

GEOL-101 Lab Modules for Distance Learning

Required:

E-Textbook and access code for Mastering Geology:

Laboratory Manual in Physical Geology, Edited by Vincent S. Cronin, 12th Edition 2020, Pearson

Students can purchase access to **Mastering** with eText for \$79.99 (ISBN 9780135870389).

Lab-1 Filling your Geoscience Toolbox

Module Overview: In this session you will learn about the structure of the course and learn to think like a geoscientist.

Learning Outcomes: At the end of this session, you will be able to:

1. Use Google Earth to get a view of your planet from above and then use that skill to investigate Earth's surface
2. Determine coordinates of an arbitrary point on a map using both the geographic and the UTM coordinate systems.
3. Use data to discover characteristics of Earth's internal structure
4. Explore how several locations plot on a hypsometric chart for surface elevations of the Entire Earth
5. Gain practice rounding and plotting data and using graphic plots to interpret rates, trends, and relationships within data.

Learning Materials:

- Introduction to the course
- Book Chap-1
- Power point lecture slides (prepared by the instructor)

Learning Activities:

- Lab exercises

- Mastering Assignments
 - Discussion Board
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- **Read** the introduction to Lab-1
- **Attend** the Blackboard Collaborate lecture
- **Review** the lecture slides
- Complete the Lab exercises
- Complete the Mastering Assignments
- Submit your lab via Blackboard
- Participate in the Discussion Board

[Lab-2 Plate Tectonics](#)

Module Overview: In this session you will learn about Plate Tectonics and how we know about the processes that shape the surface of the earth.

Learning Outcomes: At the end of this lab exercise you will be able to

1. Measure plate motion from difference reference points
2. Learn how materials deform and will use a lava lamp to illustrate concepts of buoyancy and heat transfer by convection
3. Interpret marine magnetic anomalies to infer the rate at which plate have diverged and explore how the North Atlantic Ocean Basin opened over the past 154 million years
4. See how earthquakes help define boundaries of plates

Learning Materials:

- Book Chap-2
- Power point lecture slides (prepared by the instructor)
- Video

Learning Activities:

- Lab exercises
 - Mastering Assignments
 - Discussion Board
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- **Read** the introduction to Lab
- **Attend** the Blackboard Collaborate lecture
- **Review** the lecture slides
- **Watch** the following videos
 - **Earth's Layers & Isostasy** (6 min, 15 MB) [Video only](#) | [Video w/CC](#) | [Script](#)
 - **Plate Tectonics Basics** (11 min, 26.5 MB) [Video only](#) | [Video w/CC](#) | [Script](#)
 - **Plate Tectonics and Global Impacts** (11 min, 31 MB) [Video only](#) | [Video w/CC](#) | [Script](#)
 - **Plate Tectonics and California** (7 min, 25 MB) [Video only](#) | [Video w/CC and Study Quizzes](#) | [Script](#)
 - **Hotspots:** (6-min, 13.9 MB) [Video only](#) | [Video w/CC](#) | [Script](#)
 - **Paleomagnetism:** (8-min, 26 MB) [Video only](#) | [Video w/CC](#) | [Script](#)
- Complete the **Lab exercises**
- Complete the **Mastering Assignments**
- Submit your lab via Blackboard
- Participate in the Discussion Board

[Lab-3 Minerals](#)

Module Overview: In this session you will learn how to identify minerals using their physical and chemical properties.

Learning Outcomes: at the end of this lab you will be able to

1. Characterize optical properties of minerals
2. Characterize mineral form and examine broken faces for cleavage or fracture.
3. Use Mohs scale of Hardness to differentiate between several minerals
4. Identify a set of unknown minerals
5. Appreciate that we rely on mineral resources produced outside the United States for the manufacture of items we use every day
6. take a glimpse at some economic aspects of acquiring the mineral resources we need in our industrial society

Learning Materials:

- Book Chap-3
- Power point lecture slides (prepared by the instructor)
- Videos

Learning Activities:

- Lab exercises
- Mastering assignments
- Discussion Board
- Assessment

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- Read the introduction to Lab
 - Attend the Blackboard Collaborate lecture
 - Review the lecture slides
 - Watch the following videos:
 - **Inside Minerals** (16.5-min, 40 MB) [Video only](#) | [Video w/CC](#) | [Script](#)
 - **Identifying Minerals** (16-min, 72 MB) [Video only](#) | [Video w/CC](#) | [Script](#)

- **Distinguishing between some green minerals:**
(3-min, 7 MB) [Video only](#) | [Video w/CC and Study Quizzes](#)
- Complete the **Lab exercises**
- Complete the **Mastering Assignments**
- Submit your lab via Blackboard
- Participate in the Discussion Board
- **Mineral Identification Test** via Blackboard

Lab-4 Rock Cycle

Module Overview: In this session you will learn about how different types of rock are related to each other and to the environments in which they form

Learning Outcomes: at the end of this lab you will be able to

1. Use the textures and fabrics displayed by a few rock specimens to place each one within the rock cycle and where and how the rock formed.
2. Discern whether a rock specimen is mostly formed of interlocking mineral grains, clastic particles or natural glass.
3. Consolidate the skills developed in the lab to infer whether a specimen is an igneous, sedimentary or metamorphic rock.

Learning Materials:

- Book Chap-4
- Power point lecture slides (prepared by the instructor)
- Video

Learning Activities:

- Lab exercises
- Mastering Assignments
- Discussion Board

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- **Read** the introduction to Lab
 - **Attend** the Blackboard Collaborate lecture
 - **Review** the lecture slides
 - **Watch** the following video:
 - **Rock Cycle** (3.5 min, 11.4 MB) [Video only](#) | [Video w/CC](#) | [Script](#)
 - Complete the **Lab exercises**
 - Complete the **Mastering Assignments**
 - Submit your lab via Blackboard
 - Participate in the Discussion Board

[Lab-5 Igneous Rocks and Processes](#)

Module Overview: In this session you will learn about how and where Igneous rocks form and learn to use their textures and composition to classify and identify them.

Learning Outcomes: At the end of this session you will be able to

1. Use textures and composition to classify igneous rocks
2. Analyze, interpret, and identify Igneous rocks
3. Discover how different magma types might be related to tectonic setting
4. Examine a geologic map to interpret the geologic history of the area.

Learning Materials:

- Book Chap-5
- Power point lecture slides (prepared by the instructor)
- Video

Learning Activities:

- Lab exercises

- Mastering Assignments
 - Discussion Board
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- **Read** the introduction to Lab
- **Attend** the Blackboard Collaborate lecture
- **Review** the lecture slides
- Watch the following videos:
 - **Igneous Rocks:** (20 min, 46 MB) [Video only](#) | [Video w/CC and Study Quizzes](#) | [Script](#)
 - **Plutons** (5 min, 12.4 MB) [Video](#) | [Video w/CC](#) | [Script](#)
 - **Magma Viscosity** (5 min, 26.4 MB) [Video](#) | [Video w/CC](#) | [Script](#)
- Complete the **Lab exercises**
- Complete the **Mastering Assignments**
- Submit your lab via Blackboard
- Participate in the Discussion Board

[Lab-6 Sedimentary Rocks](#)

Module Overview: In this session you will learn about processes and environments that turn sediments into sedimentary rocks. You will learn how to classify and identify sedimentary rocks based on their textures and composition.

Learning Outcomes: at the end of this lab you will be able to

1. Examine photographs of sedimentary rock specimens to interpret their composition, texture, and other distinguishing characteristics
2. Investigate sediment formation
3. Infer the sort of environment in which a given type of sediment might have originated
4. Identify a set of unknown sedimentary rock specimens
5. Analyze and interpret sedimentary rock from Grand Canyon

6. Infer characteristics of ancient environments by comparing with modern sedimentary features

Learning Materials:

- Book Chap-6
- Power point lecture slides (prepared by the instructor)
- Video

Learning Activities:

- Lab exercises
- Mastering Assignments
- Discussion Board

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- **Read** the introduction to Lab
 - **Attend** the Blackboard Collaborate lecture
 - **Review** the lecture slides
 - **Watch** the following videos:
 - **Weathering and Sedimentation**
(16 min, 64 MB) [Video](#) | [Video w/CC](#) | [Script](#)
 - **Identifying Sedimentary Rocks:** (15 min, 29 MB)
[Video only](#) | [Video w/CC and Study Quizzes](#) | [Script](#)
 - **Sedimentary rocks in the Grand Canyon**
<https://ny.pbslearningmedia.org/resource/nvmn-sci-grandcanyon/wgbh-nova-making-north-america-uncovering-layers-of-the-grand-canyon/>
 - Complete the **Lab exercises**
 - Complete the **Mastering Assignments**
 - Submit your lab via Blackboard
 - Participate in the Discussion Board

[Lab-7 Metamorphic Rocks](#)

Module Overview: In this session you will learn about the processes that produce metamorphic rocks and how to classify and identify them based on their textures and composition.

Learning Outcomes: By the end of this lab you will be able to

1. Analyze and describe samples of metamorphic rock.
2. Classify metamorphic rocks based on their textural and compositional features.
3. Identify a set of unknown metamorphic rock samples.
4. Infer regional geologic history and the relationship of metamorphic facies to plate tectonics using index mineral, pressure-temperature diagrams, and geologic maps.

Learning Materials:

- Book Chap-7
- Power point lecture slides (prepared by the instructor)
- Video

Learning Activities:

- Lab exercises
- Mastering Assignments
- Assessment

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- Read the introduction to Lab
 - Attend the Blackboard Collaborate lecture
 - Review the lecture slides
 - Watch the following videos:
 - **Metamorphism** (7 min, 17 MB) [Video](#) | [Video w/CC](#) | [Script](#)
 - **Identifying Metamorphic Rocks:** (14 min, 25 MB)
[Video only](#) | [Video w/CC and Study Quizzes](#) | [Script](#)
 - Complete the Lab exercises
 - Complete the Mastering Assignments

- Submit your lab via Blackboard
- **Rock Identification Test** via Blackboard

Field Trip to Central Park

Module Overview: In this session you will go on a virtual/ Self-guided field trip to Central Park and learn about the local geography and geology of New York City and its geologic history.

Learning Outcomes: At the end of this session you will be able to:

- Describe the geography and geology of New York City
- Apply your knowledge of different rock types to identify the bedrock in New York City's different boroughs.
- Explain how the bedrock of New York is shaped by its geologic history
- Describe the evidence of the last glaciation that shaped the surface topography of New York

Learning Materials:

- Power point lecture slides
- Video

Learning Activities:

- Field trip
- Written reports

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- **Attend** the Blackboard Collaborate lecture
 - **Review** the lecture slides/ Virtual self-guided Field Trip
 - Watch the videos:
 - <https://ny.pbslearningmedia.org/resource/nvmn-sci-manhattanschist/wgbh-nova-making-north-america-geology-of-the-manhattan-skyline/>
 - Go to Central Park following social distancing guidelines or take the tour on Google Earth (details in the assignment)

- Make observations at the field trip stops
 - Take photographs
- Fill out the **field report**
- Complete the **Geology of New York** Assignment
- Submit your assignments via Blackboard
- Participate in the Discussion Board

Lab-8 Dating of Rocks, Fossils and Geologic Events

Module Overview: In this session you will learn about Geologic Time and how geoscientists use the techniques of Relative dating and Numerical dating to determine the ages of geologic features and the order in which geologic events occurred.

Learning Outcomes: At the end of this session you will be able to:

1. Use geologic structures to interpret the relative ages of rocks in a geologic cross-section
2. Apply the principles of relative dating to interpret geologic history from a cross-section.
3. Use index fossils and their range zones to identify the geologic ages in which they are found.
4. Apply both relative and numerical dating techniques to interpret the sequence of geologic events from structures exposed in a coal mine
5. Examine a complex series of rock layers and identify which structural features are important for determining the geologic history

Learning Materials:

- Book Chap-8
- Power point lecture slides
- Video

Learning Activities:

- Lab exercises
- Mastering Assignments
- Discussion Board

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- **Read** the introduction to Lab
 - **Attend** the Blackboard Collaborate lecture
 - Review the lecture slides
 - Watch the following videos:
 - **Radioactive Decay** (12-min, 25.4 MB) [Video](#) | [Video w/CC](#) | [Script](#)
 - **Radiometric Dating**: (8-min, 22 MB) [Video](#) | [Video w/CC](#) | [Script](#)
 - **Relative Dating** (16-min, 46 MB) [Video](#) | [Video w/CC](#) | [Script](#)
 - Complete the **Lab exercises**
 - Complete the **Mastering Assignments**
 - Submit your lab via Blackboard
 - Participate in the Discussion Board

Note to Lab instructors:

The following materials are available on a common departmental space for teachers and / or students to access.

- 68 large and small specimens of minerals and rocks from the Department's collection have been digitized into images that can be rotated (to be able to view from all directions) and zoomed in (to observe small details). These images have brief descriptions but have no 'names' so that they can be used for teaching as well as testing purposes.
- The departments sample trays have been recreated with small teaching videos that describe the samples in the department's Mineral and Rock trays with the specific sample numbers. These teaching videos are meant to be used by the student to fill out the Mineral and Rock identification charts in Labs, 3,5,6 and 7. The samples have not been identified so that the students can complete the identification themselves.

- For the 'Geology of New York City' module: A powerpoint presentation with embedded videos, a self-guided field trip to Central Park assignment and a Geology of New York assignment (adapted from Brooklyn College) are available.

Suggested Grading:

- Lab exercises- 40%
- Mastering Assignments- 20%
- Mineral and Rock Identification tests -20%
- Geology Of New York City with field trip to Central Park-10%
- Participation in the Discussion Board-10%

For instructors: To link the Blackboard course to Pearson's MyLab and Mastering:

1. Log into **BB**
2. Click on **course tools**
3. Click on **Pearson's MyLab and Mastering**
4. Click on **instructor help** to get an instructor account (if you do not have one already)
5. Click on **Select a My Lab and Mastering product to use with this course**
6. Enter author details and select **Modified Mastering Geology for Laboratory Manual in Physical Geology, 12th Edition**
7. Select the option '**student-use course**'
8. Enter **name of course** and **dates**
9. Click create
10. Once the course is created, Pearson will email you details about how your students can register for your course

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