

BOSTON COLLEGE

S U M M E R S E S S I O N

*Please note that this syllabus should be regarded only as a general guide to the course and is subject to change at the instructor's discretion.

EESC114001 Our Mobile Earth, 3 credits
Boston College Summer Session 2019
Summer 1, May 14, 2019 – June 20, 2019
Tuesdays 9:30 AM – 12:45 PM, remainder of week on-line

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Office Hours: before and after class, or by appointment

Boston College Mission Statement

Strengthened by more than a century and a half of dedication to academic excellence, Boston College commits itself to the highest standards of teaching and research in undergraduate, graduate and professional programs and to the pursuit of a just society through its own accomplishments, the work of its faculty and staff, and the achievements of its graduates. It seeks both to advance its place among the nation's finest universities and to bring to the company of its distinguished peers and to contemporary society the richness of the Catholic intellectual ideal of a mutually illuminating relationship between religious faith and free intellectual inquiry.

Boston College draws inspiration for its academic societal mission from its distinctive religious tradition. As a Catholic and Jesuit university, it is rooted in a world view that encounters God in all creation and through all human activity, especially in the search for truth in every discipline, in the desire to learn, and in the call to live justly together. In this spirit, the University regards the contribution of different religious traditions and value systems as essential to the fullness of its intellectual life and to the continuous development of its distinctive intellectual heritage.

Course Description

This course will provide you with an introduction to the structure of the Earth and the dynamic processes that continuously shape and remodel its surface. During class, we will discuss the formation and evolution of the oceans and continents within the framework of the modern theory of plate tectonics. The locations, causes and effects of earthquakes and volcanoes are presented. The dynamics within Earth which drive the tectonic plates are outlined.

Textbooks & Readings (Required)

Essentials of Geology (Third Edition or more recent) by: *Stephen Marshak*

Course Goal

After taking this course you should be able to identify and interpret some of the geological features and events you encounter in your daily life, and relate these features to plate tectonic processes. In addition, you will gain a better understanding of geologic hazards, geologic resources and geologic time.

Course Learning Objectives

1. to gain factual knowledge (geologic terminology, classifications, scientific methods);
2. to learn fundamental geologic principles, generalizations and theories;
3. to improve your ability to associate geologic features and events with plate tectonics;
4. to develop your understanding of geologic hazards and resources; and,
5. to apply course material to recognize and identify basic earth materials and earth processes.

Class Outcomes

Class 1 May 14

Introduction

1. You will learn about this course: its structure, learning objectives, grading policy, and your course instructor.
2. You will consider how geology relates to your life.

Physical and Chemical Layers of the Earth/Lithospheric Plate Boundaries

1. You will examine the chemical and physical layers of the Earth.
2. You will compare granite, basalt, peridotite (rocks).
3. You will contemplate the hypothesis of Continental Drift (Wegner) and the concept of Sea Floor Spreading (Hess and Dietz).
4. You will identify the basic principles of the Theory of Plate Tectonics.
5. You will contemplate intra plate volcanism and hot spots.

Class 2 on-line (May 16)

The Way the Earth Works

1. You will examine the main types of plate boundaries associated with tectonic plate motion.
2. You will identify geologic features at each type of plate boundary.
3. You will locate “real life” (geographic) examples of different plate boundaries and hotspots.
4. You will complete assignment 1.1.A: Pacific Plate Motion.
5. You will complete assignment 2.2.A: Plate Tectonic Boundaries.
6. You will prepare for Quiz 1 (Chapters 1, 2 and associated homework).

Class 3 May 21

Magma and Igneous Environments/Igneous Rocks

1. You will take Quiz I (Chapters 1, 2 and associated homework).
2. You will identify why rocks melt.
3. You will review P/T Phase Diagrams as they relate to molten rock/formation of magma.
4. You will relate different volcano eruption styles to magmatic chemistry and plate boundaries.
5. You will identify the different types of volcanoes.
6. You will complete assignment 3.3.A: P/T Phase Diagram and the Origin of Magma (if time permits – due May 28).

Class 4 on-line (May 23)

Volcanoes and Volcanic Hazards

1. You will compare the different chemical compositions of magma and associate magmatic chemistry to tectonic plate boundaries.
2. You will examine and identify the most common types of igneous rocks and igneous features.
3. You will research the various hazards to life and environment that can result from volcanic eruptions (Mt. St. Helens case study Box 5.1).
4. You will complete assignment 4.4.A: Bowen’s Reaction Series.
5. You will complete assignment 5.4.B: Volcanoes and Igneous Features.
6. You will prepare for Quiz II (Chapters 4, 5 and associated homework).

Class 5 May 28

Sedimentary Environments and Sedimentary Rocks

1. You will review Quiz I and homework.
2. You will take Quiz II (Chapters 4, 5 and associated homework).
3. You will learn how sediment is produced and compare different types of sedimentary environments.
4. You will examine and identify the most common types of sedimentary rocks.
5. You will contemplate transgression and regression in a sedimentary sequence.
6. You will investigate caves, sinkholes, hydrofracking.
7. You will complete assignment 6.5.A: Sedimentary Rock Summary.

Class 6 on-line (May 30)

Metamorphic Settings and Metamorphic Rocks

1. You will identify the agents of metamorphism.
2. You will examine how a rock changes/metamorphoses under stress.
3. You will examine and identify the most common types of metamorphic rocks and their protoliths.
4. You will consider all three rock types in the Rock Cycle Summary Cross Section (Interlude C).
5. You will complete assignment 7.6.A: Metamorphic Rock Summary.
6. You will complete assignment 8.6.B: Tectonic Summary Cross Section.
7. You will prepare for Quiz III (Chapters 6, 7 and associated homework).

Class 7 June 4

Structural Geology/Faults

1. You will review Quiz II and homework.
2. You will take Quiz III (Chapters 6, 7 and associated homework).
3. You will observe how the Earth's crust responds to and moves under stress.
4. You will identify the major types of faults and relate these to different types of stress and tectonic boundaries.
5. You will measure structural deformation through strikes and dips of rock units, folds and faults.
6. You will identify various geologic features in structural geology homework and relate these structures to geologic stress, plate tectonics, and our course concept map.

Class 8 on-line (June 6)

Structural Geology

1. You will compare brittle and ductile deformation.
2. You will examine the main types of folds.
3. You will evaluate the main types of seismic waves.
4. You will complete assignment 9.7.A: Locating the Epicenter of an Earthquake.
5. You will complete assignment 10.8.A: Structural Deformation.
6. You will prepare for Quiz IV (Chapters 8, 9 and associated homework).

Class 9 June 11

Relative Dating

1. You will review Quiz III and homework.
2. You will take Quiz IV (Chapters 8, 9 and associated homework).
3. You will review the principles of relative dating.
4. You will identify the main types of unconformities and what they represent.
5. You will use the principles of relative dating to determine the sequence of geologic events in a geologic cross section (in class assignment).

Class 10 on-line (June 13)

Correlation

1. You will interpret the geologic history of an area using what you know about rock formation and the principles of relative dating.
2. You will consider index fossils and correlation of stratigraphic sequences.
3. You will complete assignment 11.9.A: Relative Dating.
4. You will complete assignment 12.10.A: Correlating Subsurface Geology from Well Logs.
5. You will prepare for Quiz V (Chapter 10 Relative Dating and associated homework).

Class 11 June 18

Geologic Time/Intro to groundwater

1. You will review Quiz IV and homework.
2. You will take Quiz V (Chapter 10 Relative Dating and associated homework).
3. You will examine the geologic time scale.
4. You will research major events (including extinction events) in Earth's history.
5. You construct a comprehensive geologic cross section using well logs in effort to interpret the geologic history of an area.

Class 12 on-line (June 20)

Putting it all together!

1. You complete your final assignment: Correlating Well Logs to Construct a Complex Geologic Cross Section.
2. You will submit your Final Assignment.

Grading Procedures

5 quizzes* – each worth 12% = 60%

Final homework project, *Constructing and Interpreting a Geologic Cross Section* = 15%

All Homework, equal weight = 25%

Quiz dates and Assignment due dates
dates are approximate only and subject to change

Assessment	Date	Percent of Final Grade
Quiz I	Tuesday May 21	12%
Quiz II	Tuesday May 28	12%
Quiz III	Tuesday June 4	12%
Quiz IV	Tuesday June 11	12%
Quiz V	Tuesday June 18	12%
Final Correlation	Due: Thursday June 20	15%
All Homework (see below)	Due: See table below	25%

Homework Assignment	Due Date
1.1.A: Pacific Plate Motion	Tuesday May 21
2.2.A: Plate Tectonic Boundaries	Tuesday May 21
3.3.A: P/T Phase Diagram/Magma	Tuesday May 28
4.4.A: Bowen's Reaction Series	Tuesday May 28
5.4.B: Volcanoes and Igneous Features	Tuesday May 28
6.5.A: Sedimentary Rock Summary	Tuesday June 4
7.6.A: Metamorphic Rock Summary	Tuesday June 4
8.6.B: Tectonic Summary Cross Section	Tuesday June 4
9.7.A: Locating the Epicenter of an Earthquake	Tuesday June 11
10.8.A: Structural Deformation	Tuesday June 11
11.9.A: Relative Dating	Tuesday June 18
12.10.A: Correlating Well Logs/groundwater	Tuesday June 18

* **Quizzes:** Students are expected to take quizzes at the scheduled time. Only very unusual circumstances (e.g. family emergency, serious illness) are acceptable reasons for missing an assessment. You must notify me prior to the assessment date if you will miss an assessment, in any event. Failure to notify me prior to a missed assessment will result in a zero for that assessment grade.

Grading

A	>93	C	73-76.9
A-	90-92.9	C-	70-72.9
B+	87-89.9	D+	67-69.9
B	83-86.9	D	63-66.9
B-	80-82.9	D-	60-62.9
C+	77-79.9	F	below 59.9

All students can access final grades through Agora after the grading deadline each semester. Transcripts are available through the [Office of Student Services](#).

Course Expectations/Students' Responsibilities

You are expected to attend every class, submit all homework assignments and take all in-class assessments. Attendance is taken every class; I do not post lecture notes on line. All assignments must be submitted on time and according to instructions. They will not be accepted at other times. Students are responsible for completing all course requirements and for keeping up with all that goes on in the course, whether or not the student is present.

Written Assignments

Summer Session students are expected to prepare professional, polished written work. Written materials must be typed and submitted in the format required by your instructor. Strive for a thorough yet concise style. Cite literature appropriately, using APA, MLA or CLA style per your instructor's requirements. Develop your thoughts fully, clearly, logically and specifically. Proofread all materials to ensure the use of proper grammar, punctuation and spelling. For writing support, please contact the [Connors Family Learning Center](#).

Accommodation and Accessibility

Boston College is committed to providing accommodations to students, faculty, staff and visitors with disabilities. Specific documentation from the appropriate office is required for students seeking accommodation in Summer Session courses. Advanced notice and formal registration with the appropriate office is required to facilitate this process. There are two separate offices at BC that coordinate services for students with disabilities:

[The Connors Family Learning Center \(CFLC\)](#) coordinates services for students with LD and ADHD.
[The Disabilities Services Office \(DSO\)](#) coordinates services for all other disabilities.

Scholarship and Academic Integrity

Students in Summer Session courses must produce original work and cite references appropriately. Failure to cite references is plagiarism. Academic dishonesty includes, but is not necessarily limited to, plagiarism, fabrication, facilitating academic dishonesty, cheating on exams or assignments, or submitting the same material or substantially similar material to meet the requirements of more than one course without seeking permission of all instructors concerned. Scholastic misconduct may also involve, but is not necessarily limited to, acts that violate the rights of other students, such as depriving another student of course materials or interfering with another student's work. Please see the [Boston College policy on academic integrity](#) for more information.