

COURSE OUTLINE

Geology 105 (C-ID Number: GEOL 110) Earth and Life through Time (C-ID Title: Historical Geology)

I. Catalog Statement

This course is an introduction to Earth's history and the life it supports. Subjects include geologic dating, plate tectonics, stratigraphy, fossils, biological evolution, the planet's origin and the processes that have influenced paleogeography during the past 4.6 billion years.

Total Lecture Units: 3.0

Total Laboratory Units: 0.0

Total Course Units: 3.0

Total Lecture Hours: 48.0

Total Laboratory Hours: 0.0

Total Laboratory Hours To Be Arranged: 0.0

Total Faculty Contact Hours: 48.0

Prerequisites: None

Recommended Preparation: GEOL101 or its equivalent, eligibility for ENGL 120 or ESL 151 or equivalent

II. Course Entry Expectations

Prior to enrolling in the course, the student should be able to:

- read and write in English with proficiency;
- explain the paradigm of uniformitarianism in the context of a scientific view of Earth's history;
- implement basic skills to interpret timing relationships between rock units;
- explain the rock cycle and describe the classification of rocks in some detail;
- describe processes that shape the Earth's surface.

III. Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:

- explain the scientific method;
- explain the formation and basic properties of fossils, minerals and rocks;
- describe concepts related to the fossil record including index fossils, bias in the fossil record, cladistics and collection methods;
- describe ecological systems, biological evolution, and extinction concepts;
- clearly draw and explain concepts related to plate tectonics, including clear understanding of the observations and evidence that led to the construction of plate tectonic theory;
- explain the supercontinent cycle;
- understand the basis for determinations of paleoclimatic conditions and show knowledge of broad climatic trends over time on Earth;
- explain principles underlying radiometric dating of geological samples;
- explain and use the principles underlying other methods for dating geological samples including magnetostratigraphy and biostratigraphy;
- use the Geologic Time Scale and understand its basis;
- interpret sequences of geologic events from cross sections, maps, or stratigraphic sequences using dating principles and understanding of how rocks form;
- communicate complex course concepts effectively in writing and diagrams.

IV. Course Content

Total Faculty Contact Hours = 48.0

A. Earth's Materials (**6 hours**)

1. Rock-forming minerals
2. Igneous, sedimentary and metamorphic rocks
3. Rock cycle

B. Earth Structures (**6 hours**)

1. Internal layers and their properties
2. Faults, folds, joints and other geologic structures and their formation
3. Geologic subdivisions of continents including shield, craton, orogenic provinces, rifts, volcanic arcs and terranes
4. Important landscape features including basic types of volcanoes and their correlation to their tectonic or geographic setting

C. Plate Tectonics (**6 hours**)

1. Driving mechanisms
2. Plate boundaries types and relationships to geologic structures and landscape
3. Observational basis for plate tectonic theory
4. Hot spots
5. Crustal evolution and deformation including continental growth and seafloor recycling
6. Supercontinent cycle

D. Fossils (**6 hours**)

1. Modes of formation
2. Classification
3. Bias in the fossil record

4. Collection methods
 5. Ecological principles
 6. Biological evolution and evidence from the fossil record
 7. Extinction concepts including background and mass extinction
- E. Dating Methods (**6 hours**)
1. Principle of uniformitarianism in contrast to catastrophism
 2. Geologic Time Scale
 3. Relative dating using stratigraphic principles
 4. Biostratigraphic and magnetostratigraphic principles
 5. Radiometric dating
- F. Stratigraphy (**6 hours**)
1. Basic principles of stratigraphy including unconformities, intrusive contacts and fault contacts
 2. Sedimentary structures including bedding, crossbedding, graded bedding, mudcracks and raindrop impressions
 3. Interpretation of sedimentary rock sequences using lithofacies and biofacies concepts
 4. Transgressions and regressions of sea level
- G. Paleogeography (**9 hours**)
1. Hadean events including origin and formation of Earth
 2. Archean, Proterozoic and Ediacaran geologic and tectonic events
 3. Paleozoic geologic and tectonic events
 4. Mesozoic geologic and tectonic events
 5. Cenozoic geologic and tectonic events
 6. Recent geologic and tectonic events
- J. Energy and Resources (**3 hours**)
1. Importance of geologic history in natural resource distribution
 2. Man, the future and natural resources
 3. Impact of civilization on geologic processes

V. Methods of Instruction

The following methods of instruction may be used in the course:

- lectures and in-class demonstrations;
- analysis of graphs, figures and data sets;
- instructor or student-led group discussion and peer-to-peer learning;
- media of appropriate content;
- computer-assisted learning and the internet;
- hands-on experiences of appropriate design;
- field trips.

VI. Out of Class Assignments

The following out of class assignments may be used in the course:

- creation and analysis of graphs, figures, and data sets;
- online assignments;
- field trip reports (e.g., students write a geologic history of the Santa Monica Mountains);
- individual or group projects that create reports or other media (e.g., students create a presentation or webpage on the Quaternary paleoclimate of the Los Angeles basin).

VII. Methods of Evaluation

The following methods of evaluation may be used in the course:

- instructor evaluation of attendance, participation in class, and participation in group work of any kind;
- evaluation of student work by peers;
- creation and analysis of graphs, figures, and data sets;
- quizzes
- tests, with at least one midterm exam and one final exam—exams including essay style or short answer questions are strongly encouraged;
- instructor evaluation of student-created reports or other media.

VIII. Textbook(s)

Stanley, Steven M. *Earth System History*. 4th ed. New York: Macmillan Education, 2015. Print.

12th Grade Reading Level. ISBN 9781429255264

or

Levin, Harold L. *The Earth through Time*. 10th ed. Hoboken, New Jersey: Wiley, 2013. Print

12th Grade Reading Level. ISBN 9781118254677

IX. Student Learning Outcomes

Upon successful completion of the required coursework, the student will be able to:

- explain the scientific method;
- explain the formation and basic properties of fossils, minerals and rocks;
- demonstrate understanding of concepts related to the fossil record including index fossils, bias in the fossil record, cladistics and collection methods;
- articulate understanding of ecological systems, biological evolution, and extinction concepts;
- clearly draw and explain concepts related to plate tectonics, including clear understanding of the observations and evidence that led to the construction of plate tectonic theory;
- explain the supercontinent cycle;
- understand the basis for determinations of paleoclimatic conditions and show knowledge of broad climatic trends over time on Earth;
- explain principles underlying radiometric dating of geological samples;
- explain and use the principles underlying other methods for dating geological samples including magnetostratigraphy and biostratigraphy.
- use the Geologic Time Scale and understand its basis;
- interpret sequences of geologic events from cross sections, maps, or stratigraphic sequences using dating principles and understanding of how rocks form;
- communicate complex course concepts effectively in writing and diagrams.