Geology (GEO)

Major and Minor in Geology

Department of Geosciences, College of Arts and Sciences

Chairperson: Daniel Davis

Director of Undergraduate Studies: Hanna Nekvasil

Major Advisor: A. Deanne Rogers

Email: Deanne.Rogers@stonybrook.edu

Office: 255 Earth and Space Sciences

Phone: (631) 632-8200

Web Address: http://www.geosciences.stonybrook.edu

Minors of particular interest to students majoring in Geology and Earth and Space Sciences: Environmental Studies (ENS), Marine Sciences (MAR), engineering minors

Geology (GEO)

The Department of Geosciences offers two undergraduate programs: the Geology major, leading to a Bachelor of Science degree, and the Earth and Space Sciences major, leading to a Bachelor of Arts degree. Minimum course requirements for the B.S. program in Geology are detailed below. For requirements for the B.A. program in Earth and Space Sciences, see the entry in the alphabetical listing of Approved Majors, Minors, and Programs. Upon declaring the major, the student is assigned a faculty advisor who will assist in the selection of a course sequence leading to the degree. Students should consult frequently with their faculty advisors regarding their progress and regarding appropriate science courses. Because the position of the scientist in society is responsible and complex, the student is cautioned to pay careful attention to general education in the arts, humanities, and social sciences.

Geology

The science of geology is focused on evaluation of the physical and chemical characteristics of the Earth and other planets and the processes that have controlled evolution of these characteristics over time. The B.S. program has built-in flexibility to allow majors to choose from a variety of electives in environmental geoscience, planetary geoscience, geophysics and geochemistry. This allows students to develop a major that best reflects their interests and career goals, by allowing students to build upon the core curriculum by selecting 19 credits of upper-level science/mathematics electives from both within and outside of the Geosciences. The major aims to provide the student with maximum preparation to carry out graduate and professional work in each of these fields. Students graduating with a B.S. in Geology typically go on to graduate school or obtain professional employment with environmental consulting firms or various government organizations.

Requirements for the Major and Minor in Geology

Requirements for the Major

The major in Geology leads to the Bachelor of Science degree. All courses offered for the major must be passed with a letter grade of C or higher.

Completion of the major requires 63 to 66 credits.

A. Required departmental courses

- GEO 103 The Earth Through Time
- GEO 113 Historical Geology Laboratory
- GEO 102 The Earth and GEO 112 Physical Geology Laboratory
- GEO 306/GEO 366 Mineralogy and Mineralogy Laboratory
- GEO 309/GEO 369 Structural Geology and Structural Geology Laboratory
- GEO 403/463 Sedimentation and Stratigraphy and Sedimentation and Stratigraphy Laboratory
- GEO 407/467 Igneous and Metamorphic Petrology and Igneous and Metamorphic Petrology Laboratory

B. Required courses in the related sciences

- AMS 151, AMS 161 Applied Calculus I, II or MAT 131, MAT 132 Calculus I, II (See Note 1 below). If students do not place into AMS 151 or MAT 125 or 131 on the basis of the math placement examination, MAT 123 is a required course for the major.
- CHE 131/CHE 133 General Chemistry I and Laboratory, CHE 132 General Chemistry II
- PHY 131/PHY 133 Classical Physics I and Laboratory, or PHY 141/PHY 133, Honors Physics I and lab; PHY 132 Classical Physics II or PHY 142 Honors Physics II (Note: PHY 125/126/127 Classical Physics A/B/C and lab PHY 133 may be substituted for the PHY 131/132 with lab PHY 133 sequence)
Either CHE 134 General Chemistry II Laboratory or PHY 134 Classical Physics II Laboratory

C. Related science electives

A set of upper-division science courses, totaling 19 credits, that has been approved by the department.

D. Upper-Division Writing and Speaking Requirement

Before graduation all students in the Geology major must register concurrently for the 1-credit GEO 496 and GEO497 courses along with a 300-400 level GEO course. Completion of GEO 496 with an S and GEO 497 with a C or higher will satisfy the writing and speaking requirements.

Notes:

1. The following alternate beginning calculus sequences may be substituted for AMS 151, AMS 161 or MAT 131, MAT 132 in major requirements or prerequisites: MAT 125, MAT 126, MAT 127 or MAT 141, MAT 142 or MAT 171. Equivalency for MAT courses achieved by earning the appropriate score on a University mathematics placement examination will be accepted as fulfillment of the requirement without the necessity of substituting other credits. For detailed information about the various calculus sequences, see "Beginning Mathematics Courses" under the entry for the Department of Mathematics and the individual course descriptions.

Suggested Clusters of Science Electives:

Students with interest in Geology:

- GEO 310 Introduction to Geophysics
- GEO 315 Groundwater Hydrology
- GEO 320 Glacial Geology
- GEO 405 Field Camp
- GEO 487 Senior Research in Geology

Students with interest in Environmental Geoscience:

- GEO 305 Field Geology
- GEO 315 Groundwater Hydrology
- GEO 316 Geochemistry of Surficial Processes
- GEO 347 Remote Sensing
- GEO 420 Environmental Analysis and Remote Sensing/GIS or GSS 313/314 GIS Design and Application I and GIS Laboratory
- MAR 340 Environmental Problems

Students with interest in Geological Oceanography:

- GEO 310 Introduction to Geophysics
- GEO 316 Geochemistry of Surficial Processes
- GEO 318 Engineering Geology and Coastal Processes
- GEO 353 Marine Ecology
- MAR 304 Waves, Tides, and Beaches

Honors Program in Geology

Students in the Geology major who have maintained a grade point average of 3.50 in natural sciences and mathematics through the junior year may become candidates for Departmental honors in Geology by applying to the Department.

In addition to the academic program, the student must complete an honors thesis, which is evaluated by a committee composed of the student's advisor and two other science faculty members including one from outside of the Department. If the honors program is completed with distinction and the student has maintained a minimum 3.50 grade point average in all coursework in natural sciences and mathematics, honors are conferred.

Requirements for the Minor

For students majoring in other areas who are interested in obtaining a fundamental understanding of the earth sciences, a minor concentration in Geology is available. The Geology minor acquaints students with earth materials, the origin and evolution of life on earth, and physical processes that have shaped the earth through time.

All courses offered for the minor must be passed with a letter grade of C or higher. Completion of the minor requires 20 credits.

Geology

- GEO 103 and GEO 113
- GEO 102 The Earth and GEO 112 Physical Geology Laboratory
- Twelve additional credits from among GEO courses numbered 300 or higher. Courses must be approved by a departmental advisor.
Sample Course Sequence for the Major in Geology

A course planning guide for this major may be found here. The major course planning guides are not part of the official Undergraduate Bulletin, and are only updated periodically for use as an advising tool. The Undergraduate Bulletin supersedes any errors or omissions in the major course planning guides.

### Freshman

<table>
<thead>
<tr>
<th></th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FALL</td>
<td></td>
</tr>
<tr>
<td>First Year Seminar 101</td>
<td>1</td>
</tr>
<tr>
<td>WRT 101</td>
<td>3</td>
</tr>
<tr>
<td>CHE 131/133</td>
<td>5</td>
</tr>
<tr>
<td>GEO 102</td>
<td>3</td>
</tr>
<tr>
<td>GEO 112</td>
<td>1</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPRING</td>
<td></td>
</tr>
<tr>
<td>First Year Seminar 102</td>
<td>1</td>
</tr>
<tr>
<td>WRT 102</td>
<td>3</td>
</tr>
<tr>
<td>CHE 132/134</td>
<td>4(5)</td>
</tr>
<tr>
<td>AMS 151</td>
<td>3</td>
</tr>
<tr>
<td>GEO 103</td>
<td>3</td>
</tr>
<tr>
<td>GEO 113</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15(16)</strong></td>
</tr>
</tbody>
</table>

### Sophomore

<table>
<thead>
<tr>
<th></th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FALL</td>
<td></td>
</tr>
<tr>
<td>AMS 161</td>
<td>3</td>
</tr>
<tr>
<td>PHY 131/PHY 133</td>
<td>4</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPRING</td>
<td></td>
</tr>
<tr>
<td>GEO 306/366</td>
<td>4</td>
</tr>
<tr>
<td>PHY 132/PHY 134</td>
<td>3(4)</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16(17)</strong></td>
</tr>
</tbody>
</table>

### Junior

<table>
<thead>
<tr>
<th></th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FALL</td>
<td></td>
</tr>
<tr>
<td>GEO 407/467</td>
<td>4</td>
</tr>
<tr>
<td>Upper-division science elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Credits</td>
</tr>
<tr>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
</tr>
</tbody>
</table>

**SPRING**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 309/369</td>
<td>4</td>
</tr>
<tr>
<td>GEO 403/463</td>
<td>4</td>
</tr>
<tr>
<td>Upper-division Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Upper-division Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

**SENIOR**

**FALL**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 310</td>
<td>3</td>
</tr>
<tr>
<td>GEO 496</td>
<td>1</td>
</tr>
<tr>
<td>GEO 497</td>
<td>1</td>
</tr>
<tr>
<td>Upper-division Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Upper-division SBC</td>
<td>3</td>
</tr>
<tr>
<td>Upper-division SBC</td>
<td>3</td>
</tr>
<tr>
<td>Upper-division SBC</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
</tr>
</tbody>
</table>

**SPRING**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper-division Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Upper-division Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Upper-division Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Upper-division SBC</td>
<td>3</td>
</tr>
<tr>
<td>SBC</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
</tr>
</tbody>
</table>
Global Effects of Natural Disasters

Today we are faced with the challenge of driving the economies of modern civilization with new energy resources. This course looks at the current energy sources to assess their long-term sustainability. In particular, this course examines fossil fuels, from the geologic processes that create them through their utilization. This course evaluates the impact on the global environment and the finiteness of each resource. Nuclear, geothermal, solar, wind, hydro, tidal, and other energy sources will be evaluated. This course projects forward to anticipate needs and evaluate future resources for time scales of 10, 20, 50, and 100 years. It identifies the technical advances that are required to meet the future energy needs. The emphasis of the course is to provide a vision of the current global energy setting. It develops tools that enable critical thinking on issues that interface society and science. Homework assignments will use the internet for accessing relevant information and spreadsheets, such as Excel, and Google Earth to evaluate this information.

DEC: E
SBC: SNW
3 credits

GEO 105: Energy Resources for the 21st Century

GEO 106: Planetary Geology

Geology and geological history of the terrestrial planets, planetary satellites and minor bodies of the solar system are evaluated. Whenever possible, emphasis will be placed on geological results from the most recent planetary missions. Among the main topics to be considered are meteorites and the origin of terrestrial planets, the internal structure of terrestrial planets, planetary volcanism, planetary stratigraphy, surface processes such as meteorite impacts, wind and weathering, minor bodies of the solar system and the origin of the solar system. Not for credit in addition to AST 105 or AST 205.

Advisory Prerequisite: High School Earth Science

DEC: E
SBC: SNW
3 credits

GEO 107: Natural Hazards

An introduction to the concepts, techniques, and scientific methods used in the earth sciences. The natural hazards posed by earthquakes and volcanic eruptions are used as a focus. These phenomena are examined in the context of the theory of plate tectonics to determine their cause, destructive potential, and the possibility of predicting and controlling their occurrence. Elementary probability methods are introduced in the treatment of approaches to prediction. Societal responses to forecasts are also considered.

DEC: E
SBC: SNW
3 credits

GEO 108: The Earth Through Time

The history of the earth from its formation 4.5 billion years ago to the present. Major issues to be addressed include formation and early history of the earth and moon; evolution of continents, oceans, and atmosphere within the framework of plate tectonics; origin of life; and evidence of past climates.

DEC: E
SBC: SNW
3 credits

GEO 109: Making the Invisible Visible: Polarized light microscopy

Light interacts with crystals and through this interaction reveals information on the composition of the crystals and their internal atomic arrangement. This course provides a hands-on exploration of the construction of the polarized light microscope, its use in investigating the behavior of polarized visible light passing through crystals, and how the observed behavior can be used to identify natural and synthetic crystalline materials. The scientific material covered is of particular relevance to students interested in chemistry, physics, materials science, and planetary and geological science. Two 80-min lectures and

Stony Brook University: www.stonybrook.edu/ug bulletin

GEO

Geosciences

GEO 101: Environmental Geology

Fundamental earth science concepts are used to assess the impact of increasing global population and development on earth's natural resources and also to examine how natural processes affect human activities. Topics include water usage and pollution, soil pollution and erosion, radioactive and solid waste disposal, landslides, stream flooding, coastal erosion, environmental consequences of energy and mineral resource utilization, acid rain, global climate change, and the environment effects on human health. Aspects of environmental geology that are particularly applicable to Long Island and metropolitan New York are emphasized.

DEC: E
SBC: SNW
3 credits

GEO 102: The Earth

A summary of the processes that have shaped the earth and the other terrestrial planets as inferred from study of their surface materials, structural features, and interiors. Topics include the earth in the solar system; earth materials and rock-forming processes; surface processes and their bearing on human activities; crustal deformation and global tectonics; the earth's interior; and the geological features, compositions, and evolution of the terrestrial planets. Not for credit in addition to GEO 122.

DEC: E
SBC: SNW
3 credits

GEO 103: The Earth Through Time

The history of the earth from its formation 4.5 billion years ago to the present. Major issues to be addressed include formation and early history of the earth and moon; evolution of continents, oceans, and atmosphere within the framework of plate tectonics; origin of life; and evidence of past climates.

DEC: E
SBC: SNW
3 credits

GEO 104: Ripples across the World: Global Effects of Natural Disasters

Earthquakes and tsunamis create widespread devastation. Volcanic eruptions bury cities under ash and cause closures of distant airports. Heavy rains cause landslides and
one three-hour laboratory per week for a 4-week period.

Prerequisite: AP Chemistry with a score of 4 or 5 or CHE 131 or equivalent

SBC: TECH

1 credit

GEO 121: Principles of Geology
Course offered in conjunction with Sayville High School.

4 credits

GEO 122: Physical Geology
The nature of the earth and of the processes that shape it: the earth's external and internal energy; minerals and rocks; external processes and the evolution of the landscape; internal processes and the structure of the earth; the earth compared with other planets; sources of materials and energy. Laboratory includes study of minerals and rocks; landforms as shown on topographical maps and aerial photographs; geologic structures inferred from maps and block diagrams; problem sets. Two lectures and one three-hour laboratory and recitation per week. Not for credit in addition to GEO 102/112.

Advisory Prerequisite: high school chemistry and high school physics

DEC: E

SBC: SNW

3 credits

GEO 287: Introductory Research in Geology
Independent research, under the supervision of a faculty member, at a level appropriate to lower-division students. May be repeated once.

Prerequisites: U1 or U2 standing; one GEO course; permission of instructor and departmental research coordinator

SBC: ESI

0-3 credits, S/U grading

GEO 303: Sedimentary Geology and Geochronology (with emphasis on the Turkana Basin)
Field course that applies fundamental geological concepts to the sediments and rock units in the Turkana Basin, Kenya, to provide a foundation for the chronology and context for recorded events in human evolution. Emphasis is given to sedimentation, stratigraphy, volcanism, and tectonics, as they apply to local geology, including training in field methods. Modern terrestrial processes and landscape evolution are examined using features present in the Turkana Basin. Consideration is also given to broader geologic events spanning the Oligocene to the present.

Geologic concepts are linked to modern and ancient environments, archaeology, and paleoanthropology in northern Kenya.

Prerequisite: Permission of the instructor/Study Abroad office

Advisory Prerequisite: GEO 103 and GEO 113

DEC: E

SBC: SNW

3 credits

A survey of the origin, distribution, and importance to modern civilization of the fuels and minerals won from the earth. Geology of mineral resources and problems of finding, extracting, and supplying fossil fuels, metallic ores, water, and non-metallic commodities to industry and community as well as the ultimate limits of their abundances. Environmental concerns related to the exploitation of mineral resources with review of legislation and other steps being taken to minimize environmental damage.

Prerequisite: one D.E.C. E or SNW course

DEC: H

SBC: STAS

3 credits

GEO 305: Field Geology
Geological field studies on and near the Stony Brook campus. Labs emphasize mapping techniques and field studies of glacial and environmental geology, and include geophysical and hydrological analyses and mapping. Course consists of two three-hour sessions per week, divided between lecture and outdoor labs.

Prerequisites: GEO 102/112 or GEO 112 and 103 and 113 or GEO 112 and 101 and 111

SBC: EXP+

3 credits

GEO 306: Mineralogy
Topics include basic crystallography, crystal chemistry, and identification of the important rock-forming and ore minerals. Included are the fundamentals of optical crystallography: indices of refraction, isotropic, uniaxial, and biaxial minerals; optical indicatrix theory and interference figures. Three hours of lecture per week. The laboratory component, GEO 366, must be taken concurrently; a common grade for both courses will be assigned.

Prerequisites: GEO 102 and 112; CHE 131

Corequisite: GEO 366

3 credits

GEO 307: Global Environmental Change
An analysis of the physical, chemical, and biological processes in the atmosphere, hydrosphere, lithosphere, and biosphere that are susceptible to change either from natural or anthropogenic causes. In addition to focusing on the processes, this course will examine the spatial/temporal scales of environmental changes, their consequences to systems including our economic, political, and social systems, and will consider our responsibility and capability in managing systems in a sustainable way. This course is offered as both ENV 304 and GEO 307.

Prerequisites: SBC 111, or SBC 113, or ENS 101, or GEO 101, or GEO 102; ENV 115 or CHE 131

DEC: H

SBC: STAS

3 credits

GEO 309: Structural Geology
Principles of structural geology, including classification, criteria for recognition, and mechanics of formation of crustal structural features. Elementary concepts of rock mechanics. Discussion of important tectonic features of the continents and oceans. Three hours of lecture per week. A two-day weekend field trip visits "classic" structural localities in the East. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information. The laboratory component, GEO 369, must be taken concurrently; a common grade for both courses will be assigned.

Prerequisites: GEO 122, or GEO 102 and 112; one semester of calculus; PHY 131/133 or 141 and 133 or PHY 125 and 126 and 133

Corequisite: GEO 369

3 credits

GEO 310: Introduction to Geophysics
An introduction to theoretical and applied geophysics. Topics in global geophysics include seismology, gravity, geomagnetics and heat flow, with applications to the structure and dynamics of the earth's interior. Students conduct computer-based analysis of geophysical data, some of which they collect using techniques of geophysical exploration and environmental geology. Three hours of lecture per week, plus group field experiments and analysis.

Prerequisites: MAT 127 or 132 or 142 or 171 or AMS 161; GEO 122, or GEO 102 and 112; PHY 133; PHY 134 or CHE 133; PHY 132 or PHY 126 and 127 or PHY 142

3 credits
GEO 311: Geoscience and Global Concerns
An exploration of how technologically-based problems facing the United States and the world are related to the basic scientific principles that explain the properties of the lithosphere, hydrosphere, and atmosphere. The set of issues include such geoscience-based topics as global warming, fossil fuel resources, nuclear waste disposal, and earthquake prediction and preparedness.
Prerequisite: Any 3 or 4 credit 100-level GEO course
DEC: H
SBC: STAS
3 credits

GEO 312: Structure and Properties of Materials
This course will explore materials from the viewpoint of their structure and chemistry and how these affect applications. We will discuss different states matter (crystals, quasicrystals, glasses, liquids) and their similarities and differences, focusing on the crystalline state. Nanomaterials and their peculiarities in terms of structure and properties will also be considered. Particular attention will be paid to (1) Materials for energy and environment applications, (2) materials for technological applications, and (3) Earth- and planet-forming materials.
Advisory Prerequisite: CHE 131 or PHY 131
3 credits

GEO 313: Understanding Water Resources for the 21st Century
A survey of the world's water resources and the fundamental processes and concepts that govern their distribution and resupply. Topics to be covered include processes in the hydrologic cycle, water resource supply and demand, water quality, and societal aspects relating to drinking water, and industrial and agricultural water usage. Consideration is given to global water shortages, projected impacts of climate change, water-based conflict, water resource management, and conservation practices. Detail will be devoted to pollution sources, water quality standards, drinking water treatment, and government regulation. Local water issues will also be addressed.
Prerequisite: one D.E.C. E or SNW course
DEC: H
SBC: ESI, STAS
3 credits

GEO 315: Groundwater Hydrology
Physical and chemical principles of geohydrology. Concepts of groundwater geology. Introduction to quantitative models of regional fluid flow and groundwater contamination. Groundwater and geologic processes, with examples from tectonics, petroleum geology, geothermics, and economic mineralization.
Prerequisites: GEO 102 or GEO 122; MAT 127 or MAT 132 or MAT 142 or MAT 171 or AMS 161
3 credits

GEO 316: Geochemistry of Surficial Processes
Chemical principles used in the study of surface and near-surface water, rocks, and soils. Application of equilibrium concepts and reaction rates to reactions involving gases, fluids, and minerals in nature. Consideration of soil properties and processes.
Prerequisites: GEO 122, or 102 and 112; CHE 132 or 142
4 credits

GEO 318: Engineering Geology and Coastal Processes
Fundamental concepts of soil, sediment, and rock mechanics and the physics of surficial processes. Application is made to problems of geotechnical and coastal engineering. Topics include consolidation, loose boundary hydraulics, slope stability, underground excavations and beach and tidal inlet stability, and channel sedimentation. This course is offered as both GEO 318 and MAR 318.
Prerequisites: GEO 122 or GEO 102 and 112; CHE 132 or 142
3 credits

GEO 320: Glacial Geology
History of glaciation on earth; formation and dynamics of glaciers and ice sheets; processes of glacial erosion and deposition; and the nature of glacial sediments and landforms particularly relating to the development of Long Island.
Prerequisite: GEO 102 or 122
DEC: E
SBC: STEM+
3 credits

GEO 330: The Geology of Mars
Overview of Mars as a planetary system. Evolution of the planet and its atmosphere through time. Detailed discussion of processes that have shaped the martian surface, including erosion, sedimentation, volcanism, impact cratering, physical and chemical weathering.
Comparison of geologic processes on Mars and Earth. Discussion of past and future spacecraft missions to Mars.
Prerequisite: GEO 102 or GEO 122 or GEO 106
Advisory Prerequisite: GEO 112
SBC: ESI
3 credits

GEO 347: Remote Sensing
An introduction to the fundamental principles of remote sensing, with emphasis on geological and environmental applications. Discussion of the physical basis for remote sensing techniques. Survey of commonly used sensors and image analysis methods in earth sciences. Participants gain practical experience in geologic and environmental analysis using satellite imagery.
Prerequisite: GEO 102 or GEO 106 or GEO 122
3 credits

GEO 366: Mineralogy Laboratory
Three hours of laboratory per week that corresponds to the content of GEO 306. Laboratory exercises involve work with crystallographic models, mineral samples, refraction oils and the polarizing light microscope. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.
Corequisite: GEO 306
SBC: TECH
1 credit

GEO 369: Structural Geology Laboratory
Three hours of laboratory per week that corresponds to the content of GEO 309. Laboratory exercises cover map interpretation and algebraic and graphical solutions of structural problems. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.
Corequisite: GEO 309
1 credit

GEO 403: Sedimentation and Stratigraphy
The history and practice of defining units of layered rocks and interpreting their spatial relationships. Topics include the basis for the geologic time scale, lithostratigraphic versus chronostratigraphic units, biostratigraphy, magnetostratigraphy, facies patterns and Walther's Law, subsurface stratigraphy, and the application of stratigraphy to geological problems. This course has an associated fee.
This course is designed for students who engage in a substantial, structured experiential learning activity in conjunction with another class. Experiential learning occurs when knowledge acquired through formal learning and past experience are applied to a "real-world" setting or problem to create new knowledge through a process of reflection, critical analysis, feedback and synthesis. Beyond-the-classroom experiences that support experiential learning may include: service learning, mentored research, field work, or an internship.

**Prerequisite:** GEO 103; GEO 113; C or better in GEO 306 and GEO 366

**Corequisite:** GEO 463

3 credits

**GEO 405: Field Camp**

A field course that may be taken at any one of several approved university field stations.

**Prerequisites:** Two upper-division GEO courses

1-6 credits

**GEO 407: Igneous and Metamorphic Petrology**

Topics focus on the processes that govern the formation and distribution of igneous and metamorphic rocks and their link to the Earth's mantle, crust, and tectonic regimes. Emphasis will be placed on integrating assessment of the chemical control on compositional diversity through phase diagrams with the study of natural rock suites through hand sample and thin section analysis. Three hours of lecture per week. The laboratory component, GEO 467, must be taken concurrently; a common grade for both courses will be assigned.

**Prerequisites:** MAT 125 or MAT 131 or AMS 151; C or better in GEO 306 and GEO 366

**Corequisite:** GEO 467

**SBC:** STEM+

3 credits

**GEO 420: Environmental Analysis Using Remote Sensing and Geographic Information Systems**

The use of aerial and satellite imagery in environmental analysis and the manipulation of geographic data sets of all types using Geographic Information Systems. Concentrating on Long Island, each student designs and completes a research project on a particular section of the area, focusing on the habitats of local wildlife, the locations of archaeological sites, coastal regimes, etc. Students should expect to spend approximately 10 hours per week beyond regularly scheduled classes in a University computer laboratory. This course is offered as both ANT 420 and GEO 420.

**Prerequisite:** Upper-division course in ANT or BIO or GEO or MAR

**SBC:** TECH

4 credits

**GEO 444: Experiential Learning**

Please see www.stonybrook.edu/coursefees for more information. The laboratory component, GEO 463, must be taken concurrently; a common grade for both courses will be assigned.

**Prerequisite:** GEO 103; GEO 113; C or better in GEO 306 and GEO 366

**Corequisite:** GEO 463

3 credits

**GEO 459: Write Effectively in Geology**

A zero credit course that may be taken in conjunction with any 300- or 400-level Geosciences course, with permission of the instructor. The course satisfies Stony Brook Curriculum's WRTD requirement.

**Prerequisite:** taken in conjunction with a 300- or 400-level Geosciences course; permission of the instructor

**SBC:** WRTD

0 credit, S/U grading

**GEO 463: Sedimentation and Stratigraphy Laboratory**

Three hours of laboratory per week that corresponds to the content of GEO 403. The course emphasizes practical techniques in stratigraphy. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

**Corequisite:** GEO 403

1 credit

**GEO 475: Undergraduate Teaching Practicum I**

Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. The student is required to attend all the classes, do all the regularly assigned work, and meet with the faculty member at regularly scheduled times to discuss the intellectual and pedagogical matters relating to the course.

**Prerequisite:** U4 standing; previous preparation in subject field; permission of instructor

**SBC:** EXP+

1 credit

**GEO 476: Undergraduate Teaching Practicum II**

Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. Students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have already been graded. Students may not serve as teaching assistants in the same course twice.

**Prerequisite:** GEO 475; previous preparation in subject field; permission of instructor and department

**SBC:** EXP+

1 credit
**GEO 487: Senior Research in Geology**
Under the supervision of a faculty member, a major in the department may conduct research for academic credit.

*Prerequisites:* Permission of instructor and chairperson

**SBC:** EXP+
3 credits, S/U grading

---

**GEO 488: Internship**
Participation in local, state, or national private enterprises, public agencies, or nonprofit institutions. May be repeated to a limit of 6 credits.

*Prerequisites:* Permission of instructor and department

**SBC:** EXP+
0-6 credits

---

**GEO 496: Research and Synthesize Scientific Literature in Geoscience**
An introduction to writing a scientific literature review in the field of geosciences. Students will gain experience using scientific journal article databases, selecting relevant research articles from the peer-reviewed literature, and summarizing information effectively in written form. This course is to be taken in conjunction with any 300- or 400-level GEO course. Successful completion of this course satisfies the SBC categories WRTD and ESI.

*Prerequisite:* GEO 102

*Corequisite:* GEO 497 and any other 300- or 400-level GEO course

**SBC:** ESI, WRTD

1 credit, S/U grading

---

**GEO 497: Research Communication in Geoscience**
An introduction to ethics in scientific research and research communication in Geoscience. Topics from the NIH Ethics training course will be discussed with a focus on the student's current and future research and the ethical aspects of scientific communication. Discussions of clarity in scientific communication as a means of effecting ethical dissemination of scientific results will involve exposure to best practices in oral and written presentation. Students will give oral presentations of their written work (based on the co-requisite course GEO 496) and be involved in peer assessment of presentations. Successful completion of this course satisfies the SBC categories CER and SPK.

*Prerequisite:* GEO 102 and GEO 112

*Corequisite:* GEO 496

**SBC:** CER, SPK

1 credit, S/U grading