Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: GEOL 101 **Year: 2020-2021**

Course Title: Introductory Geology **Credit Hours: 3**

Attendance Policy: *To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.*

Services for Students with Disabilities: *It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for accommodations. All course materials are available in alternate formats upon request.*

Course Description

This is an introductory course in physical geology. Topics include structure of the earth, rocks and minerals, weathering and erosion, glaciation, plate tectonics, earthquakes, mountain building, igneous activity, geologic time, and local geology. Laboratories include the study of rocks, minerals, fossils, and topographic maps. Substantial outside preparation for the laboratories is required. GEOL 101 fulfills the SUNY General Education Natural Sciences requirement. Prerequisites: ENGL 099 or prior completion or concurrent enrollment in ESL 120, 121, and 122 (or prior completion of ESL 103) if required by placement testing; prior completion or concurrent enrollment in MATH 095 and RDNG 116 if required by placement testing. 3 Cr. (2 Lec., 2 Lab.) Fall and spring semesters.

Course Context/Audience

This course is part of the Liberal Arts Math/Science curriculum and can be used to fulfill a laboratory science requirement. It fulfills the SUNY natural science general education requirement and should be of interest to students who want to learn about the scientific study of the materials and processes that make up and act on the earth.

Basic Skills/Entry Level Expectations

Writing:	W2	Student should have completed ENGL 099 (if needed). The course requires short written responses and/or short papers without documentation, particularly personal reflection or narrative.
Math:	M3	Taking MATH 095 (if needed) – Course requires the use of basic mathematical skills plus very limited basic algebra skills.
Reading:	R3	Course may be taken concurrently with RDNG 116.

Course Goals

As a result of taking Introductory Geology, the student should be able to:

1. Identify and distinguish among the common rocks and minerals.
2. List the three major rock types, explain how each is formed, and describe the manner in which each rock type can be converted to another.
3. Describe the roles of rivers and glaciers in shaping the landscape.
4. Identify specific erosional and depositional features formed as a result of the actions of rivers and glaciers.
5. Describe the cause, characteristics, and effects of earthquakes.
6. State the theory of plate tectonics and describe three major geological effects that occur at plate tectonic boundaries.
7. Describe and identify the erosional and depositional features in the local landscape that were produced by Pleistocene glaciation.
8. Read a topographic map and a geologic map and understand its features.

9. Interpret his/her observations of the physical world around him/her in terms of fundamental geologic processes.
10. Apply the basic concepts and principles of geology to her/his area of academic interest.
11. Apply careful observation, critical thinking and problem-solving skills to the interpretation of geologic data.
12. Effectively use selected laboratory instruments and techniques to collect, analyze, and interpret geologic data.
13. Appreciate the importance of an awareness and understanding of geological issues to the average citizen, as a consumer, voter, or homeowner.

Course Objectives/Topics

Objective/Topic	% Course
Topic 1: Earth's Materials (Rocks and Minerals/Resources) Upon completion of this topic, the student should be able to: 1) Describe a mineral in terms of its physical characteristics. 2) Recognize how the internal structure of silicate minerals contributes to their physical characteristics. 3) Distinguish between a rock and a mineral. 4) List the three major types of rocks and list their relative abundances in the crust of the Earth. 5) Name the parent materials and describe the basic processes involved in forming each rock type. 6) Define texture and describe its relation to extrusive and intrusive igneous rocks. 7) Name four mineral compositions that are used to classify igneous rocks. 8) Name seven common igneous rocks that correspond to each of the combinations of texture and mineral composition. 9) Define: magma, aphanitic, phaneritic, porphyritic. 10) Distinguish between mechanical weathering and chemical weathering. 11) List the types of sediment and provide an example of a sedimentary rock for each sediment type. 12) Name the clastic sedimentary rocks in order of decreasing clast size. 13) List five sedimentary structures and describe the depositional environments responsible for each. 14) Define metamorphism and describe four types of metamorphism, listing an example of a metamorphic rock resulting from each type. 15) Define: Foliation, metamorphic grade, metamorphic facies, and provide an example of each. 16) Name common ores of aluminum, iron, copper, zinc, and lead. 17) Explain the difference between renewable and nonrenewable resources and give examples of each. 18) List different types of energy, metallic, and non-metallic resources we extract from the earth and some of the consequences of both the use of those resources and the methods of extraction.	25
Topic 2: Earth's Surface Processes. Upon completion of this topic, the student should be able to: 1) List processes responsible for mechanical and chemical weathering. 2) List the components of soil and list and describe each of the soil horizons. 3) Explain the factors that control the stability of a slope. 4) Account for the different types of mass wasting in terms of the speed and material involved. 5) Describe the development of a river valley from youth to old age. 6) Compare the age of current landscapes to the age of the earth. 7) Define: meander, oxbow lake, terrace, drainage divide, delta, alluvial fan, floodplain, and levee. 8) Describe the dynamics of the hydrologic cycle, groundwater movement and the formation of aquifers.9) Describe the movement of a groundwater contamination plume and give a couple of local examples. 10) Discuss the Pleistocene glaciation regarding: extent of ice coverage of North America, length of time of coverage, age of the last recession, number of major advances, rate of advance. 11) Discuss the effects of the Wisconsin ice sheet relative to the formation of the Great Lakes and Finger Lakes. 12) Identify the chemical weathering process responsible for the formation of caverns and state the type of rock that is most susceptible to this process. 13) Use aerial photos and maps to identify stream ages and erosional features.	25
Topic 3: Plate Tectonics/Structural Geology. Upon completion of this topic, the student should be able to: 1) State the theory of plate tectonics and list at least three different types of geological evidence that support the theory of plate tectonics. 2) Describe the role of the earth's magnetic field in the discovery of the theory of plate tectonics. 3) Describe each type of plate boundary discussing geologic processes involved and the resultant surface features. 4) Cite examples of subduction, rift (both continental and oceanic) and transform boundaries. 5) Explain current theory of convection currents and plate movement. 6) Define a "hotspot" with examples. 7) Define isostasy and provide an example. 8) Define geologic structure and list the three basic types of geologic structures. 3) Distinguish between: synclines and anticlines, normal and reverse faults, joints and faults. 9) Describe the role of plate tectonics in the formation of mountains.	10
Topic 4. Natural Hazards. Upon completion of this topic, the student should be able to: 1) Account for earthquakes in terms of the elastic rebound theory of earthquake generation. 2) Describe the four types of earthquake waves. 3) Define earthquake magnitude and describe the relation of intervals on the Richer scale to wave amplitude. 4) Distinguish between the focus and the epicenter of an earthquake. 5) Determine the distance to the epicenter by using travel-time curves. 6) Describe the P-wave shadow zone and the S-wave shadow zone. 7) Describe the reasons for the existence of each of these zones. 8) Describe the mechanism responsible for producing the general magnetic field of the Earth. 9) Explain what to do in the event of an earthquake. 10) List factors that cause loss of life during an earthquake (and personal/community	10

earthquake preparation). 11) Explain how tsunamis are generated. 12) Account for the location of the circum-Pacific volcano belt and the volcanic islands of Hawaii in terms of plate tectonics. 13) List and describe four types of volcanic structures. 14) List factors that cause loss of life or hardship (both locally and globally) during volcanic eruptions, with examples of specific eruptions. 15) Describe the effects and causes of radon.	
Topic 5: Earth's History. Upon completion of this topic, the student should be able to: 1) List different methods of fossilization. 2) Be familiar with the Geologic time scale and how it was developed. 3) State the Principle of Faunal Succession. 4) Define "index fossil," provide an example, and explain its use in rock correlation. 5) Describe the process of radiometric age dating in estimating the numerical ages of rocks and minerals. 6) Provide an estimate of the age of the Earth based on radiometric age dating. 7) Give a brief geologic history of the major geologic provinces of the continental U.S.	10
Topic 6: Maps. Upon completion of this topic, the student should be able to: 1) Define latitude and longitude. 2) Locate a feature on a topographic map in terms of latitude and longitude. 3) Determine the distance between two points on a topographic map by using the map scale. 4) Distinguish between geographic north and magnetic north. 5) Label and construct contour lines on a map by applying the principles of contour line interpretation. 6) Construct a topographic profile of a geomorphic feature on a topographic map. 7) Distinguish between a topographic map and a geologic map. 8) Determine the rock types and ages in a given region on a geologic map. 9) Identify and interpret geologic structures on a geologic map. 10) Be able to comfortably use maps as a tool in completing laboratories.	10
Topic 7: Local Geology/Current Issues. Upon completion of this topic, the student should be able to: 1) Describe and locate several depositional or erosional features produced by Pleistocene glaciation in the local area. 2) Give a general description of the development of the following regions of New York: Finger Lakes, Adirondacks, Taconic Region, Long Island. 3) List resources found locally. 4) Gain an increased awareness and understanding of current issues and events, both local and global for example, climate change, pollution, sustainable energy use, public policy decisions (in particular the regulation of hydrofracking), natural disasters etc.	5

General Education Goals - Critical Thinking & Social/Global Awareness

CRITICAL THINKING OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
Students will be able to ➢ develop meaningful questions to address problems or issues. ➢ gather, interpret, and evaluate relevant sources of information. ➢ reach informed conclusions and solutions. ➢ consider analytically the view-points of self and others.	Students will learn to ask appropriate questions about the geologic history of an area. They will also look at multiple sides of issues relating to the earth and environment and pose questions about the choices made by societies, governments, and individuals. Students will learn to use and interpret maps, block diagrams, rocks, and fossils to trace the geologic history of an area. Students will use information they have learned to extrapolate answers to more complex geologic questions. Students will look at multiple sides of issues relating to the earth and environment and reflect on the choices made by societies, governments, and individuals. Class discussions (both small group and entire class), homework assignments, and laboratory exercises.
SOCIAL/GLOBAL AWARENESS OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)

➢ Students will begin to understand how their lives are shaped by the complex world in which they live. ➢ Students will understand that their actions have social, economic and environmental consequences.	Students will look at the multiple ways their lives are affected by the earth and environment, including natural disasters, climate change, energy use, resource procurement and management, pollution, and environmental preservation. They will look at the complex balance between how humans affect, and are affected by, the earth. Students will look at the issues of energy use, procurement and consumption of resources and environmental preservation and how they relate to the average U.S. citizen in contrast with the rest of the world. Students will look at issues of energy use, procurement and consumption of resources, preparation for natural disasters, and environmental preservation from the perspective of consumers and taxpayers. Students will look at issues of energy use, alternative energy, procurement and consumption of resources, pollution, and environmental preservation from the perspective of both societies/governments and individuals.

Instructional Methods
The instructor should combine the following instructional methods: Classroom lectures, demonstrations, discussions and laboratory activities.

Methods of Assessment/Evaluation

Method	**% Course Grade**
Quizzes/Homework	10-20%
Major Tests	30-40%
Final Exam	15-25%
Labs	15-25%
Attendance	Up to 10%

Text(s)
Physical Geology. Plummer, Charles; Carlson, Diane, & Hummersly, Lisa, 14th edition, 2013. McGraw Hill, publishers.

Bibliography
Allmon, W. D., and R. M. Ross, © 2002, Ithaca is Gorges: Ithaca, NY, The Paleontological Research Institution, 20 p.

Bolt, Bruce, © 2003, Earthquakes (5th edition): New York, W.H. Freeman & Company, 320 p.

Bryson, Bill, © 2003, A short history of nearly everything: New York, Broadway Books, 544 p.

Dake, James © 2009, Field Guide to the Cayuga Lake Region, The Paleontological Research Institution, 152 p.

Isachsen, Y.W., E. Landing, J.M. Lauber, L.V. Rickard, and W.B. Rogers, eds., © 2000, Geology of New York. A simplified account: Albany, New York, NYS Museum/Geological Survey, 294 p.

McPhee, John, © 2000, Annals of a former world: New York, Farrar, Straus, & Giroux, 696 p.

Van Diver, B.B., © 1985, Roadside geology of New York: Missoula, MT, Mountain Press, 411 p.

Winchester, Simon, © 2005, Krakatoa: The day the world exploded. August 27, 1883: New York, Harper Perennial, 464 p.

Other Learning Resources

Audiovisual Cargill Salt Mine Tour (located in Lansing, NY) Evidence for the Ice Age Planet Earth, the Complete BBC Series Volcano: Nature's Inferno, (National Geographic) These films are available in the TC3 Media Center. How the Earth was Made, Complete Seasons 1 and 2. .
Electronic U.S. Geological Survey Earthquake Information: http://quake.wr.usgs.gov/ Volcano World: http://volcano.und.nodak.edu Textbook website: http://www.mmhe.com/plummer14e Earth Literacy Principles: http://www.earthscienceliteracy.org/
Other Periodicals Earth Magazine, American Geological Institute, 4220 King Street, Alexandria, VA 22302.