

Department of
Geology



Julie Willis, Department Chair
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<http://www.byui.edu/Geology/>

Geologists study the earth and the natural physical, chemical, and geological processes that have operated on it in the past and continue today. Geologists, sometimes referred to as geoscientists:

- Discover, develop, and protect natural resources such as oil, natural gas, rare earth minerals, metals, and water.
- Advise decision makers on energy and resource policy and management.
- Help resolve water and environmental challenges associated with population growth and climate change.
- Work with other scientists, policy makers, awareness groups, and citizens to help preserve and clean up our environment.
- Strive to understand how to develop mitigation plans to minimize risk to people from floods, landslides, volcanoes, earthquakes, tsunamis, and other natural hazards.

The BYU-Idaho Geology Department offers four degrees:

B.S. in Geology (740)

This degree prepares students for graduate school in geology or for employment as an entry level geologic technician. This is the most common major in the department. Geology majors take fundamental geology classes as well as core courses in physics, chemistry, and mathematics. Geologists are employed by resource development industries such as petroleum and mining, by federal and state government agencies, and by water and environmental consulting firms. Most students complete their Bachelor's degree with an eye toward graduate school; a Master's degree is the most marketable and financially rewarding degree in geology. Admission into graduate school is dependent on GPA and GRE scores. Top students from BYU-Idaho have been accepted into excellent graduate programs across the nation.

B.S. in Earth Science Education (840)

This degree prepares students to teach Earth and Environmental Science in secondary schools (Grades 7-12 in Idaho). Earth Science education majors take courses in geology, astronomy, chemistry, and environmental science as well as the core secondary education courses. Student teaching is completed at local schools or at partner schools in Arizona, Utah, and Nevada. The advisor for this degree is Professor Megan Pickard.

B.S. in Environmental Geoscience (748)

This degree prepares students for graduate school in environmental science or for employment as an entry level environmental science technician. These majors take specific geology classes to complete an Earth Studies Concentration with an environmental focus and specific biology classes to complete a Biology Minor also with an environmental focus. Although they take numerous biology classes, the student works primarily with geology advisors to ensure degree completion.

B.S. in Geoscience Computing (745)

This degree prepares students for graduate school in Geographic Information Systems (GIS) or for employment as a computer or GIS technician in geoscience related industries. Students take specific geology classes to complete an Earth Studies Concentration with a technology focus and also complete either a Computer Science or GIS Minor. Students work primarily with geology advisors to ensure degree completion.

Other Options

The Geology Department also offers an Earth Studies Concentration as well as minors and clusters in Geology and GIS. Pairing one of these offerings with concentrations, minors, or clusters in other fields of study can help students prepare for careers in medicine, environmental or water law, science writing or illustration, economics or business, and numerous other fields. Geology also hosts education minors in Earth Science and Natural Science. The Natural Science minor may be particularly attractive to individuals who plan to teach in smaller school districts as it may enable them to teach Physical Science and Life Science in addition to Earth Science, depending on state and district requirements.

Careers

A geoscience degree helps students develop critical thinking and communication skills and a strong science, technology, and math background as well as a deeper appreciation of the earth and its resources and hazards. These skills can serve students well in many traditional and non-traditional careers.

Typical career opportunities for geologists include mineral or energy exploration and development, geological engineering, geophysics, environmental geology, water resources, computer applications (including GIS), paleontology, etc. Employers include energy companies, consulting firms, academic institutions, and local, state, and federal government agencies.

Outdoor Study

Many geologic concepts are best understood by leaving the classroom and spending time studying rocks and geologic features where they exist. Off-campus field trips enable students to experience geology first-hand. The unique location of BYU-Idaho offers an exceptional opportunity to study at some of the most famous geological localities in the world including Yellowstone, Grand Teton, and Grand Canyon National Parks, the Snake River Plain (famous for volcanic and river features and an important aquifer), Hebgen Lake and Borah Peak earthquake sites, and western Utah and Wyoming fossil beds and geologic structures. These local and regional field experience provide for effective learning, enhanced student understanding of geologic processes, and superior preparation for future careers.

Outcomes**B.S. Geology (740)**

1. Students understand and apply the principles, concepts, and tools of geology.
2. Students 'do geology' in unscripted situations using their knowledge, relevant field methods, computation, computer applications, and laboratory methods.
3. Students engage in scientific inquiry and communicate their work professionally--orally and in writing.
4. Students can evaluate public and corporate geology-related policies that impact society and planet Earth.
5. Students use scientific and spiritual reasoning wisely.
6. Students are professional.

B.S. Earth Science Education (840)

1. Students understand and develop skills to teach the basic principles and concepts of earth science (e.g. geology, meteorology, oceanography, astronomy).
2. Students 'do earth science' in unscripted situations using their knowledge, relevant field methods, computation, computer applications, and laboratory methods.
3. Students engage in scientific inquiry and are able to communicate their work and other scientific concepts to non-scientists.
4. Students evaluate earth science-related media and public policies and their societal and environmental impacts.
5. Students use scientific and spiritual reasoning wisely.
6. Students become skilled earth science education professionals.

B.S. Environmental Geoscience (748)

1. Students will develop a core foundation in geoscience and environmental studies and apply scientific principles and analyses to identify and resolve environmental issues.
2. Students will analyze and synthesize data from varied sources such as earth, soil, water, and life, and interpret how the data interact in and with the environment.
3. Students will read interpret, and critically analyze environmental and scientific policies, procedures, and studies, and then evaluate how they impact society and planet Earth.
4. Students will communicate work professionally in written, oral, and geographical formats, including ability to use GIS software to build maps and analyze data.
5. Students will demonstrate an ability to function well and lead on team projects and show professionalism and good ethics in a team environment.
6. Students will demonstrate a desire to meet their professional responsibility to serve others in both a professional and non-professional capacity.

B.S. Geoscience Computing (745)

1. Students will develop a core foundation in the geosciences including an ability to identify earth materials, understand earth's past, and identify features on earth's surface.
2. Students will develop a core foundation in computer programming or GIS. They will use computers to collect, analyze, and present data relevant to the geosciences.
3. Students will integrate computer skills and geoscience understanding and demonstrate their abilities to use both to solve problems.
4. Students will communicate work professionally in written, oral, and geographical formats, including ability to use GIS software to build maps and analyze data.
5. Students will demonstrate an ability to function well and lead on team projects and show professionalism and good ethics in a team environment.
6. Students will demonstrate a desire to meet their professional responsibility to serve others in both a professional and non-professional capacity.

BS in Geology (740)

Introductory Geology Core <i>Take these courses during your first two semesters:</i>	Choose an emphasis from the following list:			Program Notes:																																																																																																																																																																																																																																																																														
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text-align: right;">15</td></tr> </table> <p>Physical Science & Math Requirements <i>Take these courses during your sophomore or junior year:</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>CHEM 105</td><td style="text-align: right;">4</td></tr> <tr><td>CHEM 106</td><td style="text-align: right;">4</td></tr> <tr><td>FDMAT 112</td><td style="text-align: right;">4</td></tr> <tr><td>MATH 215</td><td style="text-align: right;">4</td></tr> <tr><td>PH 121</td><td style="text-align: right;">3</td></tr> <tr><td>PH 123</td><td style="text-align: right;">3</td></tr> <tr><td>PH 150</td><td style="text-align: right;">1</td></tr> <tr><td colspan="2" style="border-top: 1px solid black; text-align: right;">23</td></tr> </table> <p><i>Take 1 course:</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>B 380</td><td style="text-align: right;">3</td></tr> <tr><td>BIO 180</td><td style="text-align: right;">4</td></tr> <tr><td>BIO 302</td><td style="text-align: right;">4</td></tr> <tr><td>BIO 460</td><td style="text-align: right;">4</td></tr> <tr><td>CE 341</td><td style="text-align: right;">3</td></tr> <tr><td>CE 370</td><td style="text-align: right;">3</td></tr> <tr><td>CS 124</td><td style="text-align: right;">3</td></tr> <tr><td>CHEM 351</td><td style="text-align: right;">4</td></tr> <tr><td>MATH 221B</td><td style="text-align: right;">3</td></tr> <tr><td>MATH 316</td><td style="text-align: right;">4</td></tr> <tr><td>MATH 330</td><td style="text-align: right;">3</td></tr> <tr><td>GEOL 400-level elective</td><td style="text-align: right;">3</td></tr> <tr><td colspan="2" style="border-top: 1px solid black; 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Ensure that your grad plan includes 30 total credits of 300- and 400-level courses. •FDMAT 112 will satisfy the Foundations Quantitative Reasoning requirement. •CHEM 105 is a prerequisite to GEOL 351. PH 121 and PH 150 are strongly recommended as a pre- or co-requisite to GEOL 391. •You should take your math, chemistry, and physics courses early. Those courses will help with your geology classes. •Students who become Geology Majors must change to a Fall/Winter Track during or after their Freshman year. •Geology majors do not take 200-level FDSCI courses. The combined coursework in Geology, Chemistry, and Physics meets this Foundations requirement. •To fulfill the foundations Writing requirement Geology majors should complete FDENG 101 and GEOL 316.
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Geology

Brigham Young University-Idaho 2015-2016

BS in Geoscience Computing (745)

<p>Core Courses Take these courses:</p> <p>CHEM 105 4 GEOL 111 3 GEOL 111L 1 GEOL 112 4 GEOL 140 1 GEOL 340 3 GEOL 351 3 <u> 3</u> 19</p> <p>Take 3 courses:</p> <p>GEOL 370 4 GEOL 404 3 GEOL 425 3 GEOL 435 3 <u> 3</u> 9</p> <p>Professional Core Take this course:</p> <p>MATH 221B 3 <u> 3</u> 3</p> <p>Take 1 course:</p> <p>MATH 109 5 FDMAT 112 4 <u> 4</u> 4</p> <p>Interdisciplinary Courses Take these courses:</p> <p>GEOL 498R or IDS 398R 1-3 IDS 499 2 <u> 2</u> 3</p>	<p><i>Complete 1 option:</i></p> <p>Computer Science Take these courses:</p> <p>CS 124 3 CS 165 3 CS 235 3 CS 246 3 Take 12 credits:</p> <p>ECEN 160 3 ECEN 324 3 CS 213 3 CS 237 2 CS 238 4 CS 306 3 CS 312 3 CS 313 3 CS 345 3 CS 364 4 CS 371 3 CS 416 2 CS 432 3 CS 450 3 CS 460 3 CS 470 3 CS 480 3 CS 490R 3 <u> 3</u> 24</p>	<p>GIS Take these courses:</p> <p>CS 101 2 CIT 111 3 GEOG 340 3 GEOL 440R 3 GEOG 240 3 Take 2 courses:</p> <p>CIT 160 3 CIT 260 3 COMM 125 3 ME 142 or CIT 110 <u> 3</u> 20</p>	<p>Computer Science & GIS for Geoscientists Take these courses:</p> <p>CS 124 3 CS 165 3 GEOL 440R 3 Take 9 credits:</p> <p>CIT 111 3 CIT 160 3 CS 101 2 CS 124 3 GEOG 240 3 MATH 221B 3 ME 142 or CIT 110 <u> 3</u> Take 6 credits:</p> <p>CS 213 3 CS 235 3 CS 237 2 CS 238 4 CS 246 3 CS 312 3 CS 460 3 ECEN 160 3 ECEN 324 3 <u> 3</u> 24</p>	<p>Program Notes:</p> <ul style="list-style-type: none"> •No Double Counting of Major Courses •No Grade Less Than C- for Major Courses •FDMAT 112 will satisfy a major requirement as well the foundations Quantitative Reasoning requirement. •GEOL 140 and GEOL 340 can double count. •Be sure to meet with your academic advisor early in your education. •To fulfill the foundations Writing requirement complete FDENG 101 and GEOL 316.
Credit Requirements:		Tracks Available:		
<p>Foundations 40 Major 58 Elective 22 Total 120</p>		<p>Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes</p>		

BS in Environmental Geoscience (748)

<p>Core Courses Take these courses:</p> <p>GEOL 111 3 GEOL 111L 1 GEOL 112 4 GEOL 140 1 GEOL 340 3 <u> 3</u> 12</p> <p>Supplemental Courses Take 13 credits:</p> <p>GEOL 351 3 GEOL 404 3 GEOL 435 3 GEOL 440R* 3 APS 220 & 220L or CONST 350 4 <u> 3</u> 13</p>	<p><i>Take these courses:</i></p> <p>BIO 208 4 BIO 302 4 BIO 423 3 CHEM 105 4 MATH 221B 3 <u> 3</u> 18</p> <p>Take 1 course:</p> <p>MATH 109 5 FDMAT 112 4 <u> 4</u> 4</p> <p>Take 2 courses:</p> <p>BIO 352 3 BIO 362 3 BIO 392 2 BIO 393 4 BIO 420 3 <u> 3</u> 5</p>	<p>Interdisciplinary Courses Take 1 course:</p> <p>GEOL 498R 1-3 IDS 398R 1-3 <u> 1-3</u> 1</p> <p>Take this course:</p> <p>IDS 499 2 <u> 2</u> 2</p>	<p>Program Notes:</p> <ul style="list-style-type: none"> •No Double Counting of Major Courses •No Grade Less Than C- for Major Courses •Other Recommended Courses: (These courses are not required, but are useful as electives) AGRON 425, CIT 110, CS 124, GEOL 335, GEOL 420, GEOG 240. •*GEOG 424 is offered at the University of Idaho Falls Center and can substitute for GEOL 440R. If students take this course and count it towards a UI M.S. degree in Environmental Science, then they need to complete 3 credits from the list of 'Other Recommended Courses' to finish their BYUI B.S. requirements. •FDMAT 112 will satisfy a major requirement as well as the foundations Quantitative Reasoning requirement. Be sure to meet with your academic advisor early in your education. •To fulfill the foundations Writing requirement complete FDENG 101 and GEOL 316.
Credit Requirements:		Tracks Available:	
<p>Foundations 40 Major 55 Elective 25 Total 120</p>		<p>Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes</p>	

Geology

Brigham Young University-Idaho 2015-2016

BS in Earth Science Education (840)

Education Core <i>Take these courses:</i> ED 200 2 ED 304 3 ED 461 3 ED 492 10 SPED 360 2 <hr style="width: 50%; margin-left: 0;"/> 20	Earth Science Education Core <i>Take these courses in your first 2 semesters:</i> GEOL 111 3 GEOL 111L 1 GEOL 112 4 <hr style="width: 50%; margin-left: 0;"/> 8 <i>Take these courses your sophomore or junior year:</i> GEOL 335 4 GEOL 351 3 MATH 109 5 <hr style="width: 50%; margin-left: 0;"/> 12	<i>Take these courses your sophomore or junior year:</i> BIO 305 2 CHEM 105 or CHEM 101 & 101L 4 GEOL 380 2 GEOL 404 3 GEOL 405 3 PH 127 3 PH 277 2 <hr style="width: 50%; margin-left: 0;"/> 19	Program Notes: •No Double Counting of Major Courses •No Grade Less Than C- for Major Courses •Students in this Education Major are required to have an Education Minor, such as Natural Science Education, Biology Education, Chemistry Education, Physics Education, or Mathematics Education. •Most Geology and Physics classes are only offered once each year. Create a graduation plan early and follow it. •Earth Science Education majors do not take 200-level FDSCI courses. The combined coursework in Geology, Chemistry, and Physics meets this Foundations requirement. •To fulfill the foundations Writing requirement complete FDENG 101 and GEOL 316.
Credit Requirements:		Tracks Available:	
Foundations	40	Fall-Winter	Yes
Major	39	Winter-Spring	Yes
Education Core	20	Spring-Fall	Yes
Education Minor	20		
Elective	1		
Total	120		

Minor in Natural Science Education (130)

Core Courses <i>Take these courses:</i> BIO 180 4 BIO 181 4 CHEM 105 4 CHEM 106 4 GEOL 111 3 GEOL 111L 1 GEOL 112 4 PH 105 4 PH 106 4 <hr style="width: 50%; margin-left: 0;"/> 32	Program Notes: •No Grade Less Than C- for Minor Courses •Students wishing to minor in Natural Science must major in Biology Ed, Chemistry Ed, Earth Science Ed or Physics Ed. •Double counting is allowed, which makes it possible to complete this minor in the 20 credit limit.		
Credit Requirements:		Tracks Available:	
Total	32	Fall-Winter	Yes
		Winter-Spring	Yes
		Spring-Fall	Yes

Geology Minor (154)

Geology Core <i>Take these courses:</i> GEOL 111 3 GEOL 111L 1 GEOL 112 4 GEOL 140 1 GEOL 340 3 <hr style="width: 50%; margin-left: 0;"/> 12	Geology Electives <i>Take 8 credits:</i> GEOL 335 4 GEOL 340 3 GEOL 351 3 GEOL 352 3 GEOL 370 4 GEOL 380 2 GEOL 391 2 GEOL 392 2 GEOL 404 3 GEOL 411 3 GEOL 412 3 GEOL 420 3 GEOL 425 3 GEOL 435 3 GEOL 440R 3 GEOL 445 3 GEOL 480 3 <hr style="width: 50%; margin-left: 0;"/> 8	Program Notes: •No Double Counting of Major, Minor or Cluster Courses •No Grade Less Than C- for Minor Courses •Please stop by the Geology Department office for help planning your courses. •Geol 111 & Geol 112 (and labs) are offered every semester. Other geology courses are only offered once each year, with very few in winter semester.	
Credit Requirements:		Tracks Available:	
Total	20	Fall-Winter	Yes
		Winter-Spring	Yes
		Spring-Fall	Yes

Minor in Earth Science Education (181)	
Core Courses <i>Take these courses:</i> GEOL 111 3 GEOL 111L 1 GEOL 112 4 GEOL 335 4 GEOL 351 3 GEOL 380 2 PH 127 3 <hr style="width: 100%;"/> 20	Program Notes: <ul style="list-style-type: none"> •No Double Counting of Major, Minor or Cluster Courses •No Grade Less Than C- for Minor Courses •Students in this Education Minor are required to take a Science or Math Education Major for graduation. •The options are: Biology Education (800), Chemistry Education (810), Mathematics Education Composite (852), or Physics Education (870). •Most Geology and Physics courses are only offered once each year. Create a graduation plan early and follow it.
Credit Requirements:	Tracks Available:
Total 20	Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes

Geographical Information Systems (GIS) Technology Minor (222)				
Core Courses <i>Take these courses:</i> CIT 111 3 CS 101 2 GEOL 140 1 <hr style="width: 100%;"/> 6 <i>Take 1 course:</i> MATH 221A 3 MATH 221B 3 MATH 221C 3 <hr style="width: 100%;"/> 3	Take 1 course: GEOG 230 3 GEOL 340 3 <hr style="width: 100%;"/> 3 GIS Courses <i>Take 1 course:</i> AGTEC 286 3 GEOG 340 3 GEOL 340 3 <hr style="width: 100%;"/> 3	GIS Project <i>Take 1 course*:</i> AGTEC 486 3 GEOL 440R 3 <hr style="width: 100%;"/> 3	Supplemental Courses <i>Take 2 courses:</i> AGRON 425 3 CIT 160 3 CIT 260 3 COMM 125 3 GEOG 240 3 ME 142 or CIT 110 3 <hr style="width: 100%;"/> 6	Program Notes: <ul style="list-style-type: none"> •No Double Counting of Minor Courses •No Grade Less Than C- for Minor Courses •A directed studies or other project oriented course in a students chosen discipline may be substituted for this requirement with the Geology Chairs permission.
Credit Requirements:			Tracks Available:	
Total 24			Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes	

Earth Studies Concentration (D 100)			
Geology Core <i>Take these courses:</i> GEOL 111 3 GEOL 111L 1 GEOL 112 4 GEOL 140 1 GEOL 340 3 <hr style="width: 100%;"/> 12 <i>Take 1 course:</i> MATH 109 5 FDMAT 110 3 FDMAT 112 4 <hr style="width: 100%;"/> 3	Supplemental Courses <i>Take 5 courses*:</i> CHEM 101 and 101L or 4 CHEM 105 4 GEOL 335 4 GEOL 351 3 GEOL 352 3 GEOL 370 4 GEOL 391 2 GEOL 392 2 GEOL 404 3 GEOL 409 4 GEOL 410 2 GEOL 411 3 GEOL 412 3 GEOL 420 3 GEOL 425 3 GEOL 435 3 GEOL 440R 3 GEOL 445 3 GEOL 480 3 MATH 221B or 330 3 PH 105 or 121 3-4 <hr style="width: 100%;"/> 12	Internship <i>Take 1 course:**</i> B 398*** 1-3 ECON 398 3 GEOL 498R 1-3 IDS 398R 1-3 <hr style="width: 100%;"/> 1 Interdisciplinary Capstone <i>Take this course:</i> IDS 499 2 <hr style="width: 100%;"/> 2	Program Notes: <ul style="list-style-type: none"> •Most Geology and Physics classes are only offered once each year. Create a graduation plan early and follow it. •No double counting of concentration courses •No Grade Less Than C- for Concentration Courses •Which courses you take depends on area of emphasis (e.g. Environmental, Construction, Petroleum, Mining, Broad Science). ••Choose an internship related to your chosen field. •••If you take B 398, take it for 2 credits.
Credit Requirements:			Tracks Available:
Total 30			Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes

Geology Pre-approved Clusters

Geology		6700
<i>Take these courses:</i>		
GEOL 111	Physical Geology	3
GEOL 111L	Physical Geology Lab	1
GEOL 112	Historical Geology	4
<i>Take 4 credits:</i>		
GEOL 140	Introduction to GPS	1
GEOL 335	Oceanography and Meteorology	4
GEOL 340	Introduction to GIS for Geoscientists	3
GEOL 351	Earth Materials	3
GEOL 352	Petrology	3
GEOL 370	Stratigraphy & Sedimentation	4
GEOL 380	Regional Geology	2
GEOL 391	Structural Geology I	2
GEOL 392	Structural Geology II	2
GEOL 404	Environmental Geology	3
GEOL 411	Geomorphology	3
GEOL 420	Geochemistry	3
GEOL 425	Petroleum Geology	3
GEOL 435	Groundwater Hydrology	3
GEOL 440R	Applied GIS	3
GEOL 445	Applied Geophysics	3
GEOL 480	Palaeontology	3
Total Credits		12

Note: Most Geology and Physics classes are only offered once each year. Create a graduation plan early and follow it.

Geographical Information Systems for Geoscientists		6711
<i>Take this course:</i>		
GEOL 440R	Applied GIS	3
<i>Take 9 credits:</i>		
CIT 111	Introduction to Databases	3
CIT 160	Introduction to Programming	3
CS 101	Introduction to Programming	2
CS 124	Introduction to Software Development	3
GEOL 240	Maps and Remote Sensing	3
MATH 221B	Biostatistics	3
or		
MATH 330	Engineering Statistics	3
ME 142	Engineering Computation	3
or		
CIT 110	Introduction to Excel	3
Total Credits		12

Physical Science and Mathematics		6800
<i>Take 12 credits from at least 2 of the following areas:</i>		
Chemistry		
Take any Chemistry class numbered 105 or higher		0-10
(Chem 150 and Chem 153 cannot be taken with Chem 351 and/or Chem 352)		
Physics		
Take any Physics class numbered 105 or higher		0-10
Geology		
Take any Geology class numbered 111 and 111L or higher		0-10
Mathematics		
Take any Mathematics class numbered 111 or higher		0-10
Total Credits		12

Geographical Information System (GIS)		6801
<i>Take this course:</i>		
GEOL 140	Intro to Global Positioning Systems	1
<i>Take 1 course:</i>		
AGTEC 286	Intro to Geographic Information Systems	3
GEOG 230	Intro to Geographic Information Systems	3
GEOL 340	Introduction to GIS for Geoscientists	3
<i>Take 1 course:</i>		
MATH 221A	Business Statistics	3
MATH 221B	Biostatistics	3
MATH 221C	Social Science Statistics	3
<i>Take 1 course:</i>		
AGTEC 486	Precision Agriculture	3
GEOG 340	Advanced GIS and Spatial Analysis	3
GEOL 340	Introduction to GIS for Geoscientists	3
GEOL 440R	Applied GIS	3
<i>Take 1 course:</i>		
CIT 111	Introduction to Databases	3
CIT 160	Introduction to Programming	3
COMM 125	Visual Fundamentals	3
CS 101	Introduction to Programming	2
Total Credits		12

Course Descriptions

Credits*

GEOL 111 Physical Geology (3:3:0:0)
 This is a great introductory course for anyone curious about active geologic processes and resources. It focuses on recognizing and understanding how observed features on the earth came to exist and how they may change in the future. Students taking Geology 111 must also register for Geology 111L.
 (Fall, Winter, Spring)

GEOL 111L Physical Geology Lab (1:0:3:0)
 Total Course Fees: \$100.00
 Concurrent Requisite: GEOL 111
 This lab complements the Geology 111 lecture by providing students with hands-on opportunities to learn and identify basic minerals and rocks. It also provides exposure to identifying and interpreting landforms and features from topographic maps, remote sensing images, and geologic maps. One of the main highlights is a field trip to the Grand Canyon, Arizona.
 (Fall, Winter, Spring)

GEOL 112 Historical Geology (4:3:3:0)
 Total Course Fees: \$100.00
 Prerequisites: GEOL 111 and GEOL 111L
 This integrated lecture and lab course addresses the geological history of the earth and the evolution of its life forms. Drawing from many fields of science, emphasis is placed on an understanding of the origin and dynamic equilibrium of Earth's lithosphere, atmosphere, hydrosphere, and biosphere.
 (Winter, Fall)

GEOL 140 Introduction to Global Positioning System (1:1:0:0)

This course is an introduction to Global Positioning Systems (GPS) and how GPS data acquisition fits within the larger Geographic Information Systems (GIS).
 (Fall, Winter, Spring)

GEOL 260 Earth Science (3:0:0)

Prerequisite: ED 259

Concurrent Requisite: GEOL 260L

This course builds the ability to understand and critically analyze basic concepts of geology, astronomy, oceanography and atmospheric science. It is designed primarily for Elementary Education majors who want to earn a Science Endorsement. However, any student who is interested in learning more about Earth Science is encouraged to take this course. The course includes discussion on Earth's place in space, Earth's ocean and atmospheric systems, Earth's climate and weather, Earth materials, and how Earth's tectonic and hydrologic process create landforms. You are required to take GEOL 260L (a lab) concurrently with this course.
 (Winter, Spring)

GEOL 260L Earth Science Lab (1:0:2:0)

Prerequisite: ED 259

This course is the lab portion of Earth Science (GEOL 260). You must take it concurrent with GEOL 260. This lab course will give you hands-on opportunities to inquire into, understand, teach, and critically analyze basic concepts of geology, astronomy, oceanography and atmospheric science. This course is designed primarily for Elementary Education majors who want to earn a Science Endorsement. However, any student who is interested in learning more about Earth Science is encouraged to take this course.
 (Winter, Spring)

GEOL 290R Directed Study (1-3:0:0:0)
 Repeatable Course: May earn maximum of 3 credits
 Course Requirement: Instructor Approval Required
 In this course, faculty-student consultation will determine a special area of study and/or research problems that will give students greater preparation for advanced work in geology and related fields. Term of enrollment, credit, and other details will be arranged with instructor. Contact the instructor prior to registering for credit.
 (Fall, Winter, Spring)

GEOL 301 Geology Career Preparation (1:0:3:0)
 Prerequisites: GEOL 111 and GEOL 111L
 Corequisites: GEOL 112 and GEOL 352
 This course helps you develop a career path and cultivate essential career-related knowledge and skills. The course involves in-class discussions activities, out-of-class skill-development activities, and university-provided training resources.
 (Winter)

GEOL 316 Geowriting (3:3:0:0)
 Prerequisite: GEOL 352
 This course is designed to build student competency in scientific writing.
 (Fall, Winter)

GEOL 335 Oceanography and Meteorology (4:3:3:0)
 Total Course Fees: \$50.00
 Prerequisites: GEOL 112 and FDMAT 108
 This integrated lecture and lab course addresses the fundamentals of oceanography and meteorology. Tailored primarily to earth science education and geology students, this course builds on knowledge from previous courses (GEOL 111 and 112) to deepen students' understanding of the oceanographic and atmospheric sciences.
 (Winter even years)

GEOL 340 Introduction to GIS for Geoscientists (3:2:3:0)
 Total Course Fees: \$20.00
 Prerequisites: GEOL 111 and GEOL 111L and (FDMAT 110 or FDMAT 112 or MATH 109)
 A project-based, introductory course providing an applied approach to learning and using a Geographic Information System (GIS) to display and analyze geological data. Students will study and apply principles of GIS and use ArcGIS software to analyze vector and raster data and use spatial, geostatistical, hydrologic, and 3D tools.
 (Fall, Winter)

GEOL 351 Earth Materials (3:2:4:0)
 Total Course Fees: \$25.00
 Prerequisites: GEOL 111 and GEOL 111L
 Corequisites: GEOL 112 and (CHEM 101 or CHEM 105)
 This course is centered on a single question: What information is recorded in minerals, igneous rocks, and metamorphic rocks?
 (Fall)

GEOL 352 Petrology (3:1:5:0)
 Prerequisites: CHEM 105 and GEOL 351
 This course is centered on this question: How do igneous and metamorphic rocks form, and what do these rocks teach us about how Earth works?
 (Winter)

GEOL 370 Stratigraphy and Sedimentation (4:3:3:0)
 Total Course Fees: \$100.00
 Prerequisites: (GEOL 111 and GEOL 111L and ME 250) or (GEOL 112 and GEOL 352)
 This course is a combination lecture and laboratory course that covers the origin, classification, distribution, and correlation of sedimentary rock bodies and their use in interpreting geological history. The class will provide a broad overview of the processes involved in the production of sedimentary rock bodies and the formation of stratigraphic successions, the classification of sedimentary rocks and rock bodies, the recognition of ancient depositional environments, and the methods and uses of stratigraphic (basin) analyses.
 (Fall, Winter)

GEOL 380 Regional Geology (2:0:6:0)
 Total Course Fees: \$250.00
 Prerequisite: GEOL 351, GEOL 335 and PH 127
 This course will have students travel to different geologic regions to learn the local stratigraphy and geologic history. Written reports will summarize observation from each area visited. A final oral presentation, summarizing all observations will take place on campus.
 (Spring)

GEOL 390R Directed Study (1-3:0:0:0)
 Repeatable Course: May earn maximum of 3 credits
 Prerequisite: GEOL 352
 Course Requirement: Geology Majors and Minors Only
 This course is designed to allow a student to obtain greater depth of understanding in subject matter not readily available through normal course work. Contact the instructor prior to registering for credit.
 (Fall, Winter, Spring)

GEOL 391 Structural Geology I (2:1:2:0)
 Total Course Fees: \$120.00
 Prerequisites: GEOL 352 and GEOL 112
 Concurrent Requisite: GEOL 392
 Corequisite: PH 121
 This course covers macroscopic deformation of earth's crust by faulting, folding, and related deformation.
 (Fall)

GEOL 392 Structural Geology II (2:1:2:0)
 Prerequisites: GEOL 352 and GEOL 112
 Corequisite: PH 121
 This is the second half of Structural Geology. In this course students will study strain and stress within the earth and evaluate brittle and ductile deformation as well as the rheologic and tectonic conditions that lead to them. Students will be introduced to structural geologic techniques, including computer-based methods and analog modeling, and use them to analyze past and present tectonic settings as well as their inherent structures and hazards.
 (Fall)

GEOL 404 Environmental Geology (3:2:3:0)
 Total Course Fees: \$60.00
 Prerequisites: GEOL 111 and GEOL 111L and (FDMAT 110 or FDMAT 112 or MATH 109)
 This course gives students a project-based look at the environmental issues impacting societies today. Projects dealing with common geologic hazards associated with floods, landslides, and earthquakes will be completed using visualization software. The course will also discuss the issues of an increasing demand for natural resources on an ever-growing population. Related impacts of waste management are also addressed.
 (Winter)

GEOL 405 Teaching Methods - Earth Science (3:2:3:0)
 Prerequisites: ED 304 and BIO 305
 Concurrent Requisite: GEOL 380
 This course incorporates general science teaching methods needed for certification in Earth Science secondary education. The course focuses on classroom and laboratory techniques. Practical experience in teaching laboratories, lectures and demonstrations will be emphasized. Students will build a science unit which demonstrates their understanding and application of inquiry and the use of multiple teaching and assessment strategies.
 (Spring)

GEOL 409 Geoscience Field Methods (4:0:12:0)
 Total Course Fees: \$550.00
 Prerequisites: GEOL 316 and GEOL 340 and GEOL 352 and GEOL 370 and GEOL 392
 This course is a 4-week capstone field experience covering identification, collection, and analysis of geologic field data, and an introduction to field geologic mapping and interpretation.
 (Spring)

GEOL 410 Advanced Field Methods (2:0:6:0)
 Total Course Fees: \$250.00
 Concurrent Requisite: GEOL 409
 This is a 3-week field course focused on developing field skills in sedimentology, stratigraphy, and structural geology through geological mapping.
 (Spring)

GEOL 411 Geomorphology (3:2:3:0)
 Total Course Fees: \$40.00
 Prerequisites: GEOL 111 and GEOL 111L and (FDMAT 110 or FDMAT 112 or MATH 109)
 Co-requisite: GEOL 370
 This course is an analysis of the origin of earth's major landforms emphasizing the inter-relationship between plate tectonics and hydrology in producing the features one can see on the earth's surface.
 (Winter)

GEOL 412 Geology of North America (3:2:3:0)
 Total Course Fees: \$100.00
 Prerequisite: GEOL 392
 Corequisite: GEOL 370
 This course involves the study of the geologic history of North America. In addition to the topic studied, students will develop skills in searching and comprehending the geologic literature, presenting geographic concepts, and scientific writing.
 (Winter)

GEOL 420 Geochemistry (3:2:3:0)
 Total Course Fees: \$50.00
 Prerequisites: GEOL 352 and CHEM 106
 This course will apply elementary chemical principles to understand geologic systems.
 (Winter)

GEOL 425 Petroleum Geology (3:2:3:0)
 Total Course Fees: \$35.00
 Corequisite: GEOL 370
 This course reviews the generation and distribution of oil and gas deposits and the tools and techniques geoscientists use to explore for, and produce, these accumulations.
 (Fall)

GEOL 435 Groundwater Hydrology (3:2:3:0)
 Total Course Fees: \$30.00
 Prerequisites: GEOL 111 and GEOL 111L and (FDMAT 110 or FDMAT 112 or MATH 109)
 This course is an in depth study of hydraulic issues focusing on groundwater. Students will study the movement of water in an aquifer and how it impacts the pumping and management of water as a natural resource are some of the main topics.
 (Fall)

GEOL 440R Applied GIS (3:2:3:0)
 Repeatable Course: May earn maximum of 9 credits
 Total Course Fees: \$20.00
 Prerequisite: GEOL 340
 This course allows students to expand their GIS (Geologic Information Systems) skills as related to geologic topics and problems with real-world data sets. Students are encouraged to bring GIS related research projects with them to the course.
 (Winter)

GEOL 445 Applied Geophysics (3:2:3:0)
 Total Course Fees: \$20.00
 Prerequisites: GEOL 311
 Corequisites: PH 123 and GEOL 370
 This course will help students learn and apply various geophysical methods to explore and characterize materials in the subsurface. A Field trip is included.
 (Fall)

GEOL 480 Paleontology (3:2:3:0)
 Total Course Fees: \$100.00
 Prerequisites: GEOL 112 or BIO 182
 This integrated lecture and lab course explores the fundamental principles paleontology, the study of ancient life. Emphasizing the formulation of scientific hypotheses that can be tested with data from the fossil record, this course is designed to help students learn numerous methods of data analysis, in addition to the most salient aspects of paleontology. Each student will apply these methods and new insights to an original research project.
 (Fall)

GEOL 490R Research Methods (1-2:0:4:0)
 Repeatable Course: May earn maximum of 6 credits
 Prerequisite: GEOL 352
 This course involves students applying learned skills to solve real-world problem as they work through a project in a guided/mentored environment. Appropriate projects and problems for this course are those with sufficient intellectual content to be stimulating and challenging to the student. The projects give students experience with scientific research, including scientific problem solving, writing, and presentation. Projects will be designed to solve an original research problem that will include all aspects of problem solving from project planning to communication of the results. Projects will involve between 70-200 hours of work. Projects are developed by the student and the thesis advisor and must be approved by department faculty. In cases where the project crosses semester boundaries, the student registers and receives a grade in the semester that the project is completed.
 (Fall, Winter, Spring)

GEOL 498R Geology Internship (1-3:0:0:0)
 Repeatable Course: May earn maximum of 9 credits
 Internship Fees: \$78 (LDS) \$156 (non-LDS) per credit
 Exempt from tuition, but charged this independent course fee
 Prerequisite: GEOL 352
 This course is for students who need to complete a Geology Internship. An internship experience should provide students the opportunity to apply knowledge that they have learned and/or provide exposure to possible career paths. After identifying an internship possibility, meet with the internship coordinator to make sure that it meets the standards established by the department prior to signing up for the internship through the university Career Navigator website. Students who are unable to identify an internship opportunity are encouraged to get involved in a mentored research project (GEOL 490) with one of the faculty members.
 (Fall, Winter, Spring)