

ERTH 3405 [0.5 credit], Fall 2026

Geophysical Methods: An introduction to the tools of applied geophysics including seismology, electrical, magnetic, and gravitational surveying methods. Lecture two hours a week, and a laboratory three hours a week. Most labs are computer-based geophysical practices to enhance their knowledge of modern and computer-based geophysical methods. Students will use geophysical software which comes with the textbook.

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, including information about the *Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances*, are outlined on the Academic Accommodations website (students.carleton.ca/course-outline).

Course Instructor: Dariush Motazedian

Email: dariush.motazedian@carleton.ca

Student Hours: Mondays 11:30-12:30, my office

Office Location: Room 2169 HP Building

Class Location: Please check Carleton Central for the room location.

Class Times: Wednesdays, 9:35-11:25

Lab Times: Thursdays, 8:35-11:25

Prerequisites: EARTH 2105 or permission of the Department

Preclusions: None

Department/Unit: Earth Sciences

Important Notes:

- Students must pass the lab component of the course in order to pass the course and to be eligible to write the final exam.
- Students must pass the final exam in order to pass the course.
- Reading assignments are mandatory.
- Students are responsible for regularly reviewing the course outline for lecture topics, reading assignments, laboratory topics, pre-lab review material, and homework.
- Students should regularly check the Brightspace course website for announcements, course information, laboratory assignments, and lecture materials.
- All lectures, labs, quizzes, and exams are held in person unless otherwise announced.
- Short quizzes will be held during lectures.
- The first lab will take place after the second lecture. Students must bring a laptop with wireless internet access to the first lab.
- Lab exercises will be posted on Brightspace.

Topics to be Covered (Tentative Order)

The pace of instruction will be adjusted according to **students' background**, progress, and learning needs.

- **Introduction to geophysics:** definitions and scope; the use of physical measurements to determine the subsurface properties of the Earth.
- **Seismic surveying:** stress and strain; seismic waves; reflection and refraction of seismic waves; critical refraction; rays and waves; seismic sources and detectors; ray-path geometry for horizontal, dipping, and undulating layers; and data interpretation.
- **Electrical surveying:** resistivity of rocks; electrode arrays; current flow in the ground; resistivity sounding; and resistivity profiling.
- **Gravity surveying:** basic theory, instrumentation, and anomaly interpretation.
- **Magnetic surveying:** basic theory, rock magnetism, Earth's magnetic field, instrumentation, and anomaly interpretation.

Important dates and deadlines can be found here:

<https://carleton.ca/registrar/registration/dates/academic-dates/>, including class suspension for fall, winter breaks, and statutory holidays.

Course-Level Learning Outcomes

- **Geophysical methods:** explain the applications, strengths, and limitations of major geophysical surveying methods, including seismic, electrical, magnetic, and gravity methods. [Understanding, Analyzing, Evaluating]
- **Computer-based analysis:** analyze, interpret, and model geophysical data using appropriate computer-based methods and software. [Applying, Analyzing, Evaluating]
- **Seismic surveying:** explain seismic surveying tasks and analyze, interpret, and model seismic observations. [Applying, Analyzing, Evaluating]
- **Electrical and magnetic surveying:** explain, analyze, and interpret electrical and magnetic surveying data. [Applying, Analyzing, Evaluating]
- **Gravity surveying:** apply, interpret, and model gravity data for near-surface surveying. [Applying, Analyzing, Evaluating]

Assessments: Grade Breakdown

Component	Grade value	Date
Labs	25%	Every week
Quizzes	10%	During lectures
Midterm	25%	TBA
Final	40%	TBA

Late and Missed Work Policies

Late Work

Students are responsible for attending classes and labs prepared and for submitting lab work by

the assigned deadline. Late lab submissions may be accepted only in cases of illness or emergency, and students must consult with their TAs and instructor as soon as possible.

Missed Work

Students who are ill, unable to attend an exam, or unable to meet an assignment deadline must contact the TAs and instructor immediately. The student, TAs and/or instructor will determine an appropriate arrangement for completing missed course components. If an illness extends over a longer period and an exam is missed, the instructor or TA may arrange an accommodation, such as adding the missed midterm component to the final exam or another appropriate alternative.

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

Course Textbook; Exploration geophysics of the shallow subsurface / H. Robert Burger. c1992. Last year price around \$108.00

Note: Books were ordered at the bookstore. You may also buy a used one from Haven Books, 43 Seneca St, Ottawa (613) 730-9888.

Academic Accommodations and Regulations

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AI Use Policy

Students may use AI tools only for basic word-processing support, such as grammar and spell checking (e.g., Grammarly, Microsoft Word Editor, Copilot). Documentation is not required for these permitted uses. For any other AI use, consult your instructor first.

This policy keeps students' own voices and ideas central to their work while supporting clarity, correctness, layout, and flow.

AI may not be used for:

- Completing lab assignments during scheduled lab time. If a student misses a lab and the TA agrees to provide support, the student should complete the lab during the next session while the TA is present.
- Quizzes
- Exams

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 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**: Email or drop in during student hours 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.

