

# Physical Geology, Syllabus 2023

Class MWF 9:15-10:20, Olin 332, labs W 1:50-4:45, Olin 332

*"Facts are stubborn things; and whatever may be our wishes, our inclinations, or the dictates of our passions, they cannot alter the state of facts and evidence." - John Adams*

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Text: [Physical Geology](#), Karla Panchuk and Steven Earle, and [Physical Geology](#), by Earle

Date		Week	Labs	Topic
Mar	27	1	Lab 1	Introduction
	29			Structure of the Earth, plate tectonics introduction
	31			Plate tectonics - forming magmas and igneous rocks
Apr	3	2	Lab 2	Plate tectonics - sea-floor spreading
	5			Plate tectonics - subduction zones
	7			Subduction zones, volcanoes, and volcanic eruptions
	10	3	Lab 3	Folds and faults
	12			Geologic time - relative age relationships
	14			Geologic time - absolute age relationships
	17	4	Lab 4	Geologic time - using both absolute and relative ages
	19			The Earth's climate - climate zones, climate controls
	21			Weathering and sediments
	24	5	Lab 5	Erosion on hill slopes
	26			Running water - moving sediment and dissolved material
	28			Running water - floods and related deposits
May	1	6	Lab 6	Mid-term exam
	3			Sedimentary rocks, origin and characteristics
	5			Ground water - concepts of ground water flow
	8	7	Lab 7	Ground water - storage and flow
	10			Oceans - shoreline processes
	12			Steinmetz
	15	8	Lab 8	Oceans - shoreline advance and retreat
	17			Oceans - open ocean currents, shallow and deep
	19			Deserts of sand, rock, and ice
	22	9	Lab 9	Evidence for climate change
	24			Deducing long-term climate from sedimentary rocks
	26			Glaciers and ice ages
	29	10	Lab 10	Anatomy and dynamics of glaciers
31	Topographic features, flood, landslide hazards			
June	2			Geologic hazards
Final exam				

Topics are subject to change, naturally.

## General notes

This course has 30 lecture classes and 10 labs, with one lab section. Nexus, Union's "learning management system," will be the center for course materials that will include backups of all class handouts, PowerPoint materials presented in-class, with captions, and links to any videos.

## Course objectives

In this course you will learn about geologic materials (e.g., minerals, rocks, water, air) and processes (e.g., erosion, plate tectonics, climate change, volcanism). Through labs and other activities, you will gather and examine evidence, and evaluate it to reach geologically plausible conclusions. You will practice technical writing, and several ways to graphically communicate the results of your work.

## Geosciences at Union College

In its most basic form, the geosciences involve the study of the solid earth. Geology had its beginnings in early attempts to understand the origin and nature of mineral deposits and associated rocks, and later evolved into the study of the distribution of rock types over Earth's surface (geologic mapping), and study of geologic processes. The geosciences now comprise broad field that incorporates aspects of:

Recorded history	Physics	Mathematics	Inorganic chemistry	Environment
Astronomy	Water resources	Paleoclimate	Organic chemistry	Computer models
Paleobiology	Economics	Oceanography	Land use planning	Global warming
Environment	Microbiology	Engineering	Resource management	Biology
Law	Politics	Public policy	Ecology	Other planets

No single geosciences branch includes all of these fields, but the field is diverse, with broad public appeal, practical applications, and scientific challenge. The geosciences are also active fields, with new things happening every day. Because of its diversity and direct application to modern events, the geosciences are always new and exciting.

The Geosciences Department has [advanced instrumentation and equipment](#) that rivals some graduate schools. We strive for excellence in research and teaching, and in covering all the fundamental aspects of the modern geosciences. We offer a full range of instruction that includes a variety of introductory (1xx level, no prerequisites) and upper-level courses, experiences abroad, and summer field and lab work. Many geoscience majors do research with one of the faculty, which is great preparation for graduate school or professional work.

## Opportunities in the Geosciences

[Employment](#) in the geosciences is available at many levels, fields, and geographic areas. Employers traditionally include mining and petroleum companies, but also federal, state, and local government agencies, environmental consulting and engineering firms, schools at all levels, software development, and even banks, insurance, and real estate companies. Employment prospects overall are good.

Understanding the origins and physical systems of the Earth, oceans, and atmosphere, and those of other solid bodies in our solar system, are the ultimate goals of the earth sciences. Dwindling mineral and water resources in many areas, future energy and mineral resources, pressing environmental issues, land use planning, waste disposal, and the dynamics of weather and climate and their effect on people, are all modern challenges. The geosciences are directly applicable to solutions for those problems. That's what makes the geosciences the most exciting scientific field.

## Labs

There will be 9 formal lab exercises. The 10<sup>th</sup> lab will be review for the final exam. Five labs will be out in the field, and will require 2-page write-ups, explained during the lab. These should concisely describe what you did, how you did it, your results, and your interpretation of the results in terms of the posed geologic questions. Labs will start indoors, and will start moving outdoors when the weather warms up, the ground dries out, and stream water levels fall to manageable levels.

All such write-ups must be submitted on the Nexus system *by the Saturday noon following the lab. Submitted labs must be a single PDF file, with your last name at the beginning of the file name.* Figures and tables included in the file must be legible, complete, *labeled and numbered as figures and tables, and cited as evidence supporting your conclusions.* Completing and understanding the readings will help you finish the labs with a minimum of fuss.

→ **File submissions must be a single pdf document!**

→ **File names must start with your last name!**

## Tests

There will be mid-term and final exams. Exams will be closed book and closed notes, and will contain mostly short answer questions, many related to illustrations given in the exam ([a copy of an old final exam is on Nexus and the Physical Geology web site to give you an idea of the format](#)). The exams will cover material from lectures, labs, and the textbook. As per *Union College policy*, failure to complete a scheduled exam will result in failure of the exam (contact [me](#) and the [Dean of Students](#) office if extraordinary circumstances force you to miss an exam).

## Work handed in must be your own

All work handed in (lab reports, exams, comments on readings) must be your own, not copied from anyone's previous or current work. You certainly may and are encouraged to work with one another in small groups, but prepare all of your own text, illustrations, and tables yourself. See Academic Misconduct below.

## Readings

There will be two kinds of readings. The first will be readings from the textbook, with chapters closely following the lecture material. All of these are required. The second reading type will be short articles that I've taken from the popular scientific literature during the past two years. They are all about contemporary geoscience issues, mostly about how those issues affect people. One of those readings will be required, and other listed ones will be completely optional. The optional ones are *completely* optional, without grades, tracking, or exam questions. Read them if they look interesting. P.S. They are all interesting.

All of the required readings will be accessed through the Perusall system. For each assigned reading you will be asked to make a particular (minimum) number of comments, questions, or answers to questions. These comments etc. will be graded by the Perusall "AI" system, but I will also look through your comments at the end of the term, and adjust the Perusall scores as appropriate. On Nexus is a document that explains how Perusall works, or you can find similar information elsewhere.

## Text readings

This is a list of the textbook readings, and the weeks that they will be assigned. I give them here in case you want to read ahead, but remember all will require you to add comments via the Perusall system. Those specific assignments will be added to Nexus each week. What do you need to take away from the readings? At the very least you should understand what the

illustrations are showing, and why they are showing it. Don't worry that the chapters aren't in sequence. Each chapter, except for the first few, are pretty self-contained.

Week	Chapters
1	1, 2, 7
2	3, 4, 5
3	10, 12, 13
4	6, 11, 19
5	8, 15
6	9, 14
7	14-5
8	17-5, 18-5
9	16
10	17
11	18

### Grades

The exams will receive 0-100 numerical scores and letter grades. Other assignments, such as lab write-ups, will be scored on a 0 to 5 scale. This scale translates to letter grades approximately as follows: 5 =A, 4 ~B+, 3 ~B-, 2 ~C, 1 ~F. Your final grade for the course will be based on your cumulative numerical scores. Note that even letter grades of 'F' will help if the number score is >0. *Nothing averages worse than a zero, so always turn in something!* The final grade will be calculated approximately on the following basis:

Labs (9)	47%
Mid-term exam	20%
Final exam	25%
Textbook Perusall scores	5%
Other reading Perusall scores	3%
Total points	100%

### Library

The [Schaffer Library](#) receives many excellent geoscience journals, many available on-line. [Geology](#) is a monthly journal that specializes in short, 3 to 5 page, well-written papers from a wide variety of geological subjects. Most geological books are cataloged under QE, in the Schaffer library basement, except for big ones which are in the q stacks upstairs. The library also has access to a wide variety of on-line reference search databases specializing in the sciences.

### Reading, class attendance, turning in work

All students are expected to attend all classes and labs. If attendance is impossible for some reason, materials will be made available on-line, so you will still be responsible for all work (readings, labs, tests), on which your grade will be based. Lab assignments will be due Saturday noon the same week each lab takes place. *Can't turn it in by then? Get it in earlier!* If you have to miss a class, quiz, exam, or lab for some valid reason (e.g., you being quarantined), let [me](#) and the [Dean of Students](#) office know beforehand to make alternative arrangements. I can't make arrangements after the fact without a valid excuse through the [Dean of Students](#) office. Sorry folks, just following College policy.

This not a fast-paced or particularly difficult course, but it is a fast-paced 10-week term. Because of that, late work will generally not be accepted, except as recommended by Deans. Get work in on time!

Specifics for medical issues: If you have to or have missed or may miss a class, lab, or homework deadline because of illness, go to the Wicker Wellness Center, or send them the relevant medical documentation (fax to 518-388-6147, email to [uchealthcenter@union.edu](mailto:uchealthcenter@union.edu), web site: <https://www.union.edu/health-services>). The Wellness Center will make an evaluation. They may or may not send that information on to the Dean of Students, with your permission, but if you are sick you should certainly see someone. Try not to get sick.

### **Extra help**

For extra help there is always me, of course. Office hour times are listed above, and I can make Zoom or in-person appointments. I can even schedule weekly or more frequent regular appointments to give extra help to individuals or small groups. Also, feel free to drop in to my office for help to see if I'm available. Geoscience majors may be hanging out on the 3<sup>rd</sup> floor of Olin, especially Olin 322. They are mostly harmless and can be quite helpful.

### **Union-recommended on-line classes boilerplate**

*"If you are quarantined or isolated for COVID-19-related reasons, I will be notified by the Dean of Students Office that you may require flexibility with regard to your participation in this course. Your responsibility will be to contact me as soon as you are able so that we can discuss your needs. If you are not able to keep up with the course in real time, I will make arrangements to provide you with full course material missed from classes."*

In addition, all materials will routinely be available on Nexus and/or the class web site, and all Zoom classes and labs, if we have any, will be recorded and available. That means you can be away or out of touch for a while, and still turn in the work. Do so.

### **Learning or other disabilities**

From the Union College Student Handbook: *"Students seeking reasonable accommodations should be aware that it is their responsibility to...request accommodations from the Director [of Student Support Services] in person with at least two (2) weeks notice of the accommodation needed."* Contact them directly: [Accommodative Services Office](#), 518-388-8785, [harrings@union.edu](mailto:harrings@union.edu). No accommodations can be provided without a letter or card from the [Accommodative Services Office](#). You talk the them, they will notify me. You should also talk to me, too, to make sure I am aware of (or remember) the issue so we can arrange things appropriately.

### **Academic misconduct**

You will sometimes work in small groups, and are encouraged to do so, but *all work that you hand in must be your own!* No copying or otherwise duplicating lab reports or computer-generated figures. No giving or accepting access to old course materials. This and all other forms of plagiarism, cheating, destruction of resource materials, and other forms of academic dishonesty will be referred immediately to the [Dean of Studies](#), as per *Union College policy*.

We have an [Honor Code](#) at Union College. Here is the "[model statement](#)" that I have been asked to place right here in this very spot, just for you:

*"Union College recognizes the need to create an environment of mutual trust as part of its educational mission. Responsible participation in an academic community requires respect for and acknowledgement of the thoughts and work of others, whether expressed in the present or in some distant time and place. Matriculation at the College is taken to signify implicit agreement*

*with the Academic Honor Code, available at [honorcode.union.edu](http://honorcode.union.edu). It is each student's responsibility to ensure that submitted work is his or her own and does not involve any form of academic misconduct. Students are expected to ask their course instructors for clarification regarding, but not limited to, collaboration, citations, and plagiarism. Ignorance is not an excuse for breaching academic integrity. Students are also required to affix the full Honor Code Affirmation, or the following shortened version, on each item of coursework submitted for grading: 'I affirm that I have carried out my academic endeavors with full academic honesty.'*

*Signed*

*Whoever you are*

Note that, if you forget to "...affix the full Honor Code Affirmation, or this shortened version, on each item of coursework submitted for grading: "I affirm that I have carried out my academic endeavors with full academic honesty. ", I will assume that you meant to.