ERTH2404 for Term Winter 2026

ENGINEERING GEOSCIENCE

We, the people of the Faculty of Science at Carleton University, acknowledge that our campus is located on the traditional, unceded territories of the Algonquin Anishinabeg people. Miigwetch for your hospitality and stewardship of this territory and the teachings that come from it. We are grateful for this land, the air that we breathe, and the water that sustains us all as well as for the animals, plants and other living beings: these enable us to research, teach, mentor, support, study, and learn. We recognize our responsibility to our natural environment and to reconciliation with Indigenous peoples.

Course Instructor: Dr. Maurice Lamontagne

How to address me: Professor Lamontagne

Gender Pronouns: (he/him/his)

Email: mauricelamontagne@cunet.carleton.ca

Note: If you have or question or would like to talk with me, you can send an email or approach me before or after lecture.

Best Ways to be in Touch: in class, via email

Student Hours: N/A

Office Location: None

Class Location: Southam Hall Theatre B (THB SH)

Class Times: Fridays from 08:35 to 11:25 a.m.

Prerequisites: None

Preclusions: None

Department/Unit: Earth Sciences

Lab Coordinator: Dr. Geoff Pignotta

How to address me: Geoff

Gender Pronouns: (he/him/his)

Email: geoffpignotta@cunet.carleton.ca

Best Ways to be in Touch: via email

Student Hours: N/A

Office Location: HP 2102

Department/Unit: Earth Sciences

Course TAs:
Lab TA Information will be posted on Brightspace.

Topics Covered and Learning Outcomes

Why should future professionals want to take a course in Earth Science? Here's why: many aspects of your future profession are connected in some way to the physical Earth; its lands, oceans, atmosphere, plants and animals. In addition, the materials used for our homes and offices, the clothes that we wear, cellphones and computers, our sources of energy, our drinking water, the air that we breathe, and the food that we eat, are all in some way derived from our planet.

The Earth Sciences offer an integrated and interdisciplinary approach to understanding Earth, and apply knowledge from biology, chemistry, physics, ecology, mathematics and computer science to tackle complex issues. If we wish to maintain and improve the quality of life on Earth, as its population exceeds 8 billion people, then we are required to understand and appreciate the complex processes that control our planet.

Earth Science benefits everyone! Understanding Earth Science empowers you to think globally and act locally. Only if you understand the Earth system can you make informed decisions about issues that impact our daily lives.

This course may help you apply geological knowledge to engineering problems: in the designing and locating reservoirs; in integrating of geological factors important in slope stability for construction purposes; and in considering geohazards such as earthquakes, floods, mass movements, volcanic activity or subsidence in areas considered for roads, pipelines, or other engineering works.

This course will provide you with an overview of the Earth system, mostly the solid part of our planet. We will discuss the origin of the Solar System; the inner layers of the Earth; geologic time and radiometric dating of rocks and minerals; how minerals and rocks form; the theory of plate tectonics; rocks, including the major igneous, sedimentary and metamorphic rock types; the physical properties of the Earth, including magnetism, earth resources, including water, metals, and energy, and potential resources of the future. As often as possible, we will illustrate each process with field examples and will relate it to the geology of Canada. In each section, we will examine how this knowledge affects engineering projects using historical cases.

Topics to be Covered in the Lectures

All course material will be provided through Brightspace. This includes lecture notes, quizzes, announcements (announcements will also be emailed) and marks. For problems with Brightspace, go to: https://carleton.ca/brightspace/

Lecture	Date	Topic	Chapter(s) in Kehew
1	Jan. 9	Introduction; Geological Time	1, 2
2	Jan. 16	Minerals; Igneous Rocks	3, 4
3	Jan. 23	Sedimentary and Metamorphic Rocks	5, 6
4	Jan. 30	Plate Tectonics	2
5	Feb. 6	Earthquakes and Engineering Seismology	8
6	Feb. 13	Volcanic Hazards; Structures (faults, folds)	4, 8
	Feb. 20	No class Winter Break (Feb 16-20)	
Midterm ------- 7	Feb 27 08:35-10:05 10:10-11:25	Mid-term (on Lectures 1-6) ---------- Weathering of geological materials	 9
8	March 6	Soils; Erosion	10, 9
9	March 13	Rivers; Oceans; Glacial Processes	9, 11
10	March 20	Rock Mechanics; Mass Movement	7, 13
11	March 27	Groundwater; Earth Resources	11, 1
12	April 3	Geomagnetic Hazards; Geophysical Methods; Geological Impacts of Climate Change	1

Laboratories

Week	Date	Topic	Lab Weight
1	**01/5-01/9**	**No Labs**	
2	01/12-01/16	Physical Mineralogy	1.25
3	01/19-01/23	Igneous Rocks	1.25
4	01/26-01/30	Sedimentary Rocks	1.25
5	02/02-02/06	Metamorphic Rocks	1.25
6	**02/09-02/13**	**LAB PRACTICAL EXAM**	**15**
7	**02/16-02/20**	***Winter Break***	
8	02/23-02/27	Topographic Maps and Aerial Imagery	3.33
9	03/02-03/06	Geologic Structures and Geologic Maps	3.33
10	03/09-03/13	Plate Tectonics	3.33
11	03/16-03/20	Earthquakes and Earthquake Hazards	3.33
12	03/23-03/27	Soils and Soil Mechanics	3.33
13	03/30-04/03	Water Resources	3.33

Please note that there is no lab on the first week of the term. TA's will maintain lab attendance and grades will be posted on Brightspace. Switching lab times is not permitted without permission of the lab coordinator. Permission to switch labs must be arranged **in advance** if possible. If this is not possible contact regarding a deferral must be made within **24 hours** of the lab time.

Please direct your lab questions to Dr. Geoff Pignotta: geoffpignotta@cunet.carleton.ca

Lab sections

Section	Day and Time	Location
L1	Tuesday 14:35 – 17:25	**HP 2110**
L2	Tuesday 11:35 – 14:25	
L3	Thursday 14:35 – 17:25	
L4	Tuesday 8:35 – 11:25	
L5	Tuesday 18:05 – 20:55	
L6	Wednesday 18:05 – 20:55	
L7	Wednesday 8:35 – 11:25	
L8	Thursday 18:05 – 20:55	
L9	Monday 18:05 – 20:55	
L10	Thursday 11:35 – 14:25	

Important dates and deadlines can be found here: https://calendar.carleton.ca/academicyear/, including class suspension for fall, winter breaks, and statutory holidays.

Course level learning outcomes:

1. Explain the different properties of earth minerals and rocks.
2. Understand global and local geological processes.
3. Relate how geological structures and processes influence engineering design.
4. Describe the geologic processes that create natural hazards and risks.
5. Explain the impact of geological processes on people, infrastructure, and engineering design.
6. Outline the engineering strategies that can mitigate the impact of geohazards.

Assessments

Please note that the passing mark is 50% and is based on the total of exams, quizzes and labs as shown below.

Grade Breakdown

COMPONENT	GRADE VALUE	COMMENT
LECTURE MIDTERM	27.5 %	Covers Lecture 1 to 6. In class, multiple-choice, eProc with CoMaS No material allowed
FINAL EXAM	27.5 %	Covers Lectures 7 to 12 In person, multiple-choice, eProc with CoMaS No material allowed
LECTURE QUIZZES	5 %	Up to 10 on-line quizzes covering material of the lecture of the week. To be completed before following lecture. They provide a good opportunity to keep on top of the material before the exams.
LAB WORK (EXERCISES + EXAM)	40 %	See above for mark distribution
TOTAL	100 %	

Although the mid-term and final exams will be written in person, please note that the lecture examinations in this course will use a **remote proctoring service** provided by Scheduling and Examination Services. You can find more information at https://carleton.ca/ses/e-proctoring/.

Exams are closed books, no material allowed. Students must have a computer. It is your responsibility to install CoMaS and to ensure that it works. Instructions will be sent to you one week prior to the exams.

Late and Missed Work Policies

Conflicts with Course Requirements:

Students with conflicts for ANY course requirement (lab, quiz, exam, etc.) due to illness or otherwise MUST be reported to the instructor PRIOR to the due date when possible. If this is not possible contact regarding a deferral must be made within 24 hours of the deadline.

Missed exam

Students who missed the mid-term or the final exam for a medical or other important reason must contact Maurice Lamontagne as soon as possible (within 2 days). Arrangements will be made for the student to do the exam at a later date.

The policy for deferring a final exam is the same as Conflicts with Course Requirements above. With the exception that you must follow the instructions on the Registrar's website for Deferred Exams which can be found here: https://carleton.ca/registrar/deferral/ .

Learning Material(s) and Other Course/Lab-Related Resources

Students are not required to purchase a textbook or other learning materials for lecture portion of this course. Please note that most geological concepts are described in introductory manuals on geology. Often, a few days before lectures, students are asked to watch a few short on-line videos that introduce the topic covered in the upcoming lecture.

The textbook below used to be suggested for this course. It is out-of-print and consequently, not mandatory. The textbook is available in the library.

> Kehew, Alan E. 2006. Geology for Engineers & Environmental Scientists. 3rd Edition. Prentice Hall.

There is a ***required*** lab manual for the course. You can order it online at the Science Stores website: https://science.carleton.ca/science-stores/#undergraduate. Science Stores is located at Steacie 118. You will need the lab manual in hand for the first lab of the term, Lab 1 – Physical Mineralogy.

Academic Accommodations and Regulations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The

accommodation request processes are outlined on the Academic Accommodations website (https://students.carleton.ca/course-outline/).

Statement on Chat GPT/Generative AI usage (See the *Sample Syllabus Statements for AI use in Courses* document for examples)

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Statement on Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools such as ChatGPT when your assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in Carleton University's Academic Integrity Policy. A list of standard sanctions in the Faculty of Science can be found here.

Additional details about this process can be found on the Faculty of Science Academic Integrity website.

Students are expected to familiarize themselves with and abide by Carleton University's Academic Integrity Policy.

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Student Concerns

If a concern arises regarding this course, **your first point of contact is me**: mauricelamontagne@cunet.carleton.ca and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):

Note: You can also bring your concerns to Ombuds services.