Degree Applicable
Course ID 004028

Glendale Community College
April 2016

COURSE OUTLINE

Geology 111 H
Honors Physical Geology Laboratory

Catalog Statement

Geology 111 is an introduction to common laboratory practices and exercises in physical geology, such as identifying common minerals and rocks, and understanding simple topographic and geological sections and maps. The honors course is enhanced in one or more of the following ways: 1. Lab exercises involving utilizing skills expected of students who are eligible for Math 110. 2. Students perform lab exercises in which they: a) learn how to read a geological map at an advanced level; b) manipulate geological and/or geochemical datasets using a computer; c) identify and interpret a range of landscapes.

Total Lecture Units: 0.0
Total Laboratory Units: 1.0
Total Course Units: 1.0

Total Lecture Hours: 0.0
Total Laboratory Hours: 48.0
Total Laboratory Hours To Be Arranged: 0.0
Total Faculty Contact Hours: 48.0

Prerequisites: GEOL 101 or GEOL 101H. (GEOL 101 or GEOL 101H may be taken concurrently.)

Course Entry Expectations

Prior to enrolling or while enrolled in the course the student should be able to:

- discuss current basic understanding of earthquakes, including how they are measured, local issues concerning earthquake risk, and the relationship of seismic activity to faults and tectonic plate boundaries;
- list and briefly discuss the evidence behind the theory of plate tectonics;
- discuss why melting occurs inside the Earth, its relationship to volcanoes, and geographic locations where volcanoes occur;
- discuss uniformitarianism in the context of a scientific view of Earth’s history;
- implement basic skills to interpret timing relationships between rock units;
- discuss the rock cycle and describe the classification of rocks in some detail;
- describe processes that shape the Earth’s surface;
- discuss mineral and water resources.

Course Exit Standards

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

- apply the scientific method to measure or describe the physical properties of unknown minerals and determine their identity;
- identify visually common minerals and rocks;
- infer the basic geologic history of an area from rocks, geologic structures, and landforms present in the landscape and develop multiple working hypotheses about the history;
- discuss recurrence intervals of earthquakes on particular faults from calculated slip rates and other data and/or use data to locate the epicenter of an earthquake and determine its magnitude;
- discuss some of the scientific methods used to infer properties of Earth's interior and evaluate the accuracy of the results;
- evaluate the result of a calculation from a data set and discuss its accuracy;
- interpret timing relationships between rock units by applying observations of rock relationships and knowledge of scientific laws;
- read and interpret simple topographic and geologic maps;
- demonstrate an ability to communicate complex course concepts effectively in writing and diagrams and apply critical thinking and problem solving skills to make informed decisions in life.

Course Content — **Total Faculty Contact Hours = 48.0**

Structural Geology **(1.5 hours)**
- Lithostatic stress, differential stress, and strain
- Brittle and ductile rock behavior
- Identification of faults and folds and their relationship to stress

Seismology **(3 hours)**
- Depth of earthquake foci and relationship to brittle-ductile transition in the crust
- Measuring earthquakes and earthquake magnitude scales
- Locating earthquake epicenters
- Relationships between focal depth, fault size, and earthquake magnitude
- Fault slip rates and recurrence intervals of earthquakes

Earth's Internal Structure **(3 hours)**
- Use of s-wave shadow zone to determine the size of Earth's core and evaluate results
- Use of earthquake foci data to visualize the Wadati-Benioff zone and contrast these data to data showing the brittle-ductile transition in the crust

Plate Tectonics **(1.5 hours)**
- Relationships between types of differential stress, types of faults, and types of plate boundaries
- Relationships between depth of earthquake foci, volcano types, and plate boundaries

Speeds of plate motion and history of plate motion

Minerals **(3 hours)**

Physical properties of minerals
Testing unknown minerals' physical properties and using a dichotomous key to identify them

Igneous Rocks **(3 hours)**

Intrusive vs. extrusive igneous rocks
Rock names and characteristics
Intrusive igneous rock structures
Using the scientific method to interpret the geologic history of an area that contains igneous rocks

Volcanology **(4.5 hours)**

Basic volcano types and their eruptive styles
Where volcanoes occur and why they occur in those locations
Eruptive styles and relationship to volcano type and to geographic location
Why there are different eruptive styles
Visual identification of basic volcano types and intrusive igneous structures in the landscape

Sedimentary Rocks **(3 hours)**

Identifying sedimentary rocks from their visual characteristics
Use of scientific methods to interpret the depositional environment of sedimentary rocks
Identification and interpretation of contacts (structural, depositional, and erosional) with special emphasis on unconformities
Use the scientific method to interpret the geologic history of an area that contains sedimentary rocks

Metamorphic Rocks **(3 hours)**

Types of metamorphism and how metamorphism occurs
Index minerals and metamorphic grade
Identifying metamorphic rocks and a few basic types of metamorphic rocks, including foliated and non-foliated examples
Using the scientific method to interpret the geologic history of an area that contains metamorphic rocks

Geologic Time **(6 hours)**

Relative age dating and its implementation
Absolute age dating processes
The geologic time scale
Basic overview of the big events in Earth's history that determine the boundaries on the geologic time scale
Rocks, contacts, and laws of relative dating in analyzing complex rock unit relationships in a cross section and interpreting the geologic history of that area

Map Reading **(6 hours)**

Finding latitude and longitude points on a map
Finding the distance between two points using the scale
Finding the elevation of a point using topographic contour lines
Finding the type of rock or rock structure using layered geologic data

Using the stratigraphic information given on geologic maps to interpret geologic cross sections
Remotely sensed data

Field Geology **(6 hours)**
Using maps in the field
Basic field observations and measurements that include the use of global positioning systems (GPS), Brunton compass, or other tools
Interpreting geologic elements of the landscape and developing simple geologic histories using multiple working hypotheses

Surface Environments (at least one of the following) **(3 hours)**
Visual identification of key desert features and surface processes that create them
Visual identification of key coastal features and surface processes that create them
Visual identification of key glacial landscape features and surface processes that create them

And either

Global Climate Change **(1.5 hours)**
Using proxy data to interpret climate
Evaluating data over time

Or

Planetary Geology **(1.5 hours)**
Using remotely sensed data sets, such as cratering density, to infer history or other properties of other planetary bodies

Methods of Instruction

The following methods may be used in the course:

- hands-on learning in groups;
- use of various tools to make measurements of mineral properties;
- use of various tools to make measurements in the field;
- use of data sets (either real or created);
- brief lectures prior to student work;
- instructor or student-led group discussion and peer-to-peer learning;
- media of appropriate content;
- computer-assisted learning and the internet.

Out of Class Assignments

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

- field trips and field trip reports (e.g. write a report which analyzes elements of an area's geologic history);
- data collection (e.g. collect data to make a map or data set);
- laboratory reports.

Methods of Evaluation

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

- lab attendance and performance of assigned work;
- quizzes;
- midterm exam including essay or short answer questions;
- final exam including essay or short answer questions ;
- instructor directed student projects for evaluation by peers and/or the instructor.

Textbooks

Richard M. Busch and Dennis G. Tasa. *Laboratory Manual in Physical Geology*, 10th ed. Upper Saddle River: Prentice Hall, 2014. Print.
12th Grade Reading Level ISBN 978-0321944511

Ludman, Allan and Stephen Marshak. *Laboratory Manual for Introductory Geology*. 3rd ed. New York: W. W. Norton., 2011. Print.
12th Grade Reading Level ISBN 978-0393937916

Student Learning Outcomes

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