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 spreadsheet tools (such as Excel) and Google Earth to evaluate this information.

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: 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
consideration is also given to broader geologic
features present in the Turkana Basin.
and landscape evolution are examined
field methods. Modern terrestrial processes
stratigraphy, volcanism, and tectonics, as they
evolution. Emphasis is given to sedimentation,
and context for recorded events in human
provide a foundation for the chronology
rock units in the Turkana Basin, Kenya, to
general concepts to the sediments and
Turkana Basin)
GEO 303: Sedimentary Geology and
and Geochronology (with emphasis on the
Turkana Basin)
Field course that applies fundamental
general 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: 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 304: Energy, Mineral Resources,
and the Environment
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; 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
SBC: TECH
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 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
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+
0 credit, S/U grading

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
1-3 credits

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
0 credit, 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
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 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 regular graded 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
GEOLOGY (GEO) - COURSES

Fall 2017

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

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