hour laboratory per week.
- 5530 Geographic Information Systems.** Four credits. Lecture and laboratory work relative to computer-manipulated geographic data base. Laboratory work will involve experience in practical application of a geographic information system (GIS) to problem-solving. Student will take appropriate data and compile an environmental impact statement (EIS). Three hours lecture and two hours laboratory per week.



Courses in Geology [GEOL]

- 5000 Petrology and Petrography.** Four credits. Prerequisite: GEOL 3000. Igneous, sedimentary, and metamorphic rocks. Theories of formation and evolution based upon mineralogical and geochemical evidence. Examination and classification of rocks in hand sample and thin section. Additional assignments involving data analysis and interpretation and completion of a research paper required for graduate credit.
- 5020 Geomorphic Regions of the United States.** Four credits. Prerequisite: GEOL 1030/1031 or 1040/1041. The origin, regional distribution, and geomorphic features and history of the landforms of the United States. Students required to analyze maps, structure sections, and aerial photography to determine geomorphic form and the forces and processes that produced these forms plus research a geomorphical problem resulting in a thesis-type paper. Three hours lecture and two hours laboratory per week.
- 5030 Invertebrate Micropaleontology.** Four credits. Invertebrate and microscopic animal life of the past including recent preserved representatives and their ancient fossilized ancestors. Numerous field trips to local fossil-collecting sites. Designed to aid in the preparation of earth science teachers, geologists, and biologists. Research paper on a topic approved by instructor. An oral presentation of this material may be required. Three hours lecture and two hours laboratory per week.
- 5050 Meteorology.** Three credits. Prerequisite: GEOL 1030/1031 or 1040/1041 or GEOG 1030 or consent of instructor. (PHYS 2010/2011 or 2110/2111 and CHEM 1110/1111 recommended.) Physical laws as they relate to the atmosphere, atmospheric processes and their effects on air masses, fronts, and atmospheric circulation, the dynamics of the atmosphere and its relationship to the hydrosphere. Special problem to be assigned by the instructor.
- 5060 Principles of Geoscience.** Four credits. Includes topics from geology, astronomy, meteorology, and oceanography. Specifically designed to aid in the preparation of earth science teachers in the public schools. Term paper on topic approved by the instructor. Three hours lecture and two hours laboratory per week.
- 5070 Sedimentation and Stratigraphy.** Four credits. Prerequisites: GEOL 1030/1031 or 1040/1041, 1050, and 3000, or consent of instructor. Sedimentary rocks; the processes of sedimentation, the alteration of sediments through time, and an examination of the resulting stratigraphic units. For geoscience majors and those with interests in soil mechanics and civil engineering. Research paper on a topic approved by the instructor. An oral presentation may also be required. Three hours lecture and two hours laboratory per week.
- 5080 Structural Geology.** Three credits. Prerequisites: Knowledge of trigonometry, GEOL 1030/1031 or 1040/1041; GEOL 1050 recommended. Orientation and deformation of rock. Geometric, analytical, and statistical solutions to structural problems. Emphasis on three-dimensional visualization, problem solving, geological map interpretation, and the mechanics of deformation. Case analyzing, research, and interpretation required. Lecture and laboratory.
- 5090 Problems in Geology.** One to six credits. Prerequisite: A minimum of 12 semester hours of geology, at least 6 hours of which must be upper division and excluding GEOL 1030/1031 or by consent of instructor. An independent research-oriented project commensurate with the student's interests and qualifications. In-depth research requiring extensive and intensive search of applicable literature and large study area. An oral examination and discussion required. May be repeated up to a maximum of six hours.

- 5100 Geophysical Prospecting.** Four credits. Prerequisites: GEOL 3060, MATH 1910, PHYS 2010/2011 or 2110/2111, or consent of instructor. PHYS 2020/2021 or 2120/2121, GEOL 1030/1031 or 1040/1041, and MATH 1920 also recommended. Survey of seismic, gravimetric, and magnetic/electrical exploration methods. Applied course covering some elementary theory, basic field practice, computation fundamentals, interpretation techniques. Case analysis, research, and interpretation required. Two-hour lecture and two hours laboratory per week.
- 5120 Environmental Geology.** Four credits. Prerequisite: GEOL 1030/1031 or 1040/1041 or GEOG 1030 or consent of instructor. Application of geologic information to minimize possible environmental degradation and maximize utilization of resources in the natural and modified environment, local examples and field trips. Topics include engineering properties of earth materials, natural hazard prediction and reduction, water supply, solid and hazardous wastes, mineral resources, global change, land-use planning, environmental impact analysis. Three hours lecture and two hours laboratory per week. An in-depth research project and paper required.
- 5130 Hydrogeology.** Four credits. Prerequisites: GEOL 1030/1031 or 1040/1041 or consent of instructor. Basic processes and measurement of the hydrologic cycle, including precipitation, evaporation, surface runoff, stream flow, soil moisture, and ground water. Emphasis placed on ground water, including geology of occurrence, principles of flow, conceptual models of regional flow, chemistry and quality, well hydraulics, aquifer characteristics, resource development, detection of pollutants, and contaminant transport. Additional individual research project required, including a written and classroom report. Lecture and laboratory.
- 5140 Inorganic Geochemistry.** Three credits. Prerequisites: CHEM 1120/1121 and GEOL 1040/1041. Principles of inorganic geochemistry. Geochemistry of the earth and solar system, isotope geochronometers, thermodynamics of geochemical processes, mineral stability diagrams, isotope fractionation, rates of geochemical processes, chemical weathering, chemical compositions of surface and groundwater, geochemical exploration, geochemical cycles, environmental geochemistry. Additional assignments involving data analysis and interpretation and completion of a research paper required for graduate credit. Three-hour lecture per week.
- 5150 Environmental Applications of Hydrogeology.** Three credits. Prerequisite: GEOL 4130 or 5130 with a minimum grade of C. Advanced course that emphasizes applied methods for assessing hazardous and solid waste facilities and contaminated ground water remediation techniques. Included will be site characterization methods, ground water sampling procedures, and monitoring well installation techniques. Additional assignments involving case history analysis with an oral presentation will be required of graduate students. Three hours lecture per week.
- 5401- Field Course.** Four credits. Supervised study in some geological
- 5402** area preceded by classroom preview and concluded by a time of evaluation. Emphasis on the natural and physical elements of the environment, with special attention directed toward the geomorphology and geology of scientific areas. An intensive period of study and research on a full-time basis. Work required will depend on area researched and time involved. Consult department chair for specific fees.

Some geography and/or geology courses may be accepted as either geography or geology; others are accepted only in one discipline. Substitutions are made at discretion of department chair in consultation with the academic minor advisor.