

DEPARTMENT OF EARTH SCIENCES

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| <p>Chairperson: Connelly, Jeffrey B.</p> <p>Professors: Connelly, Jeffrey B. McMillan, Margaret E.</p> <p>Assistant Professors: DeAngelis, Michael T. Ruhl, Laura S. Shroat-Lewis, René A.</p> <p>Instructor: Spinler, Joshua C.</p> | <p>The Department of Earth Sciences offers a Bachelor of Science in Geology, with an optional concentration in Environmental Geology. Areas of study can include (but are not limited to): climate studies, energy resources, engineering geology, environmental geochemistry, geochemistry, geoinformatics (including GIS), geomorphology, geoscience education, hydrogeology, isotope geochemistry, medical geology, mineralogy, oceanography, paleontology, petrology, petroleum geology, planetary geology, sedimentology, seismology, stratigraphy, structural geology, tectonics, and volcanology. The department's goals are to relate these areas of study to understanding the Earth, and how Earth processes affect and are affected by humanity. Students are encouraged to obtain a scientific understanding of earth systems on a global scale.</p> <p>The Earth Sciences provide career opportunities for employment in industry, government, and teaching. Students interested in this area of study are urged to consult the departmental faculty regarding curricular plans and career goals. The department also offers minors in Geology and Environmental Geology, and a graduate certificate in Geospatial Technology. Departmental faculty also advise graduate students in the Applied Sciences graduate program.</p> |
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General Information

Professional courses, numbered 3320 and above, are designed for geology majors and minors; biology, chemistry, physics, and engineering majors; students interested in science teaching; and for other students with deeper interest in the field. For example, ERSC 3460, 4322, 4353, and 4421 are recommended for biology students; ERSC 4372, 4322, 4323, 4421, and 4473 are recommended for all students in environmental fields; and ERSC 4371, 4372, and 4473 are recommended for students in civil engineering, environmental engineering, and construction management.



Geology students on a field trip to Enchanted Rock State Natural Area, central Texas.

For freshmen and sophomores who are interested or think they may be interested in teaching, please see the UALR Teach website (ualr.edu/ualrteach/) for more information about the UALR Teach program.

Laboratory Science Core Requirement Courses

The core curriculum requirements for Laboratory Science may be met by taking any of the following courses:

ERSC 1302 Physical Geology and ERSC 1102 Physical Geology Laboratory

ERSC 1304 Earth and the Environment and ERSC 1104 Earth and the Environment Laboratory

ERSC 2303 Historical Geology and ERSC 2103 Historical Geology Laboratory

Goals, Objectives, and Outcomes of the B.S. in Geology Program

The goals of the program are to:

- Prepare students for successful scientific, technical or management careers in the geosciences or related fields
- Provide employers with a well-educated workforce that is ready and able to perform valuable scientific, technical or managerial services immediately after graduation
- Encourage the growth of knowledge-based industry and stimulate economic growth in Arkansas

Program educational objectives are broad statements that describe what graduates are expected to attain within a few years after graduation. Program educational objectives are based on the needs of the program's constituencies. The educational objectives of the program are to produce graduates who:

1. are able to begin productive careers as professional geologists engaged in continuous professional growth along their chosen career path;
2. are able to become Geologist in Training (GIT) and are able to become licensed Professional Geologists (PG) after gaining the required professional experience and the requisite knowledge to pass the licensing exams;

3. are knowledgeable of fundamental mathematics, chemistry, and physics in preparation for advanced instruction and professional practice in geology or related fields, or for pursuing graduate or professional education in geology or related fields; and
4. engage in lifelong learning, through on-the-job training, participation in professional societies, additional formal education, continuing education and professional development, research, and self-study, in order to use state-of-the-art knowledge to solve geologic problems and/or provide high quality service to the general public, employers, clients, and other professionals.

Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program. Students finishing the program in will have:

- an ability to apply knowledge of mathematics, science and applied science to geological problems;
- an ability to design and conduct experiments, as well as to analyze and interpret data;
- an ability to formulate or design a system, process, or program to meet desired needs. (For geologists, this will include one or more of the following considerations: the distribution of physical and chemical properties of earth materials, including water, energy resources and other natural resources; the effects of natural surface and subsurface processes; the impacts of human activities on these materials and processes);
- an ability to function on multidisciplinary teams;
- an ability to identify, formulate, and solve geological problems;
- an understanding of professional and ethical responsibility;
- an ability to communicate effectively;
- the broad education necessary to understand the impact of geological solutions in a global, economic, environmental, and societal context;
- a recognition of the need for, and an ability to engage in life-long learning;
- a knowledge of contemporary issues; and
- an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice.



Geology student examining tightly folded rock strata in the Ouachita Mountains.

Bachelor of Science in Geology

General: 120 minimum total hours, including 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (0-3 hours)

Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 36 for details)

Core (35 hours)

See page 24 for requirement details. (Geology majors should complete the following for their Laboratory Science core requirement: ERSC 1302/1102 or ERSC 1304/1104; ERSC 2303/2103)

Second Language Proficiency (none required)

Major (62-64 hours)

Earth Science Foundation Courses (31 hours)

(ERSC 1302 Physical Geology and ERSC 1102 Physical Geology Laboratory)
 or (ERSC 1304 Earth and the Environment and ERSC 1104 Earth and the Environment Laboratory)
 ERSC 2303 Historical Geology
 and ERSC 2103 Historical Geology Laboratory
 ERSC 3320 Field Geology I
 ERSC 3410 Mineralogy
 ERSC 3411 Igneous and Metamorphic Petrology
 ERSC 3430 Structural Geology
 ERSC 3440 Sedimentology and Stratigraphy
 ERSC 4190 Senior Seminar
 ERSC 4320 Field Geology II

ERSC Electives (9 hours)

Select at least 9 hours from any 3000-4000 level ERSC courses (except ERSC 3390, which may not be counted toward the BS in Geology).

Supporting Courses (22-24 hours)

CHEM 1402 General Chemistry I
 CHEM 1403 General Chemistry II
 PHYS 1321 College Physics I
 and PHYS 1121 College Physics I Laboratory

with PHYS 1322 College Physics II
and PHYS 1122 College Physics II Laboratory
or PHYS 2321 Physics for Scientists and Engineers I
and PHYS 2121 Physics for Scientists and Engineers I
Laboratory with PHYS 2322 Physics for Scientists and
Engineers II and PHYS 2122 Physics for Scientists and
Engineers II Laboratory

MATH 1451 Calculus I

or Math 1311 Applied Calculus I

Any one of the following courses:

MATH 1452 Calculus II, MATH 1312 Applied Calculus II,
STAT 2350 Introduction to Statistical Methods, STAT 3352
Applied Statistics I

Minor (None Required)

Unrestricted General Electives

Remaining hours, if any, to reach 120 minimum total hours,
45 hours of upper-level courses (3000-4000 level), and/or 30
hours in residence.

ASBOG Fundamentals of Geology Examination

The department recommends that Geology majors
take the ASBOG Fundamentals of Geology licensing exam
in their senior year or immediately after graduation. The
following courses are recommended as preparatory courses
for the Fundamentals of Geology exam:

ERSC 1302 Physical Geology
and ERSC 1102 Physical Geology Laboratory
ERSC 2303 Historical Geology
and ERSC 2103 Historical Geology Laboratory
ERSC 1304 Earth and the Environment
and ERSC 1104 Earth and the Environment Laboratory
ERSC 3320 Field Geology I
ERSC 3372 Surface Water Hydrology
ERSC 3410 Mineralogy
ERSC 3411 Igneous and Metamorphic Petrology
ERSC 3430 Structural Geology
ERSC 3440 Sedimentology and Stratigraphy
ERSC 3460 Paleobiology
ERSC 4320 Field Geology II
ERSC 4322 Environmental Geology
ERSC 4371 Engineering Geology
ERSC 4373 Hydrogeology
ERSC 4419 Geomorphology

Bachelor of Science in Geology: Environmental Geology Concentration

General: 120 minimum total hours, including 45 hours of upper-
level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (0-3 hours)

Required of full-time freshmen entering college for the first
time and transfer students with less than 12 hours of credit.
(See page 36 for details)

Core (35 hours)

See page 24 for requirement details. (Geology majors should
complete the following for their Laboratory Science core
requirement: ERSC 1302/1102 or ERSC 1304/1104; ERSC
2303/2103)

Second Language Proficiency (none required)

Major/Minor (75-77 hours)

Earth Science Foundation Courses (38 hours)

(ERSC 1302 Physical Geology and ERSC 1102 Physical
Geology Laboratory)
or (ERSC 1304 Earth and the Environment and ERSC 1104
Earth and the Environment Laboratory)
ERSC 2303 Historical Geology and ERSC 2103 Historical
Geology Laboratory
ERSC 3320 Field Geology I
ERSC 3410 Mineralogy
ERSC 3411 Igneous and Metamorphic Petrology
ERSC 3430 Structural Geology
ERSC 3440 Sedimentology and Stratigraphy
ERSC 4190 Senior Seminar
ERSC 4320 Field Geology II
ERSC 4322 Environmental Geology
ERSC 4421 Intro to Geographic Information Systems (GIS)

Electives (select 15 hours, up to seven of which may be from the non-ERSC courses listed below)

ERSC 3380 Oceanography
ERSC 3460 Paleobiology
ERSC 4195, 4295, 4395 Internship in Earth Science
ERSC 4199, 4299, 4399, 4499 Special Topics (must be
approved)
ERSC 4323 Geology of Arkansas
ERSC 4353 Geology and Ecology of the Bahamas
ERSC 4371 Engineering Geology
ERSC 4372 Surface Water Hydrology
ERSC 4391 Cooperative Education in Earth Science
ERSC 4419 Geomorphology
ERSC 4422 Applied GIS
ERSC 4426 Introduction to Remote Sensing
ERSC 4473 Hydrogeology
BIOL 3303 Principles of Ecology
BIOL 4310 Evolution
BIOL 4402 Limnology
BIOL 4415 Biometry
BIOL 4421 Introduction to GIS
CHEM 4342 Environmental Chemistry
CNMG 3347 Engineering Soil Mechanics
PHYS 3320 Physics of the Earth

Supporting Courses (22-24 hours)

CHEM 1402 General Chemistry I
CHEM 1403 General Chemistry II
PHYS 1321 College Physics I
and PHYS 1121 College Physics I Laboratory
with PHYS 1322 College Physics II

and PHYS 1122 College Physics II Laboratory
or PHYS 2321 Physics for Scientists and Engineers I
and PHYS 2121 Physics for Scientists and Engineers I
Laboratory with PHYS 2322 Physics for Scientists and
Engineers II and PHYS 2122 Physics for Scientists and
Engineers II Laboratory

MATH 1451 Calculus I

or MATH 1311 Applied Calculus I

Any one of the following:

MATH 1452 Calculus II, Math 1312 Applied Calculus II,
STAT 2350 Introduction to Statistical Methods, STAT 3352
Applied Statistics I

Minor (none required)

Unrestricted General Electives

Remaining hours, if any, to reach 120 minimum total hours,
45 hours of upper-level courses (3000-4000 level), and/or 30
hours in residence.

**ASBOG Fundamentals of Geology
Examination**

The department recommends that Geology majors
take the ASBOG Fundamentals of Geology licensing exam
in their senior year or immediately after graduation. The
following courses are recommended as preparatory courses
for the Fundamentals of Geology exam:

ERSC 1302 Physical Geology
and ERSC 1102 Physical Geology Laboratory
ERSC 2303 Historical Geology
and ERSC 2103 Historical Geology Laboratory
ERSC 1304 Earth and the Environment
and ERSC 1104 Earth and the Environment Laboratory
ERSC 3320 Field Geology I
ERSC 3372 Surface Water Hydrology
ERSC 3410 Mineralogy
ERSC 3411 Igneous and Metamorphic Petrology
ERSC 3430 Structural Geology
ERSC 3440 Sedimentology and Stratigraphy
ERSC 3460 Paleobiology
ERSC 4320 Field Geology II
ERSC 4322 Environmental Geology
ERSC 4371 Engineering Geology
ERSC 4373 Hydrogeology
ERSC 4419 Geomorphology

Minor in Geology (20 hours)

Required Courses (8 hours)

ERSC 1302 Physical Geology
and ERSC 1102 Physical Geology Laboratory
ERSC 2303 Historical Geology
and ERSC 2103 Historical Geology Laboratory
Electives (select 12 hours of ERSC electives)

**Minor in Environmental Geology
(20 hours)**

Required Courses (12 hours)

ERSC 1302 Physical Geology and ERSC 1102 Physical
Geology Laboratory
ERSC 2303 Historical Geology and ERSC 2103 Historical
Geology Laboratory
ERSC 4421 Introduction to Geographic Information
Systems

Electives (select 8 hours from the courses listed below)

ERSC 3380 Oceanography
ERSC 3390 Weather Studies
ERSC 4195, 4295, 4395 Internship in Earth Science
ERSC 4199, 4299, 4399, 4499 Special Topics (must be
approved)
ERSC 4322 Environmental Geology
ERSC 4371 Engineering Geology
ERSC 4373 Hydrogeology
ERSC 4419 Geomorphology
ERSC 4422 Applied GIS

Courses in Earth Sciences (ERSC)

ERSC 1102 Physical Geology Laboratory

Prerequisite or corequisite: ERSC 1302. A laboratory course
designed to accompany ERSC 1302. Students observe,
gather and manipulate data, interpret data, and make field
measurements using minerals, rocks, graphs, and maps.
The laboratory meets for two hours per week. One credit
hour. (ACTS Course Number GEOL 1114 when taken with
ERSC 1302)

ERSC 1104 Earth and the Environment Lab

Prerequisite or corequisite: ERSC 1304. A laboratory
course designed to accompany ERSC 1304. Students
make observations and interpretations from case studies,
gather, manipulate, and interpret data, and make field
measurements and problem solve using minerals, rocks,
graphs, and the UALR campus. The laboratory meets for
two hours per week. One credit hour.

ERSC 1302 Physical Geology

An introduction to the science of geology, the geological
view of the human environment, how geologists learn
about Planet Earth, and how society and geology interact.
Active learning applied to natural processes shaping the
earth's surface, producing the solid and fluid earth, and
historical development of geological paradigms. Three
hours lecture per week. Three credit hours. (ACTS Course
Number GEOL 1114 when taken with ERSC 1102)

ERSC 1304 Earth and the Environment

This is an introductory course environmental geology course that examines interactions between human beings and our changing planet, the affects of natural/geologic hazards on humans, and anthropogenic (human-caused) impacts on nature, geology, and society. Fundamental geologic concepts such as plate tectonics, geologic time, and surficial processes are used as a basis for understanding a variety of natural processes. The course topics include natural and anthropogenic geologic hazards (earthquakes, volcanoes, landslides, and land subsidence), climate change, environmental issues, as well as the impact of mineral extraction and water resource utilization. Three credit hours.

ERSC 1305 Science Skills

Prerequisite: Permission of the instructor. This course will help biology, chemistry, and earth science students reach their educational objectives. Interactive instructional methods promote the development of skills that lead to success in college and a successful career in science. Students 1) identify and use appropriate campus resources, 2) master common computer programs, 3) learn graphing and statistical methods, 4) develop better strategies to manage money, time, and stress wisely, and 5) explore the research conducted by UALR science faculty. Grading is based on projects, attendance, and participation. This course cannot be used for credit toward a biology, chemistry, or earth science major or minor. Three credit hours.

ERSC 2103 Historical Geology Laboratory

Prerequisite: ERSC 1302/1102 or ERSC 1304/1104. Corequisite: ERSC 2303. A laboratory course designed to accompany ERSC 2303. Students are involved with geologic data gathering, manipulation, and interpretation along with field measurements and problem solving. Two hours laboratory per week. One credit hour. (ACTS Course Number GEOL 1134 when taken with ERSC 2303)

ERSC 2300 Science and Technology in Society

Recommended prerequisite: RHET 1311. Introduction to how society is impacted by and responds to science-driven decision-making. Examines how society embraces and applies (including governmental institutions) scientific principles and technological advances to solving global societal problems such as sustainability of natural resources, development of new energy resources due to population and economic growth, changes in climate and weather, pollution, and human health issues. Case studies will examine societal response (particularly governmental) to both past and current global scientific and technological issues. Three credit hours.

ERSC 2303 Historical Geology

Prerequisite: ERSC 1302/1102 or ERSC 1304/1104. Corequisite: ERSC 2103. An introduction to the science of geology, how geologists have learned about the Earth using geologic time as a theme. Active learning applied to various measurements of time, the documentation of evolutionary changes presented by the geologic record, and the development of geologic paradigms used in interpreting this record. Three hours lecture per week. Three credit hours. (ACTS Course Number GEOL 1134 when taken with ERSC 2103)

ERSC 3320 Field Geology I

Prerequisites: ERSC 1302, ERSC 1102. Corequisites: ERSC 2303, ERSC 2103. Introduction to geologic field methods. Topics include: outcrop description; map and aerial photo interpretation; navigation skills; stratigraphic section measurement; cross-section construction; GPS and GIS techniques; computer drafting techniques; and geologic mapping in the Ouachita Mountains. One hour lecture, four hours laboratory per week. Three credit hours.

ERSC 3380 Oceanography

Prerequisite: 4 hours of earth science, biology, chemistry, or physics. This course provides an introduction to the historical, physical, chemical, geological, and biological aspects of the oceans and their importance to the global system. Three hours lecture per week. Three credit hours.

ERSC 3390 Weather Studies

Prerequisite: 4 hours of earth science, biology, chemistry or physics. This course provides an overview of how the distribution of heat, atmospheric circulation, humidity, and air pressure forms local, regional and global weather conditions. The course will include analysis of recent meteorological events that demonstrate basic principles of how weather patterns evolve. May not be counted for BS in Geology. Three hours lecture per week. Three credit hours.

ERSC 3410 Mineralogy

Prerequisites: ERSC 1302, ERSC 1102 and CHEM 1402 or consent of instructor. Introduction to the concepts of crystal chemistry, petrography, and the geochemical analysis of important rock-forming minerals. Laboratory includes hand-specimen and microscopic identification of minerals and use of computer software to examine crystal structures. A term project and field trip are required. Three hours lecture, two hours laboratory per week. Four credit hours.

ERSC 3411 Igneous and Metamorphic Petrology

Prerequisite: C or better in ERSC 3410. Composition, characteristics, classification, occurrence, and petrogenesis of igneous and metamorphic rocks. Megascopic and microscopic methods of description. Three hours lecture, two hours laboratory per week. Four credit hours.

ERSC 3430 Structural Geology

Prerequisites: ERSC 3410 and MATH 1303 or equivalent. The description and analysis of geological structures in Earth's crust. Topics covered include the description of geological structures, stress, strain, rheology, the kinematics and dynamics of folding and faulting and microstructural analysis, geologic maps, structure sections and stereographic analysis. Three hours lecture, two hours laboratory per week. Four credit hours.

ERSC 3440 Sedimentology and Stratigraphy

Prerequisite: ERSC 1302/1102 and ERSC 2303/2103; Corequisite ERSC 3410 or consent of instructor. This course covers the properties, processes and depositional environments of sediments and sedimentary rocks. Lateral and vertical relationships between rock units and how these can be used to understand geologic resources and interpret Earth history are also covered. Three hours lecture, two hours lab per week. Field trips required. Four credit hours.

ERSC 3460 Paleobiology

Prerequisites: ERSC 2303/2103, or BIOL 1400 or 1401, or consent of instructor; ERSC 3320 recommended. The evolution and ecological structure of the biosphere from the origin of life to the present emphasizing the evolution and paleobiology of animal life as shown by the fossil record. Lectures discuss the methods used to interpret the fossil record, and cover topics such as ontogeny, speciation, phylogeny and systematics, functional anatomy, biogeography, biostratigraphy, paleoecology, and macroevolution. Laboratories will focus on paleobiological principles that can be demonstrated by the major groups of invertebrates that are common in the geologic record. Three hours lecture, two hours laboratory per week; one 1-2 day field trip. Four credit hours.

ERSC 4100, 4200, 4300 Independent Problems

Prerequisite: consent of instructor, generally given only with senior standing and/or 20 hours of geology. Field or laboratory problem in consultation with instructor. One, two, or three hours or equivalent per week. One, two, or three credit hours.

ERSC 4190 Senior Seminar

Prerequisite: Senior standing and geology major or minor. Discussion of current topics in geology and career preparation. Semester project presentation is required. One hour per week. One credit hour.

ERSC 4304 Geology of North America

Prerequisites: ERSC 2303/1103, 3360. Detailed history of North America and its life forms as interpreted from rock and fossil records. Principles of interpretation, geologic and biologic succession of events, and advanced individual interpretation of geologic maps, with reports. Two hours lecture, two hours laboratory (or equivalent) per week. Three credit hours.

ERSC 4320 Field Geology II

Prerequisites: ERSC 3320, ERSC 3430 and ERSC 3440. Advanced geologic mapping techniques. Three weeks of field work and instruction at various locations in the United States. Three credit hours. Requires 8 hours in the field every day for three weeks. Additional fee for transportation, food and other field costs. Three credit hours.

ERSC 4322 Environmental Geology

Prerequisite: consent of instructor based on completion of ERSC 1302/1102, GEOG 1311, or the equivalent. Humans as a geologic agents, geologic hazards in the environment, geology and land use studies, urban geology, and case histories. Dual-listed as ERSC 5322. Three hours lecture per week. Three credit hours.

ERSC 4323 Geology of Arkansas

Prerequisites: ERSC 1302/1102 or 2303/2103 or consent of instructor. Regional geomorphology, structure, stratigraphy, and paleontology of Arkansas. Includes field trips to Ozark dome, Ouachita fold belt, Arkansas Valley, and Mississippi Embayment/Gulf Coastal Plain. Dual-listed as ERSC 5323. Three hours lecture per week, field trips. Three credit hours.

ERSC 4353 Geology and Ecology of Bahamas

Prerequisites: Eight hours of core science and consent of instructor. This course explores the geology and ecology of the shallow-water marine environment by examining the preeminent modern example, the Bahamas platform. The Bahamas provide an excellent model for understanding modern and ancient carbonate and reef deposits, and variety of terrestrial/aquatic habitats. Biological processes are ultimately responsible for many of the geological features of the Bahamas, so the course considers the biology/ecology of marine organisms in addition to geological topics. The field component is based at the Gerace Field Center for Geological, Biological, and Anthropological Research on San Salvador Island, Bahamas. Seventy-five hours of lecture/laboratory/field activity. Dual-listed as ERSC 5353. Three credit hours.

ERSC 4371 Engineering Geology

Prerequisite: MATH 1303 or higher or the consent of instructor. The study of the interaction of rock, soil and geologic processes with the engineering activities of man by applying geological data, techniques and principles. The integration of geological, geotechnical and geophysical investigative methods will be emphasized. Lecture topics will include soil and rock mechanics and rock deformation, the assessment of the spatial-temporal variability of sub surface materials, slope stability analysis and slope failure mitigation, earthquake engineering, hydrologic system management, and the application of GIS and geology. Dual-listed as ERSC 5371. Two hours lecture, two hours laboratory per week. Three credit hours.

ERSC 4372 Surface Water Hydrology

Prerequisites: ERSC 1302/1102 or higher and MATH 1311 or 1451. Hydrologic cycle, basin analysis, runoff analysis, stream hydraulics, flooding, case histories, field methods in hydrology, hydrologic planning. Three hours lecture per week. Three credit hours. Dual-Listed as ERSC 5372.

ERSC 4389 Undergraduate Research

Prerequisite: Consent of instructor. Various topics for thorough research selected by students in consultation with an advisor. Field work and/or experimental or laboratory work resulting in a report to be critiqued by at least two faculty members (no oral defense). The student is expected to spend at least nine hours per week on the project. The exact hourly commitment per week will depend on the nature of the project and will be agreed on in advance by the student and the instructor. Three credit hours.

ERSC 4391 Cooperative Education in Earth Science

Prerequisites: Consent and approval of assignment by advisor. Supervised professional experience related to students discipline with governmental agencies, industry and consulting firms. This course requires a minimum of 200 semester work hours. Dual listed as ERSC 5391. Three credit hours.

ERSC 4195, 4295, 4395 Internship in Earth Science

Prerequisites: Consent and approval of assignment by advisor. Supervised professional experience related to students discipline with governmental agencies, industry, and consulting firms. Forty hours supervised work per credit hour. One, two, or three credit hours.

ERSC 4419 Geomorphology

Prerequisites: ERSC 1302, ERSC 1102, ERSC 3320, or consent of instructor. The study of form and process at the Earth's surface. The interactions between erosional and depositional processes at the Earth's surface and tectonic processes operating within the Earth are examined with respect to landform evolution. Laboratory includes the analysis of maps, digital imagery, and field applications of GPS/GIS technology. Dual-listed as ERSC 5419. Three hours lecture, two hours laboratory or field study per week. Four credit hours.

ERSC 4421 Introduction to Geographic Information Systems (GIS)

Prerequisites: consent of instructor. This course introduces Geographic Information Systems (GIS) and the use of spatial data for problem-solving in science. The lecture portion of the course focuses on the data models used to represent spatial features and on the processes involved in creating, acquiring, analyzing, and displaying georeferenced information. The laboratory portion of the course employs a project-based methodology including applications from geology, biology, environmental science, and political science to foster basic GIS software proficiency. Dual-listed as ERSC 5421. Three hours lecture, two hours laboratory per week. Four credit hours.

ERSC 4422 Applied GIS

Prerequisites: BIOL/ERSC 4421 or consent of instructor. This course builds on the fundamental concepts of Geographic Information Systems (GIS) from ERSC 4421 Introduction to GIS. It focuses on advanced applications in GIS with an emphasis on problem-solving, advanced analysis techniques, and database management. Dual listed as ERSC 5422. Three hours lecture, two hours laboratory per week. Four credit hours.

ERSC 4426 Introduction to Remote Sensing

Prerequisites: ERSC/BIOL 4421 or consent of instructor. This course introduces the fundamentals of manipulating and interpreting the electromagnetic spectrum. The lecture portion of the class covers concepts of remote sensing, including how data is collected, processed, analyzed, and interpreted. The lab portion of the class is focused on building proficiency in several images processing software programs and the use of spatial data for problem-solving in science. Dual listed as ERSC 5426. Three hours lecture, two hours laboratory per week. Four credit hours.

ERSC 4473 Hydrogeology

Prerequisites: ERSC 1302/1102 or ERSC 2303/1103 and MATH 1302 or higher. Ground water occurrence, flow, porosity, permeability, aquifer analysis, geology of ground water, water well logging, water chemistry, water quality, well development, case histories, field methods, hydrogeologic planning. Dual-listed as ERSC 5473. Three hours lecture and two hours lab per week. Four credit hours.

ERSC 4199, 4299, 4399, 4499 Special Topics

Prerequisite: consent of instructor. Advanced and specialized topics in the geological sciences, especially those of current interest. Refer to semester schedule for special topic offered. Credit will vary depending upon course topic. One, two, three, or four hours or equivalent per week. One, two, three, or four credit hours.