

Geology (GEOL) 1501 Historical Geology (4 Units) CSU:UC  
[Formerly Geology 11]

Advisory: Eligibility for English 1000 and Reading 1005 strongly recommended

Total Hours: 48 hours lecture; 48 hours lab (96 hours total)

Catalog Description: Historical geology examines the origin and evolution of Earth, its continents, oceans, atmospheres, and life. There is a laboratory component, which allows students to apply principles they learn in lecture to classroom and field activities. Subjects introduced in historical geology include minerals and rocks, plate tectonics, geologic time, evolution, plate tectonics, and a summary of important events that occurred in the Precambrian, Paleozoic, Mesozoic, and Cenozoic Eras.

Text: Wicander, Reed, and James S. Monroe. *Historical Geology, Evolution of Earth & Life through Time*. 8<sup>th</sup> ed. Boston: Cengage, 2014. Print.

Type of Class/Course: Degree Credit

Additional Instructional Materials: None

Course Objectives:

By the end of the course, a successful student should be able to

1. Demonstrate a fundamental understanding of concepts and principles of Historical Geology including:
  - A. Fossilization
  - B. Ecology, Evolution and Extinction
  - C. Plate Tectonics
  - D. Geologic Time and Dating Methods
  - E. The Supercontinent Cycle and Paleo-Climate
2. Explain formation of and basic properties of fossils, minerals and rocks
3. Explain the tectonic processes that shape the Earth over geologic time
4. Interpret sequences of geologic events
5. Practically apply concepts and principles of Historical Geology including:
  - A. Fossilization
  - B. Ecology, Evolution, Extinction and the Fossil Record
  - C. Plate Tectonics
  - D. Geologic Time and Dating Methods
  - E. The Supercontinent Cycle and Paleoclimate
6. Interpret geologic maps, cross sections and stratigraphic columns

7. Identify representative samples of fossils and rocks
8. Practically apply knowledge of tectonic processes to interpret geologic events
9. Practically apply principles of relative dating to interpret sequences of geologic events
10. Practically apply the principles of the scientific method
11. Communicate complex course concepts effectively in writing and diagrams.

### Course Scope and Content (Lecture)

- Unit I            The Dynamic and Evolving Earth
- A. What is Historical Geology
  - B. Origin of the Universe
  - C. Why Earth is a Dynamic and Evolving Earth
  - D. Uniformitarianism
- Unit II            Minerals and Rocks
- A. Elements and Atoms
  - B. Chemical Bonding
  - C. Minerals – The Building Blocks of Rocks
  - D. Igneous Rocks
  - E. Sedimentary Rocks
  - F. Metamorphic Rocks
  - G. Rock Cycle
- Unit III           Plate Tectonics – A Unifying Theory
- A. Continental Drift
  - B. Earth’s Magnetic Field
  - C. Magnetic Reversals and Seafloor Spreading
  - D. Concepts of Plate Tectonics
  - E. Three Types of Plate Boundaries
- Unit IV           Geologic Time – Concepts and Principles
- A. How Geologic Time is Measured
  - B. James Hutton and Recognition of Geologic Time
  - C. Relative Dating Methods
  - D. Numerical Dating Methods
- Unit V            Rocks, Fossils, and Time - Making Sense of the Geologic Record
- A. Stratigraphy
  - B. Fossils and Fossilization
  - C. The Relative Geologic Time Scale
  - D. Correlation
- Unit VI           Sedimentary Rocks – The Archives of Earth History
- A. Sedimentary Rock Properties
  - B. Depositional Environments
  - C. Interpreting Depositional Environments

- D. Paleogeography
  
- Unit VII Evolution – The Theory and its Supporting Evidence
  - A. Charles Darwin Ideas on Evolution
  - B. Significance of Natural Selection
  - C. Mendel and the Birth of Genetics
  - D. Modern View of Evolution
  - E. Evidence Supporting Evolution
  
- Unit VIII Precambrian Earth and Life History – The Hadean and the Archean Eon
  - A. Significant Events During the Hadean
  - B. Archean Earth History
  - C. Evolution of the Atmosphere and Hydrosphere
  - D. Origin of Life and Early Life History
  
- Unit IX Precambrian Earth and Life History – The Proterozoic Eon
  - A. Proterozoic History of Laurentia
  - B. Proterozoic Supercontinents
  - C. Ancient Glaciers and Their Deposits
  - D. The Evolving Atmosphere
  - E. Proterozoic Life
  
- Unit X Early Paleozoic Earth History
  - A. Continental Architecture – Cratons and Mobile Belts
  - B. Paleozoic Paleogeography
  - C. Early Paleozoic Evolution of North America
  - D. The Appalachians
  
- Unit XI Late Paleozoic Earth History
  - A. Late Paleozoic Paleogeography
  - B. Evolution of North America
  - C. History of Late Paleozoic Mobile Belts
  - D. Late Paleozoic Mineral Resources
  
- Unit XII Paleozoic Life History – Invertebrates
  - A. The Cambrian Explosion
  - B. Present-Day Marine Ecosystems
  - C. Paleozoic Invertebrate Marine Life
  - D. Mass Extinctions
  
- Unit XIII Paleozoic Life History – Vertebrates and Plants
  - A. Evolution of Fish
  - B. Evolution of Amphibians
  - C. Evolution of Reptiles
  - D. Plant Evolution
  
- Unit XIV Mesozoic Earth History

- A. The Breakup of Pangaea
- B. Mesozoic History of North America
- C. Development of Eastern Coastal Region
- D. Development of Gulf Coastal Region
- E. Development of Western Region

- Unit XV Life of the Mesozoic Era
- A. Marine Invertebrates and Phytoplankton
  - B. Plants – Primary Producers
  - C. Dinosaur Evolution
  - D. The Origin and Evolution of Birds
  - E. Mass Extinctions – A Crisis in Life History

- Unit XVI Cenozoic Earth History – The Paleogene and Neogene Periods
- A. Cenozoic Orogenic Belts
  - B. North American Cordillera
  - C. The Continental Interior
  - D. Cenozoic History of the Appalachian Mountains

- Unit XVII Cenozoic Earth History – The Quaternary Period
- A. Pleistocene and Holocene Tectonism
  - B. Pleistocene Stratigraphy
  - C. Ice Ages
  - D. Glaciation and It's Effects
  - E. Glaciers Today

- Unit XVIII Life of the Cenozoic Era
- A. Cenozoic Vegetation and Phytoplankton
  - B. Cenozoic Birds
  - C. The Age of the Mammals
  - D. Intercontinental Migrations

- Unit XIX Primate and Human Evolution
- A. What are primates?
  - B. Prosimians
  - C. Anthropoids
  - D. Hominids and Hominins

#### Course Scope and Content (Laboratory)

Laboratory Activities Include the Following:

- Unit I Cladograms and Phylogenetic Trees
- A. Create simple Cladogram from data set
  - B. Create Pjylogenetic Tree from data set
- Unit II Unknown Mineral Identification

- A. Understanding of Physical Properties of Minerals
- B. Identify 24 Unknown Minerals

Unit III Sedimentary Rocks

- A. Understanding of Three Types of Sediment and Lithification Process
- B. Identify 14 Unknown Sedimentary Rocks

Unit IV Plate Tectonic Boundaries

- A. Understanding of Three Tectonic Boundaries
- B. Able to Construct a Tectonic Boundary Utilizing a Shoebox

Unit V Stratigraphic Correlation

- A. Correlate Fossils from Three Locations Off Map
- B. Construct a Lithostratigraphic Cross Section

Unit VI Relative Age Dating Relationships

- A. Describe the Specific Principles of Relative Age Dating
- B. Place the Strata in Correct Order from Oldest to Youngest

Unit VII Absolute Age Dating

- A. Understanding of Radioactive Isotopes in Determining Age of Rocks
- B. Solve Various Ages of Rock Based on Radioisotope Pairs

Unit VIII Natural Selection Lab

- A. Understanding of Principles of Natural Selection
- B. Perform Exercise In Lab Where Students Gauge Natural Selection In Predator/Prey Species

Unit IX Introduction to Field Mapping

- A. Learn to Describe Basic Geologic Structures In The Field
- B. Able to Read and Understand a Geologic Map

Unit X Fossil Evolution Exercise

- A. Understanding of Various Body Symmetries In Marine Invertebrates
- B. Be Able to Identify Four Different Phylum of Marine Invertebrates

Unit XI Fossils on the Internet

- A. Understanding of Morphologic Features of Trilobites
- B. Research a Specific Species of Trilobite on Internet

Unit XII Taxonomy, Modes of Life, and Paleozoic Fossils

- A. Understanding of Various Trace Fossils
- B. Identify Various Unknown Paleozoic Fossils

Unit XIII Dinosaur Cladistics

- A. Construct a Cladogram for Dinosaurs

B. Pose Scientific Questions About a Group Dinosaurs

Unit XIV Soil Classification

- A. Be Able to Describe Various Properties of Soils
- B. Identify Five Unknown Soils Types

Additionally, students attend up to three field trips during laboratory to apply principles learned in the classroom to geologic problem solving activities.

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab.

1. Curriculum development for each lab.
2. Published schedule of individual laboratory activities.
3. Published laboratory activity objectives.
4. Published methods of evaluation.
5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies.

During laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is physically present in lab when students are performing lab activities.
2. Instructor is responsible for active facilitation of laboratory learning.
3. Instructor is responsible for active delivery of curriculum.
4. Instructor is required for safety and mentoring of lab activities.
5. Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is responsible for personal evaluation of significant student outcomes (lab exercises, exams, practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course.
2. Instructor is responsible for supervision of laboratory clean up of equipment and materials.

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying
2. Answering questions
3. Skill practice
4. Problem solving activity or exercise

Methods of Instruction:

1. Lectures covering major points, methods, and procedures
2. Laboratory study as described below
3. Field trips to geologically interesting areas

4. Visual aids: Films, slides, charts, and rock and fossil specimens

Methods of Evaluation:

1. Substantial writing assignments, including:
  - a. essay exams
  - b. term or other papers
  - c. written homework
2. Computational or non-computational problem-solving demonstrations, including:
  - a. exams
  - b. homework problems
  - c. quizzes
3. Other examinations, including:
  - a. multiple choice
  - b. matching items
  - c. true/false items

Supplemental Data:

TOP Code:	191400 Geology
SAM Priority Code:	E: Non-Occupational
Funding Agency:	Y: Not Applicable
Program Status:	1: Program Applicable
Noncredit Category:	Y: Not Applicable
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Not Applicable
Prior to College Level:	Y: Not Applicable
Cooperative Work Experience:	N: Course is not a part of a cooperative education program
Eligible for Credit by Exam:	No

Eligible for Pass/No Pass:	Yes