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.

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 flooding. How do these disasters happen? What are the secondary global effects on societal infrastructure, on public health, on international trade? How do societal differences cause varied local responses and affect the global impact? This course focuses on evaluating the global effects of several recent geological disasters. Scientific and popular news sources are used to explore the underlying natural phenomena and the nature and global distribution of the effects from geologic, economic, and public health perspectives.

Prerequisite: High school chemistry and biology
SBC: GLO
3 credits

GEO 105: Energy Resources for the 21st Century
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 spread sheets (such as Excel) and Google Earth to evaluate this information.

DEC: E
SBC: SNW
3 credits

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 112: Physical Geology Laboratory
Rock and mineral identification, introduction to topographic and geologic maps.
Pre- or Corequisite: GEO 102
1 credit

GEO 113: Historical Geology Laboratory
An introduction to basic techniques used for interpreting geological history. Topics include interpretation of topographic and geological maps and cross sections, introduction to fossils, and basic stratigraphic techniques. One three-hour laboratory per week.
Pre- or Corequisite: GEO 103
1 credit

GEO 115: 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 one three-hour laboratory per week for a 4-week period.
GEO 121: Principles of Geology
Course offered in conjunction with Sayville High School.

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

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

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,
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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; MAT 127 or 132 or 142 or 171 or AMS 161
SBC: STEM+
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. 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 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:** 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

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:** WRT 102 or equivalent; permission of the instructor and approval of the EXP+ contract (http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/degree_requirements/EXPplus.php)  
**SBC:** EXP+  
**S/U grading**

### GEO 447: Senior Tutorial in Geology

Independent readings in advanced topics. May be repeated once.

**Prerequisites:** Permission of instructor and chairperson  
**1-3 credits**

### GEO 448: Geosciences Colloquium

Every semester, the Department of Geosciences hosts a colloquium series. The series features weekly lectures covering a wide variety of geosciences research topics. The purpose of this course is to expose upper division geoscience students to current research being performed at Stony Brook University and elsewhere. May be repeated up to a limit of 3 credits.

**Prerequisite:** U3 or U4 status as a GEO or ESS major; Permission of Instructor  
**1 credit**

### GEO 458: Speak Effectively Before an Audience

A zero credit course that may be taken in conjunction with any GEO course that provides opportunity to achieve the learning outcomes of the Stony Brook Curriculum's SPK learning objective.

**Pre- or corequisite:** WRT 102 or equivalent; permission of the instructor  
**SBC:** SPK  
**S/U grading**

### 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  
**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 467: Igneous and Metamorphic Petrology Laboratory

Three hours of laboratory per week that corresponds to the content of GEO 407. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

**Corequisite:** GEO 407  
**SBC:** STEM+  
**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; interview; permission of instructor  
**SBC:** EXP+  
**3 credits, S/U grading**

### 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; interview; permission of instructor and department  
**SBC:** EXP+  
**3 credits, S/U grading**

### 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:** ESI, EXP+  
**0-6 credits**

### 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, S/U grading**