SCI 311: Physical Geology
Fall 2022–Spring 2023
Maine School of Science and Mathematics

Class Times and Locations

Class MTRF 1:15–2:10 PM **Lab** W 1:15–3:10 PM

All class meetings are in room B216.

Instructor

Richard Barrans, Ph.D., M.Ed.; barransr@mssm.org
Office Hours: Sun 6:30–7:30 PM; MTR 11:30 AM–12:25 PM, W 9:30–10:25 AM

Objectives

After completion of this course, the successful student will be able to:

- Describe how rocks and minerals are created and broken down.
- Explain how Earth's topographic and structural features arise and evolve.
- Describe how geologists study the Earth.

Course Content and Approach

Geology is the study of the planet Earth in totality. This course is an introductory survey of the science of geology, including internal structure, geologic time, minerals, formation of igneous, sedimentary, and metamorphic rocks, and the development of topographic features. Hands-on laboratory activities are an integral component of the course.

Textbook

Essentials of Geology, Seventh Edition, by Stephen Marshak, published by W.W. Norton & Co., 2022.

Grading

Projects	50%
Lab	25%
Final examination	10%
Homework	10%
Class work	5%

Course Components

Class

Attendance is expected in class. Class work receives full credit if it shows evidence of earnest effort in good faith.

Projects

For each thematic section of the course, you will choose one from a menu of projects to demonstrate your understanding of the content. Projects are the most significant input (50%) determining your course grade. Most will be completed and submitted in pieces, so that I can verify your progress.

Thematic Sections

The thematic sections of the course, with their percentages of the total course grade are:

Section	Chapters	Percent
I: The whole Earth	1–3	10
II: Making rocks	4–7	10
III: Changes over time	8–11	10
IV: Money	12	3.5
V: Carving the crust 1	13–14	6.5
VI: Carving the crust 2	15–18	10

Homework

Homework problems are assigned to reinforce the covered material. For full credit, you must explain how to approach and answer the question. Merely giving an answer, even if it is correct, will not earn full credit.

Laboratories

Weekly laboratory participation is an essential component of the course.

Lab Groups

It is expected that you will work in groups in lab. Many of the experiments require several people just to take the data. Groups may contain four or fewer students; obtain instructor permission *each time* for larger groups. All group members are responsible for completing all data tables, graphs, and analyses. Your instructor may check the data sheet of any group member to evaluate the group's work and data collection. The instructor may assign lab groups.

Lab Reports

Written lab reports, if required, are due at the beginning of the next lab.

Final Exam

The final exam is comprehensive, covering all topics addressed in the course throughout the semester.

Resources

Instructor

If office hours are inconvenient, the very best way to contact me is by e-mail. I can pretty much guarantee that I will forget any conversation during or right around class. If I have my wits about me when you speak to me in class, I will ask you to send me an e-mail to remind me of what we discussed. If I forget, please send the e-mail anyway.

Textbook

The textbook is your first source of information. The assigned sections of the text are best read by each student before class.

Internet

Current scores for homeworks, labs, and projects will be posted on Infinite Campus. Homework assignments are accessed through Canvas.

Absences

Assessments missed due to an excused absence may be made up. Arrangements for make-up assessments must be made within seven calendar days of your return to class. If you are unable to attend a lab due to an excused absence, contact me. I may either schedule a make-up at another time or pro-rate your missed lab.

Remote learning during extended medical absences

If you are unable to be on campus due to a medical absence, you may participate in the class remotely. However, it is not technically possible for me to deliver the full classroom experience to students attending remotely; when I attend to students physically in lab or lecture, I am not able to optimize cameras, microphones, and narration. Students attending labs remotely may use data gathered from the group in which they synchronously participated, and which they record in their own data tables. Students taking quizzes or exams remotely are subject to the same conditions, including time limits, as if they were physically present.

Academic Integrity

2022-2023 Community Handbook

At MSSM, students and staff take great pride in academic honesty and a supportive academic environment. All are expected to maintain habits of rigorous debate, healthy inquiry, and the vigorous pursuit of truth. Academic dishonesty, in any of its forms, disrupts the learning process and tarnishes the integrity of our community. As a result, MSSM will treat instances of academic dishonesty very seriously.

If an instructor grants permission, students may collaborate in completing assignments and homework. Any unauthorized collaboration, copying, using of notes on exams/major assessments, storing of non-permitted information on calculators or on computers, or any other unacceptable activity that gives a student or a group of students advantages over others is cheating and will not be tolerated.

While the assimilation of ideas from many sources is basic to academic research and intellectual development, students must always reference the use of any non-original materials. Failure to do so is plagiarism and this dishonesty impairs an instructor's ability to accurately evaluate a student's performance. Plagiarism is using someone else's ideas, wording, or data without proper or complete acknowledgment. Credit must be given for ideas and information that belong to someone else, whether it is quoted, summarized, or paraphrased. Faculty members may require that notes, drafts, and a list of sources be submitted along with the finished project. Failure to provide evidence of the work process may constitute an admission of plagiarism.

This class

Students are expected to respect others' opinions and abilities. Those who disrupt the class or interfere with other students' opportunity to learn will be asked to leave the class. If you have a mobile phone or any other distracting equipment, turn it off or silence it and refrain from non-class use during class.

Students are expected to work together on group work and labs, and encouraged to study together. However, all submissions must represent your OWN work. Copying, collaborating, and sharing of materials during examinations is not permitted, as described in detail above. Other prohibited practices include, but are not limited to, signing an absent student's name to a sign-in sheet, submitting material for grading that is also submitted to another class without clearance by both instructors, and "dry-labbing" or recording data in lab that you did not actually observe.

Notice of Non-Discrimination

MSSM does not discriminate on the basis of race, color, national origin, sex, disability, or age in its programs and activities. The following person has been designated to handle inquiries regarding the non-discrimination policies:

Dr Greg Hamlin (he/him/his), Title IX Coordinator, Affirmative Action Officer
Email: hamling@mssm.org
Cell: 607-301-3922

For further information on notice of non-discrimination you may contact the U.S. Department of Health and Human Services, Office for Civil Rights. Web: https://www.hhs.gov/ocr/index.html, Phone: 1-800-368-1019, Email: OCRMail@hhs.gov, TDD: 1-800-537-7697

Disclaimer

Information in the syllabus was, to the best of the instructor's knowledge, correct when distributed at the beginning of the term. However, the instructor reserves the right to correct errors and to make changes in the course content or instructional techniques during the term. The instructor will make every effort to ensure that any such changes benefit the students. Before any changes to the syllabus take effect, students will be notified and given the opportunity to comment, object, and propose alternatives.

Tentative Schedule for the Fall Semester

Day	Topic	Reading	Assignments*
8/22	Introduction, Origin of the Earth	1.1–1.5	
8/23	Earth's domains	1.6–1.8	
8/24	*Lab 1: Determining Plate Boundaries*		
8/25	Development of the theory of plate tectonics	2.1–2.4	
8/26	Plate behavior	2.5–2.9	PI↑ H1↑
8/29	Tectonic forces	2.10–2.11	
8/30	Minerals and their characteristics	3.1–3.3	H1↓
8/31	*Lab 2: Minerals*		
9/1	Classes of minerals	3.4–3.5	
9/2	Project I work day		H2↑
9/5	Igneous settings	Ch. 4	
9/6	Volcanoes and lava	5.1–5.4	H2↓
9/7	*Lab 3: Understanding topographic maps*		
9/8	Eruptional Hazards	5.5–5.8	
9/9	Weathering and sediments	6.1–6.2	H3↑
9/12	Chemical and biological sediments	6.2	PII↑
9/13	Diagenesis and sedimentary structures	6.3–6.5	H3↓
9/14	*Lab 4: Rocks*		
9/15	Project II work day		PI↓
9/16	Metamorphic environments	7.1–7.2	
9/19–9/20	**break** (4-day weekend)		
9/21	*Lab 5: Interpreting topographic maps*		
9/22	Types of metamorphic rocks; metamorphic facies	7.3–7.4	
9/23	Project II work day		H4↑
9/26	Earthquake tectonic settings	8.1–8.2	
9/27	Earthquake energy and motion	8.3–8.6	H4↓
9/28	*Lab 6: Rock weathering*		
9/29	Earthquake hazards and solutions	8.7–8.8	PIII↑
9/30	Geophysical measurements	Int. D	H5↑
10/3	Orogeny and mountains	9.1–9.5	PII↓
10/4	Constructing the craton	9.6–9.7	H5↓
10/5	*Lab 7: Earthquake data*		
10/6	Deep time and Steno's rules	10.1–10.3	
10/7	Project III WD		H6↑

Day	Topic	Reading	Assignments*
10/10	Correlation, geologic column, and unconformities	10.4–10.6	
10/11	Dating and Earth milestones	10.7–11.6	H6↓
10/12	*Lab 8: Modeling geologic maps*		
10/13	Assembling the continents		
10/14	Project III work day		
10/17–10/18	**break** (4-day weekend)		
10/19	*Lab 9: Interpreting geological maps*		
10/20	Fossil fuel resources	12.1–12.3	
10/21	Extracting fossil fuels	12.4–12.6	H7↑ PIV↑
10/24	Ores, mining, and processing	12.7–12.11	
10/25	Project IV work day		H7↓ PIII↓
10/26	*Lab 10: Stream flow*		
10/27	Mass wasting	Ch. 13	
10/28	Stream processes	145.1–14.2	H8↑ PV↑
10/31	Stream transport and sedimentation	14.3	
11/1	Fluvial landscapes and profiles	14.5–14.5	H8↓
11/2	*Lab 11: Stream landscapes*		
11/3	Flooding	14.6	
11/4	Humans and rivers	14.7	H9↑
11/7	Project V work day		PIV↓
11/8	Sea coast and structures	15.1–15.6	H9↓
11/9	*Lab 12: Limestone water facility*		
11/10	Coastal influences	15.7–15.8	
11/11	Ground water	16.1–16.6	H10↑ PVI↑
11/14	Caves and karst	16.7	
11/15	Wind and deserts	Ch.17	H10↓
11/16	*Lab 13: Ground water*		
11/17	Project VI work day		PV↓
11/18	Glacial ice	18.1–18.2	
11/19–11/27	**Thanksgiving break**		
11/28	Glacial processes	18.2	H11↑
11/29	Glacial deposits		
11/30	*Lab 14: Desert landforms*		
12/1	Alpine glacial landscapes	18.3	H11↓
12/2	Continental glacial landscapes	18.4	

Day	Topic	Reading	Assignments*
12/5	Milankovich cycles, deep freeze episodes	18.6–18.7	
12/6	Project VI WD		
12/7	*Lab 15. Glacial landforms*		
12/8			PVI↓
12/9			
Midterm week			**Midterm parts 1 & 2**