

Department of

Geology*Julie Willis, Department Chair**Robb Clayton, Forest Gahn, Bill Little, Mark Lovell, Dan Moore,
Megan Pickard, Greg Roselle, Julie Willis
Jeanette Belnap, Secretary (208) 496-7671
<http://www.byui.edu/Geology/>***Introduction**

Geology offers students career opportunities both as professional geologists and as teachers in secondary education (Earth Science). Both career paths are currently in high demand. Graduates in Earth Science education are employable with their bachelor's degree while the professional geologist's track generally requires a graduate degree. The current financial rewards for geologists are significant and generally require living close to a major city. The education major provides greater flexibility in choosing where to live. In addition to our major programs, we are also home for a minor in geology and education minors in Earth Science and Natural Science. The education Natural Science minor is especially attractive for individuals planning to teach in smaller school districts, as within the State of Idaho, upon successful completion of required exams the candidate is able to teach all science categories.

Career opportunities for geologists include mineral or energy exploration and development, geological engineering, geophysics, environmental geology, water resources, computer applications to geology (including GIS), paleontology, etc. Employers include energy companies, consulting firms, local and federal government agencies, and academic institutions. The broad, multidisciplinary nature of a major in geology is great preparation for careers in other areas, like business or law.

Most geoscience concepts are best understood by leaving the classroom and spending time studying the rocks and geologic features where they exist. Field trips off-campus provide students field experiences, enabling them to experience geologic features first hand. The unique location of BYU-Idaho offers an exceptional opportunity to study geology. Our students study at some of the most famous geologic localities in the world. Local and regional field trips to Yellowstone and Grand Teton Nation Parks, Snake River Plain volcanic and hydrologic features, Hebgen Lake and Borah Peak earthquake localities, and the Grand Canyon in Arizona, provide for more effective learning, enhanced student understanding of geologic processes, and a superior preparation for future careers.

Geology

Brigham Young University-Idaho 2013-2014

BS in Geology (740)

Take required Foundations courses (40 credits)

No Double Counting of Major Courses

Introductory Geology Core <i>Take these courses during your first two semesters:</i> GEOL 111 3 GEOL 111L 1 GEOL 112 3 GEOL 112L 1 GEOL 140 1 GEOL 340 3 <hr style="width: 50%; margin-left: 0;"/> 12 Geology Core Module <i>Take these courses:</i> GEOL 316 3 GEOL 351 3 GEOL 352 3 GEOL 370 4 GEOL 391 2 GEOL 392 2 <hr style="width: 50%; margin-left: 0;"/> 17 Geology Seminar <i>Take this course every Fall Semester after completion of Geol 111 & Geol 112 for 1 credit:</i> GEOL 497R 0.5 <hr style="width: 50%; margin-left: 0;"/> 1	Physical Science & Math Requirements <i>Take these courses during your sophomore or junior year:</i> CHEM 105 4 CHEM 106 4 FDMAT 112* 4 MATH 215 4 PH 121 3 PH 123 3 PH 150 1 <hr style="width: 50%; margin-left: 0;"/> 23	Geology Electives <i>Take 10 credits:</i> BIO 180 4 MATH 221B 3 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 GEOL 490R 1-2 GEOL 498R 1-3 <hr style="width: 50%; margin-left: 0;"/> 10 Capstone Experience <i>Take 1 course:</i> GEOL 410 6 <hr style="width: 50%; margin-left: 0;"/> 6	Program Notes: Be sure to meet with your academic advisor early in your education. They will help you put together your graduation plan. *Note to students: FDMAT 112 needs to be taken to satisfy a major requirement as well as partially satisfy the Foundations Quantitative Reasoning requirement. Full completion of Foundations will also require FDMAT 108T. 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/Spring Track during or after their Freshman year.
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Total Major Credits=69

Additional Elective Credits Required for Graduation=11

This major is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

BS in Earth Science Education (840)

Take required Foundations courses (40 credits)

No Double Counting of Major Courses

Education Core <i>Take these courses:</i> ED 200 2 ED 304 3 ED 361 3 ED 461 3 ED 492 10 SPED 360 2 <hr style="width: 50%; margin-left: 0;"/> 23	Earth Science Education Core <i>Take these courses in your first 2 semesters:</i> GEOL 111 3 GEOL 111L 1 GEOL 112 3 GEOL 112L 1 <hr style="width: 50%; margin-left: 0;"/> 8 <i>Take these courses during your sophomore or junior year:</i> GEOL 235 2 GEOL 335 3 GEOL 351 3 <hr style="width: 50%; margin-left: 0;"/> 8	Take these courses during your sophomore or junior year: ENG 316 3 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;"/> 20	Program Notes: Be sure to meet with your academic advisor early in your education. They will help you put together your graduation plan. Note: Most geology and physics classes are only offered once each year. Create a graduation plan early and follow it.
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Total Major Credits=36

Education Core Credits =23

Education Majors Require an Education Minor for Graduation

This major is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- NO

Spring-Fall---- YES

Geology

Brigham Young University-Idaho 2013-2014

Earth Studies Concentration (D 100)

Concentration Requirements

Geology Core <i>Take these courses:</i> GEOL 111 3 GEOL 111L 1 GEOL 112 3 GEOL 112L 1 GEOL 140 1 GEOL 340 3 <hr style="width: 50%; margin-left: 0;"/> 12 Geology Seminar <i>Take this course at least 1</i> <i>Fall Semester:</i> GEOL 497R 0.5 <hr style="width: 50%; margin-left: 0;"/> 0.5	Professional Writing <i>Take 1 course:</i> ENG 316 3 GEOL 316 3 <hr style="width: 50%; margin-left: 0;"/> 3 Field Geology Courses <i>Take 1 course:</i> GEOL 380 2 GEOL 410 6 <hr style="width: 50%; margin-left: 0;"/> 2	Supplemental Courses <i>Take 5 courses:*</i> CHEM 101 and 101 L OR CHEM 105 4 GEOL 235 2 GEOL 335 3 GEOL 351 3 GEOL 352 3 GEOL 370 4 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 PH 105 OR 121 4 OR 3 <hr style="width: 50%; margin-left: 0;"/> 12	Internship <i>Take 1 course**</i> B 398 3 ECON 398 3 GEOL 498R 1-3 IDS 398R 1-3 <hr style="width: 50%; margin-left: 0;"/> 1 **Choose an internship related to your chosen field. Capstone <i>Take 1 course*</i> IDS 499 2 <hr style="width: 50%; margin-left: 0;"/> 2	Program Notes: Note: 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.
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Total Concentration Credits=32.5

This concentration is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

Geology Minor (154)

Minor Requirements

Geology Core <i>Take these courses:</i> GEOL 111 3 GEOL 111L 1 GEOL 112 3 GEOL 112L 1 GEOL 140 1 GEOL 340 3 <hr style="width: 50%; margin-left: 0;"/> 12	Geology Electives <i>Take 8 credits:</i> GEOL 335 3 GEOL 340 3 GEOL 351 3 GEOL 352 3 GEOL 370 4 GEOL 380 4 GEOL 390R 1-3 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: Please stop by the department office (ROM 150) and meet with a member of the department so that we can help you plan out your minor. 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. No double counting of minor courses.
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Total Minor Credits=20

This minor is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

Geology

Brigham Young University-Idaho 2013-2014

Minor in Natural Science Education (130)

Minor Requirements

Required Courses
Take these courses:

BIO 204	4
BIO 208	4
CHEM 105	4
CHEM 106	4
GEOL 111	3
GEOL 111L	1
GEOL 112	3
GEOL 112L	1
PH 105	4
PH 106	4
	32

Program Notes:

Students wishing to minor in Natural Science must major in Ag Ed, 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.

Total Minor Credits=32

This minor is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

Minor in Earth Science Education (181)

Minor Requirements

Required Courses
Take these courses:

GEOL 111	3
GEOL 111L	1
GEOL 112	3
GEOL 112L	1
GEOL 235	2
GEOL 335	3
GEOL 351	3
PH 127	3
PH 277	2
	21

Program Notes:

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

No double counting of minor courses.

Total Minor Credits=21

This minor is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- NO

Spring-Fall---- YES

Geology

Brigham Young University-Idaho 2013-2014

Geographical Information Systems (GIS) Technology Minor (222)

Minor Requirements

No Double Counting of Minor Courses

Core Courses	GIS Project	Supplemental Courses	Program Notes:
<i>Take this course:</i>	<i>Take 1 course*:</i>	<i>Take 2 courses:</i>	
CIT 111 3	AGTEC 486 3	AGRON 425 3	
MATH 221A, 221B or 221C 3	GEOL 440R <u>3</u>	CIT 160 3	
GEOL 140 1	3	CIT 260 3	
GEOL 230 <u>3</u>		COMM 130 3	
10	<i>*A directed studies or other project oriented class in a student's chosen discipline may be substituted for this requirement with the Geography Chairs permission.</i>	GEOL 240 <u>3</u>	
		6	
Advanced/Applied Courses			
<i>Take 1 course:</i>			
AGTEC 286 3			
GEOL 340 3			
GEOL 340 <u>3</u>			
3			

Total Major Credits=22

This major is available on the following tracks:

Fall-Winter---- YES

Winter-Spring---- YES

Spring-Fall---- YES

Geology Pre-approved Clusters

<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Geology Cluster</th> <th style="text-align: right;">6700</th> </tr> </thead> <tbody> <tr> <td colspan="2"><i>Take these courses:</i></td> </tr> <tr> <td>GEOL 111 Physical Geology</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 111L Physical Geology Lab</td> <td style="text-align: right;">1</td> </tr> <tr> <td>GEOL 112 Historical Geology</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 112L Historical Geology Lab</td> <td style="text-align: right;">1</td> </tr> <tr> <td colspan="2"><i>Take 4 credits:</i></td> </tr> <tr> <td>GEOL 140 Introduction to GPS</td> <td style="text-align: right;">1</td> </tr> <tr> <td>GEOL 235 Meteorology</td> <td style="text-align: right;">2</td> </tr> <tr> <td>GEOL 335 Oceanography</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 340 Introduction to GIS for Geoscientists</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 351 Earth Materials</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 352 Petrology</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 370 Stratigraphy & Sedimentation</td> <td style="text-align: right;">4</td> </tr> <tr> <td>GEOL 380 Regional Geology</td> <td style="text-align: right;">2</td> </tr> <tr> <td>GEOL 391 Structural Geology 1</td> <td style="text-align: right;">2</td> </tr> <tr> <td>GEOL 392 Structural Geology 2</td> <td style="text-align: right;">2</td> </tr> <tr> <td>GEOL 404 Environmental Geology</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 411 Geomorphology</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 420 Geochemistry</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 425 Petroleum Geology</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 435 Hydrology</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 440R Applied GIS</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 445 Geophysics</td> <td style="text-align: right;">3</td> </tr> <tr> <td>GEOL 480 Paleontology</td> <td style="text-align: right;">3</td> </tr> <tr> <td style="text-align: right;">Total Credits</td> <td style="text-align: right;">12</td> </tr> <tr> <td colspan="2"><i>Note: Most geology and physics classes are only offered once each year. 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Total Credits	12																																																																																																																																																		

Geology

Brigham Young University–Idaho 2013-2014

Organic Biochemistry Cluster for Geology Students			6706
<i>Take 12 credits:</i>			
CHEM 106	General Chemistry	4	
CHEM 220	Quantitative Analysis	5	
CHEM 351	Organic Chemistry	4	
CHEM 352	Organic Chemistry	4	
CHEM 481	Biochemistry	4	
Total Credits		12	

Engineering Cluster for Geology Students			6707
<i>Take 12 credits:</i>			
ME 142	Engineering Computation 1	3	
ME 172	Visualization in Engineering Design	2	
ME 201	Engineering Mechanics: Statics	3	
ME 202	Strength of Materials	3	
ME 204	Engineering Mechanics: Dynamics	3	
ME 231	Manufacturing Processes 1	3	
Total Credits		12	

Computer Cluster for Geology Students			6708
<i>Take 12 credits:</i>			
CIT 160	CIT Fundamentals	3	
CIT 225	Database Design & Development	3	
CIT 240	Networking	3	
CIT 241	Network Design	3	
CIT 260	Object Oriented Programming 1	3	
CIT 360	Object Oriented Programming 2	3	
CS 124	Introduction to Software Development	3	
CS 165	Object Oriented Software Development	3	
CS 213	Web Engineering 1	3	
CS 235	Data Structures	3	
CS 246	Software Design & Development	3	
CS 371	Human-Computer Interaction	3	
CS 460	Computer Communication & Networks	3	
ECEN 150	Electric Circuit Analysis	3	
ECEN 160	Fundamentals of Digital Systems	3	
Total Credits		12	

GIS Cluster			6801
<i>Take this course:</i>			
GEOL 140	Introduction to GPS	3	
<i>Take this course:</i>			
AGTEC 286	Introduction to GIS	3	
GEOG 230	Introduction to GIS	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	Advanced GIS in Agriculture and Natural Resources	3	
GEOG 340	Advanced GIS and Spatial Analysis	3	
GEOL 340	Introduction to GIS for Geoscientists	3	
<i>Take 1 course:</i>			
CIT 111	Introduction to Databases	3	
CIT 160	Introduction to Programming	3	
COMM 130	Visual Media	3	
Total Credits		13	

Course Descriptions

Credits*

GEOL 111 Physical Geology

(3:3:0)

Concurrent Course: GEOL 111L

For majors in Geology, Engineering, Forestry, Construction and other programs. Includes a study of our earth and the processes that formed its features. Students who take Geology 111 must register for Geology 111L.
(Winter Spring Fall)

GEOL 111L Physical Geology Lab

(1:0:3)

Total Course Fees: \$100.00

Concurrent Course: GEOL 111

Mineral and rock identification and interpretation, as well as map and photo interpretation.
(Winter Spring Fall)

GEOL 112 Historical Geology

(3:3:0)

Prerequisites: GEOL 111; GEOL 111L

Concurrent Course: GEOL 112L

A study of the geological history of the earth and the evolution of its life forms. For geology and related majors. Students taking Geol 112 are required to take Geol 112L.
(Winter Spring Fall)

GEOL 112L Historical Geology Lab

(1:0:3)

Total Course Fees: \$100.00

Prerequisites: GEOL 111; GEOL 111L; GEOL 112

Concurrent Course: GEOL 112

Three hour lab per week. Examination of the principles of historical geology, along with the study of fossils, special attention given to identification, type of preservation and environments of fossils. Geologic map studies are included.
(Winter Spring Fall)

GEOL 140 Introduction to Global Positioning Systems

(1:1:0)

This course examines the components, technology, and application of the Global Positioning System (GPS). Students will be instructed how to use and apply recreational, differential, and real-time kinematic GPS systems and will be made aware of their limitations. They will also collect GPS data, such as points, tracks, polygons, and transfer the data to a GIS application such as Google Earth or ArcMap and generate a map that includes their data. Taught as a block class.
(Winter Spring Fall)

GEOL 235 Meteorology

(2:0:4)

Prerequisites: GEOL 111; GEOL 111L; FDMAT 110 or MATH 109

This course will build student competency in understanding meteorological processes with emphasis on Earth Science Education majors developing the knowledge and skills necessary to teach that material at secondary school levels. Class time will be focused on a mix of lecture and lab work, with emphasis on laboratory exercises and presentations. The course will cover what air masses are, how they form, and what impacts they have based on their characteristics (such as temperature, pressure, and humidity). Students gain an understanding of basic, local and global, atmospheric circulation and the factors that drive that circulation and will be able to interpret basic weather reports and identify basic atmospheric phenomena (such as cloud types) and understand how they form. The course will also focus on various atmospheric hazards, the conditions that lead to them, and types of mitigation of them
(Fall)

GEOL 290R Directed Study

(1-3:0:0)

Repeatable Course: may earn maximum of 3 credits

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.
(Winter Spring Fall)

GEOL 316 Geowriting

(3:3:0)

Prerequisites: GEOL 351; GEOL 352

A writing-intensive course designed to build student competency in all areas of communication, i.e., writing, lecturing, and poster presentation.
(Fall)

GEOL 335 Oceanography

(3:1:4)

Total Course Fees: \$50.00

Prerequisites: GEOL 111; GEOL 111L; MATH 109 or FDMAT 110

Builds understanding of oceans including plate tectonic processes, ocean atmosphere interactions, coastal environments, hazards, marine life, and marine resources.
(Spring)

Geology

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GEOL 340 Introduction to GIS for Geoscientists (3:2:4) Total Course Fees: \$20.00 Prerequisites: GEOL 111; GEOL 111L; MATH 109 or FDMAT 110 A project-based, introductory course providing an applied approach to learning and using a Geographic Information System (GIS) to display and analyze geological data. Also introduces using the Global Positioning System (GPS) to collect geospatial data. (Winter Fall)	GEOL 404 Environmental Geology (3:2:3) Total Course Fees: \$75.00 Prerequisites: GEOL 111; GEOL 111L; FDMAT 110; MATH 109 A project-based look at the environmental issues impacting societies today. Projects dealing with common geologic hazards associated with floods, landslides, volcanoes, 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. (Spring)
GEOL 351 Earth Materials (3:1:5) Course Fees: \$20.00 Prerequisites: GEOL 111; GEOL 111L; CHEM 105 This course is centered on a single question: What information is recorded in minerals, igneous rocks, and metamorphic rocks? (Fall)	GEOL 405 Teaching Methods - Earth Science (3:2:3) Total Course Fees: \$10.00 Prerequisites: GEOL 380; ED 304; ED 361 General science teaching methods needed for certification in Earth Science secondary education are taught. 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. (Fall)
GEOL 352 Petrology (3:1:5) Total Course Fees: \$30.00 Prerequisites: CHEM 105; GEOL 111; GEOL 111L; GEOL 351 This course is centered on a single question: How do igneous and metamorphic rocks form? (Spring)	GEOL 410 Advanced Field Methods (6:0:24) Total Course Fees: \$800.00 Prerequisites: GEOL 351; GEOL 352; GEOL 370; GEOL 316; GEOL 311 Field experience covering mapping skills, sample data collection, synthesis of field work and literature, and report writing. (Spring)
GEOL 370 Stratigraphy and Sedimentation (4:3:3) Total Course Fees: \$100.00 Prerequisites: GEOL 111; GEOL 111L; GEOL 112; GEOL 112L; GEOL 351; GEOL 352 Covers the origin, classification, distribution and correlation of sedimentary rock bodies and their use in interpreting geological history. (Fall)	GEOL 411 Geomorphology (3:2:3) Total Course Fees: \$50.00 Prerequisites: GEOL 351 Analysis of the origin of earth's major landforms emphasizing the interrelationship between plate tectonics and hydrology in producing the features we see on the earth's surface. (Spring)
GEOL 380 Regional Geology (2:1:4) Total Course Fees: \$250.00 Prerequisites: GEOL 404; GEOL 112; GEOL 112L; GEOL 235; GEOL 335; GEOL 351; PH 127; CHEM 105; CHEM 101 Travel to different geologic regions to learn the local stratigraphy and geologic history. Written reports will summarize observation from each area visited. Present rock and photo collections from earlier courses. (Spring)	GEOL 412 Geology of North America (3:2:3) Total Course Fees: \$100.00 Prerequisites: GEOL 352; GEOL 351; GEOL 316; GEOL 370 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. (Fall)
GEOL 390R Directed Study (1-3:0:0) Repeatable Course: may earn maximum of 3 credits Prerequisites: GEOL 351; GEOL 352 Directed studies in Geology 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. (Winter Spring Fall)	GEOL 420 Geochemistry (3:2:3) Total Course Fees: \$25.00 Prerequisites: GEOL 351; GEOL 352; CHEM 106 Applying elementary chemical principles to understand geologic systems. (Fall)
GEOL 391 Structural Geology 1: Geometry and Kinematics (2:2:0) Course Fees: \$100.00 Lab Fees: \$20.00 Prerequisites: GEOL 352; GEOL 370 Concurrent Courses: Geol 392 Co-requisites: Ph 121 First half of structural geology. Evaluate faults and folds and the forces that cause them. Represent earth's surface structures via aerial photos and geologic maps; represent earth's subsurface structures via cross sections and 3D modeling. (Spring)	GEOL 425 Petroleum Geology (3:2:3) Total Course Fees: \$50.00 Prerequisites: GEOL 311; GEOL 370 Petroleum Geology 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 392 Structural Geology 2: Geodynamics, Rheology, and Tectonics (2:2:0) Prerequisites: GEOL 352; GEOL 370 Concurrent Courses: Geol 391 Co-requisites: Ph 121 Second half of structural geology. Evaluate connections between brittle and ductile deformation, rheology, and tectonics. Analyze past and present tectonic settings and their inherent structures and hazards. (Spring)	GEOL 435 Hydrology (3:2:3) Total Course Fees: \$30.00 Prerequisites: FDMAT 110; GEOL 111; GEOL 111L; MATH 109 or FDMAT 110 In depth study of hydraulic issues focusing on groundwater. Movement of water in the aquifer, impacts of pumping and management of water as a natural resource are some of the main topics. (Spring)
	GEOL 440R Applied GIS (3:1:5) Repeatable Course: may earn maximum of 9 credits Total Course Fees: \$20.00 Prerequisites: GEOL 340 Applied GIS (Geologic Information Systems) allows students to apply GIS skills to geologic topics and problems with real-world data sets. (Fall)

GEOL 445 Applied Geophysics**(3:2:3)**

Total Course Fees: \$20.00

Prerequisites: GEOL 370; GEOL 311; PH 123

Learning and applying various geophysical methods to explore and characterize materials in the subsurface. Field trips included.

(Fall)

GEOL 480 Paleontology**(3:0:0)**

Total Course Fees: \$100.00

Prerequisites: GEOL 112; GEOL 370; GEOL 112L

Introduction to the fundamental principles of paleontology, the study of fossils and their significance.

(Fall)

GEOL 490R Research Methods**(1-2:0:4)**

Repeatable Course: may earn maximum of 6 credits

Prerequisites: GEOL 351; GEOL 352

Student problem and project solving (research) 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 should involve ~70 to 200 or so hours and should be designed to solve an original research problem and should include all aspects of problem solving from project planning, through data collection and analysis, to communication of the results. 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.

(Winter Spring Fall)

GEOL 497R Geology Seminar**(0.5:0:2)**

Repeatable Course: may earn maximum of 3 credits

A weekly seminar that includes guest speakers, and career, and graduate school preparation. Geology majors should enroll each fall semester.

(Fall)

GEOL 498R Geology Internship**(1-3:0:0)**

Repeatable Course: may earn maximum of 9 credits

Prerequisites: GEOL 351

An on-the-job experience related to the area of geological sciences.

(Fall, Winter, Spring)