

ESCI-141L: LAB IN PHYSICAL GEOLOGY

Cuyahoga Community College

Viewing: ESCI-141L : Lab in Physical Geology

Board of Trustees:

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Academic Term:

Fall 2022

Subject Code

ESCI - Earth Science

Course Number:

141L

Title:

Lab in Physical Geology

Catalog Description:

This Physical Geology lab course focuses on understanding and describing geological phenomena and Earth materials. This includes intensive study of plate tectonic theory and history, origins of rocks and minerals, volcanoes, geologic dating, geologic and topographic maps, determination of depositional and erosional features, earthquake epicenter locations, and exercises in the basic procedures of geologic investigations in the field and lab. The course utilizes near-to-real time data sources to emphasize current geological observations and processes. This class emphasizes the use of maps and models to investigate Earth processes and the distribution of natural resources, with a focus on the Great Lakes

Credit Hour(s):

1

Lecture Hour(s):

0

Lab Hour(s):

3

Other Hour(s):

0

Requisites

Prerequisite and Corequisite

ESCI-1410 Physical Geology or concurrent enrollment; or ESCI-141H Honors Physical Geology or concurrent enrollment.

Outcomes

Course Outcome(s):

Apply scientific methods to analyze geologic materials and explain dynamic processes and systems of our planet earth.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Interpret topographic maps, identifying features and constructing vertical cross sections of geological features.
2. Examine aerial photos and remote sensing images in order to describe, delineate, and identify earth's landforms.
3. Interpret geologic maps to understand the Earth's internal structure.
4. Use relative dating procedures to interpret geologic cross sections.
5. Differentiate between the different types of folds, faults, and joints.
6. Locate plate boundaries and identify the plates and the types of boundaries that separate them.

7. Differentiate between erosional and depositional processes and features of gravity, water, wind and ice.
 8. Differentiate among P, S, and L seismic waves, plot time-travel curves and use them to locate earthquake epicenters.
 9. Identify minerals by their physical characteristics and know their chemical composition.
 10. Identify igneous, sedimentary, and metamorphic rocks using their texture and composition.
 11. Describe the classification and activity of volcanoes by their geomorphology and magma composition.
 12. Articulate the relationship between major landforms and tectonic plate boundaries.
 13. Recognize and discuss the actions and interaction of water, ice, and wind on the earth's surface, including identification of the resulting landforms.
 14. Discuss the basic principles of scientific inquiry and apply them to current research and to past discoveries of the major theories.
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Course Outcome(s):

Apply hands-on laboratory and safety techniques.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Demonstrate laboratory safety and proper laboratory techniques for each lab exercise.
 2. Discuss the basic principles of scientific inquiry and apply them to current research and to past discoveries of theories in physical sciences.
 3. Measure physical properties while recording observations and data.
 4. Perform laboratory activities in group and/or individual environments.
 5. Analyze laboratory data using proper steps, and detailed explanation of the phenomena under study.
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Methods of Evaluation:

1. Laboratory exercises
2. Lab exams (practicals)
3. Participation in class discussions/discussion forums
4. Participation in/and completion of investigations in the field
5. Laboratory reports
6. Quizzes

Course Content Outline:

1. Minerals
 - a. The rock cycle
 - b. Determination of hardness
 - c. Crystal classes and growing of crystals
 - d. Diaphaneity - transparent, translucent, opaque
 - e. Color
 - f. Rupture - cleavage and fracture
 - g. Effervescence with hydrochloric acid
 - h. Chemical composition
 - i. Specific gravity - heft, precise determination
 - j. Reaction to a magnet
 - k. Striations
 - l. Taste
- m. Feel
- n. Streak
- o. Tenacity - elastic, plastic, brittle
- p. Luster
2. Study of volcanoes
 - a. Activity - extinct, dormant, active
 - b. Type - shield, composite, cinder cone
3. Igneous rocks

- a. Intrusive
- b. Extrusive
- c. Texture
- d. Composition
- e. Environment of formation
4. Sedimentary rocks
 - a. Texture
 - b. Composition
 - c. Environment of formation
 - d. Sedimentary structures - mud cracks, cross beds, graded beds, etc.
5. Metamorphic rocks
 - a. Composition
 - b. Parent rocks and environment of formation
6. Geologic dating
 - a. Relative dating
 - b. Numerical/Radioactive dating
 - c. Paleomagnetism
7. Topographic maps
 - a. Contour lines - construction and reading
 - b. Scales - verbal, graphic, and representative fractions
 - c. Location by latitude and longitude
 - d. Magnetic declination
 - e. Legend
 - f. Construction of vertical profiles
8. Streams
 - a. Erosional features
 - b. Depositional features
 - c. Types of streams
 - d. Gradients
 - e. Stages of valley development
9. Hydrology and ground water
 - a. The hydrologic cycle
 - b. Water tables and aquifers
 - c. Karst - erosional features
 - d. Stages of karst development
10. Glaciers
 - a. Erosional features
 - b. Depositional features
 - c. Alpine and continental glaciation, features and locations
 - d. Pleistocene glaciation
11. Wind/aeolian processes
 - a. Erosional features
 - b. Depositional features
12. Waves
 - a. Erosional features
 - b. Depositional features
13. Earthquakes
 - a. Characteristics of P and S waves
 - b. Epicenter location
 - c. Focus
 - d. Identifying P and S waves, reading seismograms
 - e. Real time data analysis
14. Structural geology
 - a. Folds - anticlines, synclines, domes, basins
 - b. Faults - normal, reverse, transform
 - c. Joints
 - d. Use of age and symbols for determining structure
15. Geologic maps

- a. Symbols used for structures
 - b. Symbols used for formations
 - c. Interpretation
 - d. Constructions of cross-sections
16. Plate tectonics
- a. Plate boundaries - rift, subduction and transform
 - b. Plate distributions and interactions
 - c. Landforms and geomorphological features associated with plate boundaries
 - d. Measuring velocity components of lithospheric plates
17. Field work
- a. Using the Brunton compass: bearings; strike and dip
 - b. Elements of cartography
 - c. Determining stream gradients
 - d. Determining stream velocity
 - e. Determining characteristics of local formations and glacial tills
 - f. Identifying rocks and minerals in the field
 - g. Using GPS sensors/handheld units, including downloading data
18. Remote sensing
- a. Aerial photography analyses
 - b. Satellite images, live and historical imagery comparison and contrast

Resources

Higgins, Cindy, Annie Woodle, Andre Scheinwald, Dr. Paul Hall, Christina Blue . *Escience Labs Kit*. 2nd. Esciencelabs.com , 2016.

AGI American Geological Institute, Vincent Cronin, Dennis G Tasa; , NAGT - National Association of Geoscience Teachers. *Laboratory Manual in Physical Geology*. 11th ed. Pearson Publishing, 2018.

Jones, N. W, and Jones, C.E. *Laboratory Manual for Physical Geology*. 8th. New York, NY: McGraw Hill, 2014.

Zumberge, J.H., Rutherford, R.H., Carter, J.L., Carter, J. *Laboratory Manual For Physical Geology*. 16th ed. New York, NY: McGraw Hill, 2014.

Tarbutck, E. J., and F. K. Lutgens, Tasa, D. *Applications and Investigations in Earth Science*. 9th Edition. Hoboken, NJ. Pearson Publishing, 2019.

Cronin, Vincent and Dennis g. Tasa. *Laboratory Manual in Physical Geology*. AGI American Geological Institute, Pearson Publishing, 2021. 12th ed.

Renton, Jon. Coastal Learning Systems. *Introductory Physical Geology Laboratory Kit and Manual*. First edition. Kendal Hunt, 2022.

Resources Other

1. Google Earth: <https://www.google.com/earth/versions/>

Instructional Services

OAN Number:

Ohio Transfer 36 TMNS and Transfer Assurance Guide OSC025 (course 2 of 2, both must be taken)

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