GES 101 INTRODUCTORY GEOLOGY
3, 3/0; NS14
Physical aspects and processes on and in the Earth, including the formation and change of properties of rocks and minerals, the theory of plate tectonics, the Solar System, volcanoes, the continents and the oceans. Aspects of earthquakes, tsunamis, glaciers, the ice ages and environmental issues. Concurrent registration in GES 103 is recommended for sciences majors. Offered every semester.

GES 102 HISTORICAL GEOLOGY
3, 3/0; NS14
Introduction to principles and methods of delineating Earth history from the rock record first locally then through correlation and dating techniques worldwide. The role of plate tectonics in changing continental configurations. Survey of the history of the Earth and from the fossil record its life forms through geologic time. Offered every year.

GES 103 INTRODUCTORY GEOLOGY LABORATORY
1, 0/2
Identification of rocks and minerals. Map and aerial photograph interpretation. Offered occasionally.

GES 111 OCEANOGRAPHY
3, 3/0; NS14
Study of the oceans including the application of geology, biology, chemistry, physics and engineering and how they interact in different parts of the ocean environment. Strong interdisciplinary focus of ocean processes and how they are connected to our lives. Topics include how technology has advanced our understanding of the oceans, sampling seawater and sediments and mapping the seafloor, opening and closing of ocean basins, formation and erosion of beaches, life in the oceans, ocean resources, marine pollution, and the role of the oceans in global climate change. Offered fall only. Equivalent Course: GES 111W

GES 131 INTRODUCTORY ASTRONOMY
3, 3/0; NS14
Non-mathematical survey of the astronomical universe, including naked-eye astronomy, physical nature of planets, satellites, stars, galaxies, and the “Big Bang”. How composition, distance, temperature, size, mass, and age are found for stars. Origins of planets, stars, and galaxies. Invention of technology as a driving force in astronomy. Planetarium visualizations, assignments, and demonstrations.

GES 189 TOPIC COURSE
1-4, 1/0
See the Undergraduate Course Catalog (http://catalog.buffalostate.edu/undergraduate/docs/currentugcat.pdf).

GES 201 GEOSCIENCES I
4, 3/3
First of a two-course sequence introducing the physical processes that formed Earth and shaped our planet through time. Topics include Earth materials; plate tectonics; climate, ocean, and atmosphere; and deep time. Student experiences through skill-building activities and experiments. Field trips required.

GES 202 EARTH AND ENVIRONMENTS THROUGH TIME
4, 2/4
How the Earth and its atmosphere and biosphere have changed over geologic time, and how this has impacted life on Earth. Labs include the identification of major fossil groups and interpreting geologic data used to construct ancient environments. Required field trips. Offered every spring semester.

GES 223 ENVIRONMENTAL EARTH SCIENCE
3, 3/0; NS14
An investigation of the impact of society on the natural environment. Examines natural resources; global climate change; and soil, water, and land use issues. The complex interrelationship of global systems and societies’ attempts to control or alter them. The unique perspective of geoscientists to environmental issues. Offered every semester.

GES 224 GEOLOGIC HAZARDS
3, 3/0; NS14
A study of natural events and processes that impact human life and health, with an emphasis on catastrophic geological events including earthquakes, volcanic eruptions, and landslides. Includes causes, physical effects, prediction and societal implications.

GES 232 THE SOLAR SYSTEM
3, 3/0; NS14
Makeup and characteristics of our solar system; formation hypotheses; geologic processes acting on solar system bodies; comparison of the planets; the search for other solar systems and life elsewhere. Expansion of solar system exploration due to advances in technology and its effect on society.

GES 241 METEOROLOGY
3, 3/0; NS14
An introduction to weather, including the makeup of the atmosphere, seasonality, heat and radiation balance, temperature, humidity, and precipitation, atmospheric motion, atmospheric pressure and wind, air masses and fronts, severe weather, meteorological instrumentation, local weather, climate controls, and synoptic forecasting. Includes laboratory modules. Emphasis on the relationship between weather systems, technology, and humans. Offered spring only. Equivalent Course: GEG 241
GES 300 SEDIMENTOLOGY
3, 2/2
Prerequisites: GES 101 and GES 103 or GES 201. Introduction to the dynamics of erosion, transport, deposition of sedimentary particles. Introduction to modern and ancient sedimentary environments. Offered fall only.

GES 301 STRATIGRAPHY
3, 3/0
Prerequisites: GES 101 and GES 103 or GES 201. Prerequisite or corequisite: GES 102. Basic principles and interpretation of the stratigraphic record, with emphasis on the practical application of stratigraphic data in interpretation of earth history and exploration for fossil fuels and groundwater resources. Offered fall only.

GES 302 INVERTEBRATE PALEONTOLOGY
4, 4/2
Prerequisite: GES 101 or GES 201. Prerequisite or corequisite: GES 102. Basic principles of the nature and interpretation of the invertebrate fossil record, with an overview of the types of organisms commonly preserved as fossils. Emphasis on practical applications of palentology. Offered occasionally.

GES 303 MINERALOGY AND PETROLOGY
4, 3/3; WIIF
Prerequisites: GES 101 and GES 103 or GES 201; one semester chemistry recommended. Crystals, minerals, and rocks, emphasizing description, identification, and origin. Offered fall only.

GES 306 SEDIMENTOLOGY AND STRATIGRAPHY
4, 3/1
Prerequisites: GES 101 and GES 103, or GES 201, or equivalent. The study of sediments and strata. Topics include: properties of fluid flow; sediment transport processes; sediment texture and composition; sedimentary structures; facies and stratigraphic concepts; sedimentary environments; and interpretation of strata. Field excursions in WNY required for some laboratories.

GES 307 GEOMORPHOLOGY
4, 3/3
Prerequisite: GES 101 or GEG 101 or GES 201. Internal and external processes and structural controls that shape the surface of Earth and other solid solar system bodies. Emphasis on selected geologic environments. Field trips required. Offered spring only.

GES 311 MODERN SOLAR SYSTEM ASTRONOMY
3, 3/0
Prerequisite: GES 131 or equivalent. The moon and planets, their appearance, atmospheres, and surfaces. Planetary magnetic fields, asteroids, meteoroids, comets. Theories of the origin of the planetary system, the possibility of extraterrestrial life. Emphasis on recent problems in understanding the solar system. Offered occasionally. Equivalent Course: GES 311W

GES 332 STELLAR AND GALACTIC ASTRONOMY
3, 3/0
Prerequisite: GES 131 or equivalent. How astronomers have determined the properties, energy, masses, and composition of stars, stellar evolution, the structure of the galaxy, and the movement of stars in the galaxy. Offered occasionally. Equivalent Course: GES 332W

GES 335 METHODS OF OBSERVATIONAL ASTRONOMY
3, 3/0
Prerequisite: GES 131 or equivalent. Locating celestial objects in the night sky. Use of astronomical telescopes to locate, observe, and photograph stars, nebulae, and galaxies. Use of observing aids. Offered occasionally.

GES 338 ASTRONOMY AND THE ASTRONOMERS FROM 1650 TO THE PRESENT
3, 3/0
See the Undergraduate Course Catalog (http://catalog.buffalostate.edu/undergraduate/docs/currentugcat.pdf). Equivalent Course: GES 338W

GES 339 ASTRONOMY AND COSMOLOGY
3, 3/0
Prerequisite: GES 131 or equivalent. Cosmology, the primeval fireball, quasars, pulsars, black holes, origin of the elements. Offered occasionally. Equivalent Course: GES 339W

GES 350 ENVIRONMENTAL GEOCHEMISTRY
3, 3/0
Prerequisites: GES 101 or GES 201 and upper-division status. Chemical nature of the earth, emphasizing chemistry associated with the polluted environment. Offered alternate years.

GES 360 FORENSIC GEOSCIENCE
3, 2/2
Prerequisite: Upper-division status or permission of instructor. Application of the principles of earth science to the law. With a "hands-on" approach, and details from actual criminal cases, introduces a variety of geological subjects such as rock and mineral types, geological and topographical maps, fossils, sand and soil through their forensic application. Offered alternate years.

GES 389 TOPIC COURSE
1-6, 0/0
See the Undergraduate Course Catalog (http://catalog.buffalostate.edu/undergraduate/docs/currentugcat.pdf).

GES 401 IGNEOUS AND METAMORPHIC PETROLOGY
4, 3/3
Prerequisite: GES 303 or permission of instructor. Advanced study of igneous and metamorphic rocks and petrogenetic processes, including the thermodynamics of magma, crystallization and recrystallization, and the field relations, fabrics and tectonics associated with these rocks. Required term project and field trips. Offered occasionally. Equivalent Course: GES 401W

GES 403 GLACIAL GEOLOGY
3, 3/0
Prerequisite: GES 307. Glacial processes, landforms, and landscapes, with emphasis on New York State. Develops a model for the sequence of glacial events and the causes of climate change. Field trips. Offered occasionally. Equivalent Course: GES 403W

GES 405 GEOLOGY OF NORTH AMERICA
3, 3/0
Prerequisites: GES 101 or 201 and GES 102. Major physical provinces of the United States and adjacent areas; their geologic history, structure, and topographic development. Offered occasionally.
GES 408 STRUCTURAL GEOLOGY  
4, 3/3; WIIF  
Prerequisites: GES 101 and GES 103 or GES 201. Folds, faults, and other structural features in sedimentary and metamorphic terrains. Introduction to rock mechanics, regional tectonics. Offered spring only.

GES 410 UNDERGRADUATE RESEARCH SEMINAR  
1, 1/0  
Prerequisites: GES 101 and GES 103 or GES 201; instructor permission. Common topics related to undergraduate research in the geosciences including research methods, handling data, making interpretations, preparing for oral and poster presentations, and preparing for graduate school and professional geology. Must be engaged in (or planning) research with an Earth Sciences faculty member. May be taken more than once. Offered every semester.

GES 431 PLANETARIUM SEMINAR  
3, 2/2  
Prerequisites: Two semesters of astronomy. The celestial sphere; operating, maintaining, and administering the planetarium; audiovisual aids in the planetarium; planetarium programming; using the planetarium to teach. Includes supervised teaching experience. Offered occasionally. Equivalent Course: GES 431W

GES 444 GLOBAL SYSTEMS GEOMORPHOLOGY  
3, 0/0  
Prerequisite: GES 307. Fundamentals of remote sensing and image processing will be presented early in the course as an introduction to the interpretation of planetary data sets. The goal is to understand the relationships between processes influencing landscape evolution on the Earth and to address possible reasons for similarities and/or differences in the number and intensity of processes operating on other planets. Offered occasionally.

GES 450 FIELD GEOLOGY  
3, 2/3  
Prerequisites: GES 303 and GES 408, or permission of instructor. Theory and application of principles and techniques in the mapping and interpretation of geological structures in the field. Using geological data to construct geological maps and reports. Classroom and field study. Includes field trips and technical report writing. Offered fall only. Equivalent Course: GES 450W

GES 452 HYDROGEOLOGY  
3, 3/0  
Prerequisites: GES 101 or GEG 101 or GES 201 and at least one 300-level GES course. Fundamentals of the occurrence, movement, and management of our largest resource of readily available fresh water. Includes groundwater protection and remediation of already contaminated supplies to increase environmental awareness. Offered fall only.

GES 460 ENVIRONMENTAL FIELD METHODS AND ANALYSIS  
3, 2/2  
Prerequisites: GES 101 or GES 201, one 300-level GES course, and college algebra. GES 350 is strongly encouraged. Applied study of environmental contaminant migration and distribution with particular emphasis on sampling and detection methods. Discussion of federal and local environmental laws and regulations, classification of hazardous chemicals, and remediation approaches used by environmental professionals. Offered spring only.

GES 465 TECTONICS  
3, 3/0  
Prerequisites: GES 101 or GES 201 and GES 408 (or equivalent), upper-division status. Advanced principles, evidence and examples of the plate tectonics paradigm as the unifying theory of geology. Topics include kinematics of plates, the nature of plate boundaries and the analysis of theories involved in the current and historical design of the paradigm. Required term project and oral presentations. Offered occasionally.

GES 488 INTERNSHIP  
3-12, 0/0  
Prerequisites: Senior status as department major, 2.5 GPA overall. Requires department application and approval. Practical work on an individual basis with a participating organization.

GES 495 SPECIAL PROJECT  
1-3, 0/0  
Prerequisite: Approval of a faculty sponsor. Environment-, energy-, geology-, or astronomy-related areas.

GES 497 WORKSHOP  
1-4, 0/0  
See the Undergraduate Course Catalog (http://catalog.buffalostate.edu/undergraduate/docs/currentugcat.pdf).

GES 498 HONORS RESEARCH  
1-3, 0/0  
Prerequisite: Acceptance in geology or earth science honors program. Includes completion of honors thesis and seminar. May be repeated for a maximum of 6 credit hours.

GES 499 INDEPENDENT STUDY  
3-12, 0/0  
Prerequisite: Faculty sponsor permission. Environment-, energy-, geology-, or astronomy-related areas.