Geology

Geology is the study of the Earth and encompasses a broad range of topics including Earth’s history, composition, physical and chemical processes and the evolution of life. It has a unique perspective of time and scale, extending billions of years in the past and to global-wide events. Because of man’s interaction with many Earth systems, geology is an environmental science that is vital to the resolution of such problems as climate change; groundwater supply and pollution; prediction and mitigation of earthquake, flooding and volcanic hazards; and natural resource discovery and utilization. Students majoring in geology acquire knowledge of value to many science and non-science professions.

The geology degree programs consist of a set of core courses that provide a foundation of geological principles and specialization tracks and elective courses that students choose to design a curriculum relevant to their interests. Many courses have a laboratory component where a hands-on, practical problem-solving approach to learning is emphasized. Students are introduced to basic and specialized computer programs and instrumental techniques used to gather and interpret data. Field trips to geological sites or field-based projects are regular features of several courses. Most classes for geology majors are small enough for students to receive individual attention and enjoy close contact with faculty in the classroom.

In the field of geology a student may work toward either a Bachelor of Arts or Bachelor of Science degree.

The Bachelor of Arts degree requires a major in geology but is a flexible program, permitting a student to combine education in geology with courses in other areas, such as other sciences, management or pre-law. A minor is optional. Having obtained a Bachelor of Arts degree, students may continue their education toward a Master of Science degree in geology.

The Bachelor of Science degree requires a core of Geology courses and courses in biology, chemistry, mathematics, physics and science electives. This degree requires a specialization to be obtained in one of the following: Geology, Environmental Geology, Geophysics, or Resource Geology. The specializations allow students to pursue specific career goals in the field of geology and related areas. The summer field course, usually taken between the junior and senior years, is part of the geology core. It is taught at a permanent field camp in the Beartooth Mountains near Red Lodge, Montana. Students desiring to do graduate work or to become a professional geologist will ordinarily pursue the Bachelor of Science degree.

Bachelor of Arts Degree in Geology Requirements

<table>
<thead>
<tr>
<th>Degree Requirements</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>University Core Curriculum Requirements</td>
<td>39</td>
</tr>
<tr>
<td>College of Science Academic Requirements</td>
<td>10-12</td>
</tr>
<tr>
<td>Biological Sciences - (3 hours included in the UCC Life Science hours)</td>
<td>3</td>
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<tr>
<td>MATH 106 or MATH 108 and MATH 109; or MATH 111 (3 hours included in the UCC Mathematics hours)</td>
<td>1-3</td>
</tr>
<tr>
<td>Physical Sciences-Completed with major Supportive Skills - CS 200B or CS 201 or CS 202 or ENGR 222, ENGL 290, ENGL 291 or ENGL 491, MATH 282; or 2 semester sequence of a foreign language</td>
<td>6</td>
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#### Geology Major Requirements

- GEOL 220 or GEOL 222, GEOL 221, GEOL 223, GEOL 224, GEOL 302, GEOL 310, GEOL 315, GEOL 325 (3 hours included in the UCC Physical Science hours)  
  21 hours
- GEOL 450 or GEOL 454  
  3-6 hours
- CHEM 200 or CHEM 200H, CHEM 201, CHEM 202 or CHEM 202H, CHEM 210, CHEM 211, CHEM 212  
  10 hours
- PHYS 203A, PHYS 253A  
  4 hours

#### Free Electives

28-31 hours

#### Total

120 hours

### Bachelor of Science Degree in Geology Requirements

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<td>6</td>
</tr>
<tr>
<td>Requirements for Major in Geology</td>
<td>58-59</td>
</tr>
<tr>
<td>GEOL 220 or GEOL 222; GEOL 221, GEOL 223, GEOL 224, GEOL 302, GEOL 310, GEOL 315, GEOL 325, GEOL 454 (3 hours included in the UCC Physical Science hours)</td>
<td>27</td>
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### Degree Requirements

<table>
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<tr>
<th>Course Description</th>
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<tr>
<td>MATH 150</td>
<td>4</td>
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<tr>
<td>CHEM 200 or CHEM 200H, CHEM 201, CHEM 202 or CHEM 202H, CHEM 210 or CHEM 210 H, CHEM 211, CHEM 212 or CHEM 212H</td>
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<tr>
<td>PHYS 203A, PHYS 253A, PHYS 203B, PHYS 253B</td>
<td>8</td>
</tr>
<tr>
<td>One of the following specializations</td>
<td>9-10</td>
</tr>
<tr>
<td>Geology Specialization - 9 hours of 400-level geology approved by the department advisor</td>
<td>9</td>
</tr>
<tr>
<td>Environmental Geology Specialization - Three courses from GEOL 418, GEOL 421, GEOL 470/GEOL 471, GEOL 474, GEOL 476, GEOL 478</td>
<td>9-10</td>
</tr>
<tr>
<td>Geophysics Specialization - Three courses from GEOL 435, GEOL 436, GEOL 437, GEOL 466</td>
<td>9</td>
</tr>
<tr>
<td>Resource Geology Specialization - Three Courses from GEOL 418, GEOL 419, GEOL 420, GEOL 421, GEOL 480, GEOL 482</td>
<td>9</td>
</tr>
<tr>
<td>Electives in Geology, Science, Mathematics or Technology</td>
<td>10-13</td>
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<tr>
<td>Total</td>
<td>120</td>
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### Geology Minor

A minor consists of 16 hours, determined by consultation with the geology advisor.

### Geology Honors Program

Students admitted to the University Honors Program (UHP) and majoring in Geology may participate in the Geology Honors Program. This program offers students more challenging course options and helps them better develop their skills in the geological sciences. Students in the Geology Honors Program must complete at least three honors courses which have special assignments arranged with the course instructor. Honors students are also encouraged to complete an Honors thesis with a member of the Department of Geology faculty. The UHP requirements are found at: honors.siu.edu.

### Geology Courses

**GEOL111 - Geology and the Environment** 111-2 Geology and the Environment. (University Core Curriculum Course) [IAI Course: P1 908] Examines human interaction with geologic processes and hazards, including earthquakes, volcanoes, landslides and flooding; occurrences and availability of geologic resources, such as energy, water and minerals; and human impacts on the environment including global warming, waste disposal, and pollution. Two lectures per week. Must be taken
concurrently with or upon completion of Geology 112 or 113. If Geology 111 is dropped the laboratory course must also be dropped.

**GEOL112 - Geology Environment Lab** 112-1 Geology and the Environment Laboratory Learning. (University Core Curriculum) [IAI course: P1 908L] Laboratory to accompany Geology 111. Hands-on and inquiry-based learning in topics such as earth materials, topographic maps, stream dynamics, floods, coastal processes, landslides, groundwater, earthquakes, volcanoes, and human impacts on the environment. One laboratory session per week. Must be taken concurrently with or upon completion of Geology 111. Lab fee: $10.

**GEOL113 - Field Geology** 113-1 Field Geology of Southern Illinois and Vicinity. (Advanced University Core Curriculum Course) Class will highlight the geological history and geological processes that have shaped southern Illinois and its surroundings, using the field as a natural laboratory. Schedule will include up to 7 Saturday field trips to nearby parks and outcrops, with a possible weekend trip outside of Illinois. Prerequisite: This class must be taken concurrently or following completion of GEOL 111, 220, 221, or 222. If GEOL 111, 220, 221, or 222 are dropped, then GEOL 113 must also be dropped. Activities fee: $150.

**GEOL121 - The History of the Earth** 121-2 The History of the Earth. (University Core Curriculum Course) Geological processes shape the surface of our planet over millions of years. These forces provide the ever changing conditions for life. Fossils are "footprints" in time which recorded those changes, giving us the opportunity to unravel Earth's past. This class will study the story of Earth's geological and evolutionary past events. Two lectures per week. Must be taken concurrently with or upon completion of GEOL 124 or GEOL 113. If GEOL 124 or GEOL 113 is dropped then GEOL 121 must be dropped.

**GEOL122 - Hazards and Catastrophes** 122-2 Natural Hazards and Catastrophes. (University Core Curriculum Course) The Earth is shaped by dynamic geological forces such as earthquakes, volcanoes, and floods. While these phenomena construct the landscapes around us, they can be extremely destructive when in contact with human civilization and/or infrastructure. This class examines the natural forces capable of catastrophic impact on society providing a greater understanding of the sometimes violent geologic processes that shape the planet along with their human impact. Two lectures per week. Must be taken concurrently with or upon completion of GEOL 123 or GEOL 113. If GEOL 123 or GEOL 113 is dropped then GEOL 122 must be dropped.

**GEOL123 - Hazards Lab** 123-1 Natural Hazards and Catastrophes Laboratory. (University Core Curriculum Course) Laboratory to accompany GEOL 122. This lab examines natural processes associated with hazard and catastrophe in human history and modern society, such as earthquakes, volcanoes, landslides, and floods. Labs provide a greater understanding of the processes and driving forces shaping the planet along with their human impact while fostering skills of scientific inquiry. One laboratory session per week. Must be taken concurrently with or upon completion of GEOL 123 or GEOL 113. If GEOL 123 or GEOL 113 is dropped then GEOL 122 must be dropped. $10 Lab Fee.

**GEOL124 - History of the Earth Lab** 124-1 History of the Earth Laboratory. (University Core Curriculum Course) Laboratory to accompany GEOL 121. Inquiry based laboratory sessions teaching the concepts of deep time, plate tectonics, evolution and the fossil record, biostratigraphy, rise and fall of the dinosaurs, evolution of mammals and humans. One laboratory session per week. Must be taken concurrently with or upon completion of GEOL 121. If GEOL 124 is dropped then GEOL 121 must be dropped. $10 Field Trip Fee.

**GEOL128 - The Dinosaurian World** 128-2 The Dinosaurian World. (University Core Curriculum Course) An introduction to Dinosaurs and the world in which they lived, and died. Topics will include Mesozoic continents; Plants of the Mesozoic; Dinosaur paleoenvironments; Dinosaur origins; Dinosaur biology; Dinosaur fossilization; Dinosaur hunters and Dinosaur extinction. Must be taken concurrently with or upon completion of GEOL 129 or GEOL 113. If GEOL 129 or GEOL 113 is dropped then GEOL 128 must be dropped.

**GEOL129 - DinoLab** 129-1 DinoLab. (University Core Curriculum Course) A physical science lab that provides hands-on and inquiry based learning in geologic concepts necessary to fully understand
dinosaur paleontology and paleobiology. Must be taken concurrently with or upon completion of GEOL 128, The Dinosaurian World. If GEOL 128 is dropped then GEOL 129 must be dropped. $10 Lab Fee.

**GEOL130 - The Planets** 130-2 The Planets. (University Core Curriculum) This course provides a general overview of the origin of the solar system, the composition of the planets and moons of the solar system, and the search for other planetary systems and life in the universe. The planetary processes of meteorite impact, volcanism, tectonics, and weathering on the various planets and the newest discoveries by NASA and other Space Agencies will be discussed. Planetary exploration efforts center on the search for life itself—“extant” life that is either active today or is dormant but still alive will be examined and compared across the solar system. Examines the methods of discovering information about the solar system involving the interdisciplinary application of pertinent basic scientific concepts of geology, chemistry, biology, meteorology, and cosmology. Two lectures per week. Must be taken concurrently or upon completion of laboratory course GEOL 131. If GEOL 130 is dropped then GEOL 131 must also be dropped.

**GEOL131 - Planets Lab** 131-1 The Planets Laboratory Learning. (University Core Curriculum) Laboratory to accompany GEOL 130. This lab will provide hands on inquiry-based learning in topics such as building materials of planets and their moons, meteorites and their origin and composition, volcanoes and plate movement, the internal structure and the atmospheric composition of planetary bodies across the solar system, the sun-earth interactions, the impacts and their effects on planetary development, and the search for “extant” life that is either active today or is dormant but still alive across the solar system. One laboratory session per week. Must be taken concurrently with Geology 130.

**GEOL220 - The Dynamic Earth** 220-3 The Dynamic Earth. (Advanced University Core Curriculum Course) [IAI Course: P1 907] Introduction to the materials which form the Earth and the dynamic processes that change them. Three lectures per week. With 223 satisfies University Core Curriculum Science Group I requirement in lieu of 111 and 112. Field trip required. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field Trip Fee not to exceed $25.

**GEOL220H - The Dynamic Earth** 220H-3 The Dynamic Earth. (University Honors Course) (Advanced University Core Curriculum Course) [IAI Course: P1 907] Introduction to the materials which form the Earth and the dynamic processes that change them. Three lectures per week. With 223 satisfies University Core Curriculum Science Group I requirement in lieu of 111 and 112. Field trip required. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field Trip Fee not to exceed $25. Restricted to University Honors Program students.

**GEOL221 - Earth Through Time** 221-3 Earth Through Time. (Advanced University Core Curriculum Course) [IAI Course: P1 907] Concepts and methods of interpreting earth history. Development of earth’s major features and environment systems. Emphasis on ancient environments and life forms, major changes in paleoclimate, paleocommunities and biodiversity. Students must complete a research project. With 224 satisfies University Core Curriculum Group I Science requirement in lieu of Geology 111 and 112. Field trips required. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field Trip Fee not to exceed $15.

**GEOL221H - Earth Through Time** 221H-3 Earth Through Time. (University Honors Course) (Advanced University Core Curriculum Course) [IAI Course: P1 907] Concepts and methods of interpreting earth history. Development of earth’s major features and environment systems. Emphasis on ancient environments and life forms, major changes in paleoclimate, paleocommunities and biodiversity. Students must complete a research project. With 224 satisfies University Core Curriculum Group I Science requirement in lieu of Geology 111 and 112. Field trips required. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field Trip Fee not to exceed $15. Restricted to University Honors Program students.

**GEOL222 - Environmental Geology** 222-3 Environmental Geology. (Advanced University Core Curriculum course) A study of the environment from a geological perspective. A critical study of geological hazards (earthquakes, floods), earth resources (minerals, water), proper land use (waste disposal), and other environmental concerns. Three lectures per week. One Saturday field trip required. Prerequisite: with 223 satisfies University Core Curriculum Science Group I requirement in lieu of 111 and 112. Lab fee: $5.
GEOL223 - Intro Geology Lab 223-1 Introductory Geology Laboratory. (Advanced University Core Curriculum Course) Understanding the earth's processes, materials and environment through hands-on laboratory and field experience. One three-hour session per week. Prerequisite: completion of, or concurrent enrollment in, 220 or 222, with 220 or 222 satisfies University Core Curriculum Science Group I requirement in lieu of 111 and 112. Lab fee: $10.

GEOL224 - Earth Through Time Laboratory 224-1 Earth Through Time Laboratory. (Advanced University Core Curriculum Course) Concepts and methods of interpreting earth's history. One two-hour laboratory per week. Weekend day field trip required. Prerequisite: completion of or concurrent enrollment in 221. With 221 satisfies University Core Curriculum Group I Science requirement in lieu of Geology 111 and 112. Lab fee: $10.

GEOL302 - Structural Geology 302-4 Fundamentals of Structural Geology. An introduction to structural geology including a study of the forces involved in the deformation of the earth's crust, with special emphasis on the recognition and interpretation of the resultant geologic features. Laboratory required. Up to 3 one- or two-day field trips may be required on weekends. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Prerequisite: GEOL 220 or 222 with a grade of C or better; 223 with a grade of C or better; MATH 109 or 111. Recommended: Physics 203 or 205, or concurrent enrollment. Field trip fee not to exceed $199.

GEOL302H - Structural Geology 302H-4 Fundamentals of Structural Geology. (University Honors Course) An introduction to structural geology including a study of the forces involved in the deformation of the earth's crust, with special emphasis on the recognition and interpretation of the resultant geologic features. Laboratory required. Up to 3 one- or two-day field trips may be required on weekends. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $199. Restricted to University Honors Program students.

GEOL310 - Mineralogy 310-4 Mineralogy. Introduction to the internal structure morphology and chemistry of crystals. Study of the properties, chemistry, occurrence and identification of rock-forming and economically important minerals. Rudiments of the use of a petrographic microscope and the optical properties of common rock-forming minerals. Up to 3 one- or two-day field trips may be required on weekends. Prerequisite: GEOL 220 or 222 with a grade of C or better; 223 with a grade of C or better; CHEM 200, 201 recommended. Lab fee: $15.

GEOL315 - Petrology 315-4 Petrology. Introduction to the classification, nature, origin and processes of igneous, sedimentary and metamorphic rocks. Hand specimen and thin-section analysis of rocks. Lecture-laboratory. Up to 3 one- or two-day field trips may be required on weekends. Prerequisite: GEOL 310 with a grade of C or better. Lab fee: $15.

GEOL315H - Petrology 315H-4 Petrology. (University Honors Course) Introduction to the classification, nature, origin and processes of igneous, sedimentary and metamorphic rocks. Hand specimen and thin-section analysis of rocks. Lecture-laboratory. Up to 3 one- or two-day field trips may be required on weekends. Prerequisite: GEOL 310 with a grade of C or better. Lab fee: $15. Restricted to University Honors Program students.

GEOL325 - Sedimentology & Stratigraphy 325-4 Sedimentology and Stratigraphy. An overview of the relationship between tectonics and climate, and the origin of sedimentary rocks; the course outlines: the plate-tectonics setting of sedimentary basins, their geometry, and subsidence mechanisms; the relationship between sediment supply, basin subsidence, and global sea-level change in determining the sequence stratigraphy of sedimentary-basin fill; and principles of interpretation of environment of deposition within a sequence stratigraphic framework. Prerequisite: GEOL 220 or 222 with a grade of C or better, 221 with a grade of C or better, 223 with a grade of C or better, 224 with a grade of C or better. Lab and field trips required. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $60.

GEOL327I - The World's Oceans 327I-3 The World's Oceans. (University Core Curriculum: Students with a catalog year prior to Summer, 2012 only) The world's ocean comprises up to 80% of the earth's surface. It plays a significant role in global climate, contains mineral resources and harbors a wealth of plant and animal life. "The World's Oceans", through the scientific method, will provide a greater
understanding of the processes and components of the oceans and their importance to our everyday life. The course will include lectures, discussion sessions, readings and exercises from the text, laboratory exercises and short field excursions.

**GEOL329H - Geomythology** 329H-3 Geomythology. (University Core Curriculum Course) (University Honors Course) Natural disasters have been the source of countless myths and legends throughout human history. This course will examine ways in which regional geology influenced ancient civilizations, and explore the possibility that some of their myths and legends preserve a record of actual geologic events. This class will include lectures, discussions, media sources and readings. An introductory geology course is recommended but not necessary. Prerequisite: GEOL 111, 220, 221 or 222 recommended. Restricted to University Honors Program students.

**GEOL329I - Geomythology** 329I-3 Geomythology. (University Core Curriculum Course) Natural disasters have been the source of countless myths and legends throughout human history. This course will examine ways in which regional geology influenced ancient civilizations, and explore the possibility that some of their myths and legends preserve a record of actual geologic events. This class will include lectures, discussions, media sources and readings. An introductory geology course is recommended but not necessary. Prerequisite: GEOL 111, 220, 221 or 222 recommended.

**GEOL330H - The Planets** 330H-3 The Planets. (University Honors Course) (University Core Curriculum: Students with a catalog year prior to Summer 2012 only) The geology of the planets and moons of the solar system, their origin and history, the origin of the universe and the solar system and the search for other planetary systems and life in the universe. The geologic processes of vulcanism, tectonism, weathering and meteorite impact on the various planets will be examined and compared. A main focus of the course will be examining the methods for discovering information about the solar system involving the interdisciplinary application of pertinent basic scientific concepts of geology, geochemistry, geophysics, meteorology and cosmology. Restricted to University Honors Program students.

**GEOL330I - The Planets** 330I-3 The Planets. (University Core Curriculum: Students with a catalog year prior to Summer 2012 only) The geology of the planets and moons of the solar system, their origin and history, the origin of the universe and the solar system and the search for other planetary systems and life in the universe. The geologic processes of vulcanism, tectonism, weathering and meteorite impact on the various planets will be examined and compared. A main focus of the course will be examining the methods for discovering information about the solar system involving the interdisciplinary application of pertinent basic scientific concepts of geology, geochemistry, geophysics, meteorology and cosmology.

**GEOL401 - Phys Earth for Teachers** 401-3 Physical Nature of the Earth for Teachers. This is an online course that offers an overview of the materials that form the Earth and the dynamic processes that shape the Earth, including both surficial processes and plate tectonics. This course will cover content appropriate for science teachers preparing to teach Physical Geology as a Dual-Credit course in high schools. Topics include: components and processes that create rocks and the cycles that change one rock into another; how plate tectonics has shaped the Earth; surficial processes (weathering, landslides, movement of ice, water, and wind); hazardous processes (earthquakes, volcanoes, flooding); and resources such as water, soil, and mineral and energy sources. This course is designed to be taken in conjunction with GEOL 402, a 1-hr laboratory course. Only open to students in the Dual Credit Certificate for Teachers program.

**GEOL402 - Phys Earth Lab Teachers** 402-1 Physical Nature of the Earth Laboratory for Teachers. Through active learning activities, this course offers examination of the materials that form the Earth and the dynamic processes that shape the earth, including surficial processes and plate tectonics. This course will cover content appropriate for science teachers preparing to teach labs associated with Physical Geology as a Dual-Credit course in high schools. This is offered as a hybrid distance education (online) class and includes both at-home and in-class laboratory assignments. For the in-class components, students will come to SIUC's campus for 2 half days (Saturdays) as indicated in the schedule. This course is designed to be taken in conjunction with GEOL 401, a 3-hr online course in which the students learn about earth materials and earth processes in greater depths. Only open to students in the Dual Credit Certificate for Teachers program.

**GEOL403 - Hist Geol Teacher Enhancement** 403-3 Historical Geology Teacher Enhancement. GEOL 403 is an online course designed to train science teachers to teach Historical Geology as a Dual Credit course in high schools. This course covers the basic principles involved in the study of geology and the
history of the Earth preserved in the rock record. We begin with the large-scale components of Earth systems and geologic time, and then learn about the evolution of life recorded in the fossil record from the earliest life through the present. This course covers not just WHAT we know, but how we know it. This course is designed to be taken in conjunction with GEOL 404, a 1-hr laboratory course. Only open to students in the Dual Credit Certificate for Teachers program.

**GEOL404 - Hist Geol Teacher Enhance Lab** 404-1 Historical Geology Teacher Enhancement Lab. GEOL 404 is the laboratory section that accompanies the online Historical Geology Teacher Enhancement. This laboratory course offers hands-on activities to complement the online lectures and will provide teachers with a structure to teach labs in their own Dual Credit high school courses. This course covers the basic principles involved in the study of geology and the history of the Earth preserved in the rock record. We study sedimentary rocks, and learn how to read the clues to past environments and life preserved within samples. This course is done partially at home, but requires a six hour in house lab session. Only open to students in the Dual Credit Certificate for Teachers program.

**GEOL405 - Science Writing** 405-2 Science Writing and Scientific Communication. Course will teach "survival skills" in scientific reading, writing, communicating, and publishing for new graduate students. Topics will include database search, analysis of journal articles, abstracts, figures, and tables, Powerpoint presentations, proposals, posters, thesis writing, and preparation of journal submissions. Enrollment is open to graduate students in the sciences and is by permission of the instructor.

**GEOL411 - Volcanology** 411-3 Volcanology. Study of volcanoes, their distribution, forms, composition, eruptive products and styles of potential hazards. Relationship of magmatic characteristic, eruptive style, and depositional products to the geologic framework is examined. Prerequisite: GEOL 315.

**GEOL412 - Advanced Petrology** 412-3 Advanced Petrology. In-depth study of the rock forming processes. The relations of rock forming processes to petrographic analysis will be emphasized. Laboratories will deal with hand-specimen and thin-section analysis from selected rock suites with genetic modeling of the resulting data. Prerequisite: GEOL 310, 315.

**GEOL413 - Quantitative Methods-Geology** 413-3 Quantitative Methods of Geology. An introduction to quantitative methods in a geological and earth sciences context. Topics introduced include sampling plans for geologic studies, non-parametric test of geological data, comparisons of geological samples, analysis of sequential geological data. Laboratories will deal with numerical examples from all areas of geology. Restricted to advanced standing. Special approval needed from the instructor.

**GEOL415 - Optical Mineralogy** 415-3 Optical Mineralogy. The optical properties of minerals and the use of the petrographic microscope for identification of crystals by the immersion method and by thin section. Lecture, laboratory. Prerequisite: GEOL 310, PHYS 203B or 205B.

**GEOL416 - Geochem Natural Waters** 416-3 The Geochemistry of Natural Waters. The purpose of this class is to provide students with a strong theoretical background in aqueous geochemistry, environmental geochemistry, and groundwater geochemistry for application in a wide range of research topics. The approach combines conceptual knowledge with quantitative skills in a cyclic fashion to build independent understanding and chemical intuition. Prerequisites: GEOL 310, CHEM 200, 201, 210, 211 or consent of instructor. Lab fee: $15.

**GEOL417 - Isotope Geochemistry** 417-3 Isotope Geochemistry. Isotope fractionation in natural systems containing D/H, carbon, oxygen, nitrogen, and sulfur. Application of stable isotope studies to environmental processes, paleoclimatology, and geothermometry. Stable and radioactive isotopes as tracers in hydrologic processes, ore deposits, sedimentology, and in crust-mantle differentiation processes. Prerequisite: GEOL 310, CHEM 200, 201, 210, 211, or equivalent.

**GEOL418 - Low Temp Geochemistry** 418-3 Low Temperature Geochemistry. The application of chemical principles to geologic processes that occur on and near the earth's surface. Lecture, laboratory. Prerequisite: GEOL 310, CHEM 200, 210, 211 or equivalent.

**GEOL419 - Ore Deposits** 419-3 Ore Deposits. Overview of the occurrence, geology and origin of metalliferous mineral deposits. Geologic principles and research techniques important to the understanding of mineral deposits. Introduction to exploration and mining methods. Lectures, laboratories and field trips required. Prerequisite: GEOL 302, 315 or consent of instructor. Expense will vary in
proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $60.

**GEOL420 - Petroleum Geology** 420-3 Petroleum Geology. The geological occurrences of petroleum including origin, migration and accumulation; a survey of exploration methods, and production problems and techniques. Laboratory study applies geological knowledge to the search for and production of petroleum and natural gas. Prerequisite: GEOL 221, 224.

**GEOL421 - Organic Geochemistry** 421-3 Organic Geochemistry. The nature, origin and fate of natural and artificial organic materials in rocks and sediments. Topics include characterization of fossil fuels using biological marker compounds, petroleum source rock evaluation, and organic pollutants in the environment. Prerequisite: GEOL 325 or consent of instructor.

**GEOL423 - Geomicrobiology** 423-3 Geomicrobiology. (Same as MICR 423 and MBMB 423) The course will focus on the role that microorganisms play in fundamental geological processes. Topics will include an outline of the present understanding of microbial involvement of weathering of rocks, formation and transformation of soils and sediments, and genesis and degradation of minerals. Elemental cycles will also be covered with emphasis on the interrelationships between the various geochemical cycles and the microbial trophic groups involved. Prerequisite: Microbiology 301 and Chemistry 210 and 211. Recommended: GEOL 220, 221 or 222.

**GEOL425 - Invertebrate Paleo & Paleocool** 425-3 Invertebrate Paleontology and Paleoecology. (Same as ZOOL 425) Concepts of paleontology and paleoecology. Emphasis on functional morphology, lifestyles and habitats of fossil invertebrates and algae. The nature and evolution of marine and coastal paleocommunities. The effects of extinction events on paleocommunities and biodiversity. Laboratory. Field trips required. Prerequisite: GEOL 325 or a biology course. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $199.

**GEOL428 - Paleoecology & Envrns Depstn** 428-3 Paleoecology and Environments of Deposition. Characteristics, distribution, and classification of recent and ancient environments. Criteria for recognizing ancient environments. Sedimentological and paleoecological approaches. Recognition of ancient environments and environmental associations. Laboratory. Field trips required. Prerequisite: GEOL 425, 325, or concurrent enrollment. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $199.

**GEOL430 - Planetary Geology** 430-3 Planetary Geology. Study of the solar system and planet formation, focusing on formation, differentiation and secondary processes. Geologic histories and geological processes of other planets are examined and compared with our understanding of the Earth. Prerequisite: GEOL 310.

**GEOL435 - Solid-Earth Geophysics** 435-3 Solid-Earth Geophysics. Earth's size, shape, mass, age, composition, and internal structure are reviewed in detail as understood from its volcanism, gravity and magnetic fields, seismicity, and motion of continents and ocean basins; plate tectonics. Up to 3 one- or two-day field trips may be required on weekends. Prerequisite: GEOL 302, MATH 150, or consent of instructor.

**GEOL436 - Applied Geophysics** 436-3 Applied Geophysics. Theory and practice of geophysics applied to exploration for natural resources including oil, minerals, coal, groundwater, and for archaeology, environmental, and meteorite impact sites and earthquake zones. Methods include seismic reflection, refraction, and surface waves also gravity, magnetic, and electrical. Up to 3 one-day field trips may be conducted on weekends. Recommend: GEOL 220 or 222, PHYS 203A/B or PHYS 253A/B. Prerequisite: MATH 150. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $80.

**GEOL437 - Field Course in Geophysics** 437-3 Field Course in Geophysics. Use of geophysical equipment for collection, analysis and interpretation of seismic, gravity, magnetic, electrical, and other types of geophysical data. Field trips required. Prerequisite: GEOL 436 or consent. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $199.
GEOL440 - Adv Topics Geological Sciences 440-1 to 8 Advanced Topics in the Geological Sciences. Individual study or research or advanced studies in various topics. Restricted to advanced standing. Special approval needed from the instructor.

GEOL445 - Museum Studies in Geology 445-3 Museum Studies in Geology. History, nature and purpose of geology in museums, relationships of geology to other museum disciplines, application of geologic methods to museum functions, preparation and preservation of specimens; nature, acquisition and utilization of geologic collections in museums; role of research in museums.

GEOL450 - Intro to Field Geology 450-3 Introduction to Field Geology. Introduction to field techniques, principles of geologic mapping and map interpretation. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Prerequisite: GEOL 310 with a grade of C or better.

GEOL451 - Field Experience in Geology 451-1 to 12 Field Experience in Geology. Preparation for and participation in academically rigorous field trips guided by faculty members. Trips will be to areas of geological interest and will occur during official breaks within or between semesters. Expense will vary in proportion to the distance traveled and duration of trip and will be determined before each trip. A student may only take a specific trip once for credit. Special approval needed from the instructor.

GEOL454 - Field Geology 454-6 Field Geology. Advanced field mapping in the Rocky Mountains, including problems in stratigraphy, structure, petrology, paleontology, geomorphology, and economic geology. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Prerequisite: GEOL 302, 315, 325. GEOL 450 recommended. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $1,000.

GEOL466 - Tectonics 466-3 Tectonics. Fundamentals of geodynamics applied to plate tectonics: mantle composition and rheology, deformation of the lithosphere, structural characteristics of plate margins, stability of triple junctions, diachronous tectonics, and orogenesis will be examined in detail. One 3-day field trip is required. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $150. Prerequisite: GEOL 302, MATH 150, or consent.

GEOL466H - Tectonics 466H-3 Tectonics. (University Honors Course) Fundamentals of geodynamics applied to plate tectonics: mantle composition and rheology, deformation of the lithosphere, structural characteristics of plate margins, stability of triple junctions, diachronous tectonics, and orogenesis will be examined in detail. One 3-day field trip is required. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $150. Prerequisite: GEOL 302, MATH 150, or consent. Restricted to University Honors Program students.

GEOL470 - Hydrogeology 470-3 Hydrogeology. Study of the distribution, origin, and movement of groundwater, and the properties of geologic materials that control groundwater flow and contaminant transport. Geology majors must also take GEOL 471 concurrently. Prerequisite: GEOL 220 or 222; or consent of instructor.

GEOL471 - Hydrogeology Lab 471-1 Hydrogeology Laboratory. Problem sets, laboratory experiments, and field exercises in hydrogeology. Majors must take concurrently with GEOL 470. Field trips required. Prerequisite: GEOL 220 or 222; or consent of instructor. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $150.

GEOL474 - Geomorphology 474-3 Geomorphology. Study of erosional and depositional processes operating at the earth's surface and landforms resulting from these processes. Relationship of processes and landforms to the geologic framework is examined. Laboratory. Field trips required. Prerequisite: GEOL 220 or 222; 223. Expense will vary in proportion to distance traveled and locations visited and will be determined before each semester. Field trip fee not to exceed $60.

GEOL476 - Quaternary Geology 476-3 Quaternary Geology. Methods used to identify, map, date and correlate Quaternary deposits and interpret Quaternary history. Covers glacial, fluvial, coastal, lacustrine and eolian chronologies, oxygen-isotope records from ocean sediments and continental ice cores,
volcanic activity, and Quaternary climate change. Field trips required. Prerequisite: GEOL 220 or 222; 221, 223, 224; or consent of instructor; GEOL 474 recommended.

GEOL480 - Geology of Coal 480-3 Geology of Coal. Stratigraphy, sedimentation and structure of coal deposits; modern analogs; origin of splits and partings in coal seams; coal quality and rank; coal exploration and mining; methods of resource evaluation. Prerequisite: GEOL 220 or 222; 221, 223, and 224; or consent of instructor.

GEOL481 - Sedimentary Basin Analysis 481-3 Sedimentary Basin Analysis. The use of stratigraphy, structure, sedimentology and geophysics to determine the paleogeographic evolution of sedimentary basins. Topics include the study of the relationships between host strata and both primary and post-depositional non-renewable resources, plate tectonics and basin evolution and subsurface geologic methods. Special approval needed from the instructor. Lab fee: $10.

GEOL482 - Organic Petrology 482-3 Organic Petrology. Petrology and geochemistry of coals and dispersed organics; emphasis on applications to the coal and oil industries; origin of coal and source rock constituents; geochemical and petrographic changes with increased maturation. Prerequisite: GEOL 220 or 222; 221, 223, and 224; or consent of instructor. Lab fee: $50.

GEOL484 - Geologic Remote Sensing 484-3 Geologic Remote Sensing. Applications of remote sensing using aerial photographs, multi-spectral imagery, hyperspectral imagery, thermal infrared imagery, and radar imagery, in structural geology, stratigraphy, geomorphology, oil and mineral exploration, geologic hazard analysis and planetary exploration. Prerequisite: GEOL 220 or consent of the instructor. Lab fee: $25.

GEOL500 - Teaching:Geol Grad Student 500-1 to 2 Teaching for Geology Graduate Students. To help teaching assistants develop skills in conducting laboratory work and leading discussions. One hour required for all teaching assistants in geology. Graded S/U only.

GEOL510 - Advanced Sedimentology 510-2 Advanced Sedimentology. Basic principles of field observation, field and laboratory sampling, and data analysis of clastic sedimentary rocks; introduction to laboratory techniques; introduction to statistical, physical and empirical models in sedimentary geology. Field trips required. Prerequisite: GEOL 325 or GEOL 474.

GEOL513 - Quantitative Methods Earth Sci 513-3 Quantitative Methods in the Earth Sciences. An introduction to quantitative methods in an Earth Sciences context. Topics include sampling plans for geologic studies, non-parametric tests of geological data, comparisons of geological samples, analysis of sequential geological data. Course will deal with numerical examples from different areas of geology. Special approval needed from the instructor.

GEOL515 - Instrumental Analysis 515-3 Instrumental Analysis in Geology. An introduction to modern methods of instrumental inorganic geochemical analysis that are particularly important in the geology sciences. This includes both operational theory and practical application of methods for the analysis of minerals, rocks and aqueous solutions. Lecture, laboratory. Prerequisite: GEOL 310, CHEM 210 or equivalent; GEOL 418 recommended.

GEOL517 - Adv Topics: Geochemistry 517-2 to 9 (2 to 6 per semester) Advanced Topics in Geochemistry. Specialized topics in geochemistry. Topics covered might include thermodynamic modeling of mineral-solution equilibria, the role of kinetics in mineral-solution reactions, experimental
hydrothermal geochemistry or other topics to be announced by the department. Maximum credit nine semester hours. Prerequisite: GEOL 418 or consent of instructor.

GEOL518 - Clay Mineralogy 518-3 Clay Mineralogy. Study of the structure, chemistry, origin, and geologic importance of clay minerals. Industrial and other applications of clays. Lecture, laboratory. Prerequisite: GEOL 310 or consent.

GEOL520 - Adv Topic: Igneous/Metam Petrology 520-2 to 9 (2 to 6 per semester) Advanced Topics in Igneous and Metamorphic Petrology. Petrologic principles and their relationships and other selected topics to be announced by the department. Special approval needed from the instructor.

GEOL522 - Sed Petro: Siliciclastics 522-3 Sedimentary Petrology-Siliciclastics. The petrography and petrology of siliciclastic rocks, emphasizing sandstone. Microscopic studies of composition and components of detrital clastic rocks, their origin, provenance, characteristics, diagenesis, cementation and lithification. Special approval needed from the instructor.

GEOL523 - Sed Petro: Carbonates 523-3 Sedimentary Petrology-Carbonates. The origin, classification, diagenesis, and geochemistry of carbonate rocks, with emphasis on petrographic analysis. Study of recent carbonate depositional environments. Laboratory required. Prerequisite: GEOL 325; GEOL 418 recommended.

GEOL524 - Adv Topics in Sed Geology 524-2 to 9 (2 to 6 per semester) Advanced Topics in Sedimentary Geology. Topics may include clastic depositional environments, carbonate depositional environments; diagenesis of sedimentary rocks, and other topics to be announced by the department. Up to 3 one- or two-day field trips may be required on the weekends. Special approval needed from the instructor.

GEOL525 - Adv Topics: Invert Paleon 525-2 to 6 (2 to 3 per semester) Advanced Topics in Invertebrate Paleontology. Lectures, readings, field and laboratory studies, including techniques and quantitative methods of study. Preparation for research in paleontology. Topics may include corals, bryozoans, brachiopods, mollusks, echinoderms, biostratigraphy, tempo and mode of invertebrate evolution and other topics to be announced by the department. Maximum credit six semester hours. Prerequisite: GEOL 425 or consent of instructor.

GEOL526 - Adv Topics: Appld Paleoecology 526-3 Advanced Topics in Applied Paleoecology. Lectures, field, and laboratory studies, including techniques and quantitative methods. Preparation for research in paleoecology. Emphasis on using fossil marine invertebrates and trace fossils to interpret ancient sedimentary environments. Prerequisite: GEOL 428 or consent.


GEOL535 - Adv Topics: Geophysics 535-1 to 9 (1 to 6 per semester) Advanced Topics in Geophysics. Specialized topics in geophysics. Examples include but are not limited to seismic stratigraphy, mid-continent seismicity, isostacy, data processing techniques. The topic to be covered is announced by the department. Maximum credit nine semester hours. Up to 3 one- or two-day field trips may be required on the weekends. Prerequisite: GEOL 435 or GEOL 436 or consent of instructor.

GEOL536 - Earthquake Seismology 536-3 Earthquake Seismology. Observational seismology. Topics include earthquake source mechanisms; propagation, reflection and refraction of elastic waves; ray theory; dispersion of surface waves; the effect of earth structure on the seismogram; and the seismograph. Research projects will be conducted using data from the SIU Geophysical Observatory. Up to 3 one- or two-day field trips may be required on the weekends. Prerequisite: GEOL 435 or GEOL 436, MATH 150 or consent of instructor.

GEOL537 - Applied Seismology 537-3 Applied Seismology. Study of the seismic reflection techniques, including theory and methods of collection and analysis of seismic reflection data, the seismic method,
waveform analysis, and digital filtering with computer applications and seismic instrument characteristics. Up to 3 one- or two-day field trips may be required on weekends. Prerequisite: MATH 150 or consent.

**GEOL 550 - Adv Economic Geology** 550-4 Advanced Economic Geology. In-depth examination of the geologic characteristics, classification and origin of metallic mineral deposits. Aspects of mineral exploration and mining techniques are also discussed. Laboratory exercises emphasize hand specimen and petrographic study of ore and host rock suites. Up to 3 one- or two-day field trips may be required on weekends.

**GEOL 555 - Adv Topics in Econ Geol** 555-1 to 6 (1 to 3 per semester) Advanced Topics in Economic Geology. Advanced study in a specific area of economic geology to be determined by course participants. Course content may focus on a specific type of mineral deposit or such topical areas as field characteristics, mineral exploration techniques, stable isotope geochemistry, fluid inclusion studies and hydrothermal processes. Maximum six credit hours. Field trips may be required on up to 3 weekends and possibly over Spring vacation. Prerequisite: GEOL 550.

**GEOL 566 - Topics in Structural Geology** 566-3 Advanced Topics in Structural Geology. Lectures, readings, and discussion of advanced aspects of rock deformation: dislocation theory and its applications to flow processes of rocks; experimental rock deformation; incremental and finite strain theory and analysis; and recent developments in structural geology. Special approval needed from the instructor.

**GEOL 570 - Adv Hydrogeology** 570-3 Advanced Hydrogeology. A combination of lectures, seminars, and independent studies of advanced topics in hydrogeology, particularly geochemistry and the response of aquifers to stresses such as tides, recharge and saline intrusion. Prerequisite: GEOL 470.

**GEOL 577 - Adv Topics: Surficial Geology** 577-2 to 9 (2 to 6 per semester) Advanced Topics in Surficial Geology. Studies of processes, landforms, and deposits in the surface or near surface geologic setting. Selected topics to be announced by the department. Maximum credit nine semester hours. Special approval needed from the instructor. Field trip fee: $35.

**GEOL 582 - Adv Coal Petrology** 582-1 to 6 (1 to 3 per semester) Advanced Coal Petrology. Microscopy, source materials, coalification, constitution, and classification of peats, lignites, bituminous coal, anthracite; applications to industrial problems. Prerequisite: GEOL 482. Lab fee: $50.

**GEOL 584 - Adv Geol Remote Sensing** 584-3 Advanced Geologic Remote Sensing. An advanced course covering the nature of electromagnetic radiation, the electromagnetic spectrum and the interaction between electromagnetic radiation and matter. Remote sensing systems will be presented and the fundamentals of digital image processing will be introduced from a theoretical and practical viewpoint. A series of case studies with applications ranging from mineral exploration to volcano monitoring will be covered. Field Trip fee: $40.

**GEOL 585 - Earth/Space Sci for Teachers** 585-3 Earth and Space Science for Teachers. Class designed to help teachers gain an understanding of some of the earth science concepts they need to teach today's standards-based curricula. Develops an understanding of earth materials, how the earth works, earth resources, the causes of natural disasters, and the exploration of the bodies of our solar system. Prerequisites: A general physical science course or equivalent. Special approval needed from the department.

**GEOL 588 - Global Energy Resources** 588-3 Global Energy Resources. Ready access to energy is essential to sustaining modern societies. This course will discuss the nature of the resources that have been, are, or potentially could be used to provide energy in the US and around the globe, including fossil fuels, nuclear energy resources, bioenergy resources and emerging energy resources such as geothermal, wind, tidal, and solar energy.
GEOL591 - Individual Research  591-1 to 6 Individual Research in Geology. Investigations in geology other than those for theses or dissertations.

GEOL599 - Thesis  599-1 to 6 Thesis (1 to 8 hours per semester). Research for and writing of the master's thesis. Maximum of six hours to be counted toward a Master's degree.

GEOL600 - Dissertation  600-1 to 30 (1 to 16 per semester) Dissertation. Research for and writing of the doctoral dissertation. Special approval needed from the instructor.

GEOL601 - Continuing Enrollment  601-1 per semester Continuing Enrollment. For those graduate students who have not finished their degree programs and who are in the process of working on their dissertation, thesis, or research paper. The student must have completed a minimum of 24 hours of dissertation research, or the minimum thesis, or research hours before being eligible to register for this course. Concurrent enrollment in any other course is not permitted. Graded S/U or DEF only.

GEOL699 - Postdoctoral Research  699-1 Postdoctoral Research. Must be a Postdoctoral Fellow. Concurrent enrollment in any other course is not permitted.

Geology Faculty

Anderson, Ken B., Professor, Ph.D., University of Melbourne, Australia, 1989.
Conder, James A., Associate Professor, Ph.D., Brown University, 2001.
Esling, Steven Paul, Associate Professor and Chair, Ph.D., University of Iowa, 1984.
Ferre, Eric C., Professor, Ph.D., University of Toulouse, France, 1989.
Fifarek, Richard H., Associate Professor, Emeritus, Ph.D., Oregon State University, 1985.
Filiberto, Justin, Associate Professor, Ph.D., Stony Brook University, 2006.
Hummer, Daniel R., Assistant Professor, Ph.D., The Pennsylvania State University, 2010.
Ishman, Scott E., Professor, Ph.D., Ohio State University, 1990.
Lefticariu, Liliana, Associate Professor, Ph.D., Northern Illinois University, 2004.
Marzolf, John E., Associate Professor, Emeritus, Ph.D., University of California at Los Angeles, 1970.
Potter-McIntyre, Sally, Assistant Professor, Ph.D., University of Utah, 2013.
Rimmer, Sue, Professor, Ph.D., Pennsylvania State University, 1985.
Sexton, John L., Professor, Ph.D., Indiana University, 1974.

Last updated: 02/06/2017

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