Introduction to Applied Geophysics Syllabus

Department of Earth and Environmental Sciences

ERTH/PHYC 2270 Winter 2026

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada.

We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Christiane Zoghbi	christiane.zoghbi@dal.ca	T, R 9:00 to 11:00 a.m. LSC 3085 (Biology Wing)
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Course Description

An introduction to using physical principles to explore the Earth's subsurface, with an emphasis on near-surface applications. Topics include seismic, gravity, magnetic, electrical, and electromagnetic surveying techniques, and some examples of their applications. The geophysics field school, normally conducted during the last week of April, is an integral part of this course.

Course Prerequisites

ERTH 1080.03 or (SCIE 1506.03/SCIE 1507.03) and MATH 1000.03 and (PHYC 1190.03/ PHYC 1290.03 or PHYC 1310.03/PHYC 1320.03 X/Y)

Student Resources

The instructor and teaching assistant will be available during their office hours to discuss any questions regarding the laboratory sessions. Office hours and contact details will be shared with students on Brightspace.

Course Structure

Course Delivery

In-person. For extended absences, contact the instructor and the Associate Dean of Science.

Lectures

M, W 11:35-12:55 am Studley LSC-COMMON AREA C212

Laboratories

T 11:35-12:25 am Studley LSC-BIOL&EARTH B2012

Course Materials

- **Textbook:** Burger, Robert, E., Sheenean, Anne F. and Jones, Craig, H., Introduction to Applied Geophysics; Exploring the Shallow Subsurface, W. W. Norton & Company, New York - London, 2006 version or 2024 version. The textbook is **required**. It is accompanied by a CD, which contains mandatory software in this course (for labs, assignments, and exams).
  The textbook is accessible via Dal Bookstore.
- The course syllabus, discussions, slides, laboratory instructions, announcements, assignments, out-of-text readings, and other pertinent information will be on the course Brightspace site. You are expected to check this site regularly.
- Computer Usage:
  Students will use their personal computers to solve computational problems handed out as part of their assignments.

Assessment

Semester grades are based on:

Component	Weight (% of final grade)	Due Date (2026)
Midterm exam (70 minutes)	20	February 25
Assignments (5)	30	See table below
Lab Attendance & Participation	5	Ongoing
In-class Attendance & Participation	10	Ongoing
Field experiment report (April)	10	April 27 - 30 (tentative)
Final exam (2h)	25	Final Exam Period

Assignments

There will be a total of five assignments during the semester. For each assignment, students must submit a professionally written document to Brightspace.

	Assignment Date (2026)	***Due Date (2026)***
Assignment 1	*January 20*	*January 27*
Assignment 2	*February 3*	*February 10*
Assignment 3	*March 3*	*March 10*
Assignment 4	*March 17*	*March 24*
Assignment 5	*March 31*	*April 7*

Lab schedule

Attendance at lab sessions is **mandatory** and contributes **5% to the final grade**. The labs are designed to reinforce course content and will include problem-solving activities, software applications, and dedicated Q&A sessions prior to the midterm and final exams. The lab component provides an excellent opportunity to **practice the theory presented in class** and to prepare effectively for completing the course assignments.

	Date (2026)		***Date (2026)***
Lab 1	*January 20*	*Lab 5*	*March 3*
Lab 2	*January 27*	*Lab 6*	*March 10*
Lab 3	*February 3*	*Lab 7*	*March 17*
Lab 4	*February 10*	*Lab 8*	*March 24*
Q&A 1	*February 24*	*Q&A 2*	*March 31*

Midterm exam

The midterm exam weighs 20% of the final grade. It will be held on **Wednesday, February 25** in class (duration: 70 minutes).

Final exam

The final exam weighs 25% of the total grade. It will take place during the **final exam period.**

Other course requirements

Participation will be assessed based on your regular attendance and active engagement in class and lab activities. This may include responding to multiple-choice questions during class, uploading problem solutions to Brightspace, or contributing to discussion forums on Brightspace.

Conversion of numerical grades to final letter grades follows the Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

1. Lab reports and/or assignments submitted late and without an approved extension will be deducted 10% per day.
2. Extensions for lab reports and/or assignments are granted for exceptional circumstances, using the Student Declaration of Absence Form. SDAs must be uploaded to Brightspace 24 hours before the assignment or exam due. The Student Declaration of Absence Form may be used two times this semester.
3. Missed lab reports and/or assignments: if you do not complete a lab reports and/or assignment and do not submit a Student Declaration of Absence form, your mark on the assignment is zero.
4. There will be no make-up midterm; if you miss your midterm due to illness, family emergency, or other acceptable reason, the final exam will have a higher value (45%).
5. A make-up date will be scheduled for the final exam. As per University regulations, you may only write the make-up exam under exceptional circumstances:
   "A student requesting an alternative time for a final examination will be granted that request only in exceptional circumstances. Such circumstances include illness (with a medical certificate) or other mitigating circumstances outside the student's control, including technology failure in the case of online examinations." For the full text, refer to the Undergraduate Academic Calendar 2025/2026: Policy for the Scheduling of Courses/Examinations

Course Policies related to Academic Integrity

Feel free to use AI-driven tool to assist you in learning but remember that the objective is for you to acquire these competencies and outcomes in this course. You are responsible for all work that you produce, whether assisted by an AI-driven tool or not. You must acknowledge all tools used to assist you. If applicable, you must provide links to chat logs. If the work that you produce is suspected to misrepresent your own competencies, you may be asked to complete a supplemental assessment to evaluate your mastery of course outcomes.

Learning Objectives

Following active participation in this course you will be able to:

1. **Understand** the underlying physical and mathematical principles of commonly used geophysical survey techniques
2. **Understand** the methods of seismic refraction, seismic reflection, electrical resistivity, gravity, magnetics, and electromagnetic methods as well as their respective strengths and limitations.

3. **Identify** the most appropriate geophysical technique(s) for addressing specific applied problems in the shallow crust, where most near-surface exploratory work is conducted.
4. **Process and interpret** geophysical data using appropriate software tools to address applied geological, environmental, and engineering problems in near-surface settings.

Course Content

Week	Date	Lesson Topic(s)	Reading	Assessment	Lab
1	Jan 5-9	About the course Approaching the Subsurface	Ch. 1		
2	Jan 12-16	Seismic Exploration: Fundamental Considerations	Ch. 2		
3	Jan 19-23	Seismic Exploration: Fundamental Considerations	Ch. 2	Assignment 1	Lab 1
4	Jan 26-30	Seismic Exploration: The Refraction Method	Ch. 3		Lab 2
5	Feb 2-6	Seismic Exploration: The Refraction Method	Ch. 4	Assignment 2	Lab 3
6	Feb 9-13	Seismic Exploration: The Reflection Method	Ch. 4		Lab 4
	STUDY BREAK				
7	Feb 23-27	**MIDTERM**			
8	Mar 2-6	Electrical Resistivity	Ch. 5	Assignment 3	Lab 5
9	Mar 9-13	Electrical Resistivity	Ch. 5		Lab 6
10	Mar 16-20	Exploration Using Gravity	Ch. 6	Assignment 4	Lab 7
11	Mar 23-27	Exploration Using Gravity	Ch. 6		Lab 8
12	Mar 30 -Apr 3	Exploration Using the Magnetic Method	Ch. 7	Assignment 5	
13	Apr 6 & 7	Exploration Using the Magnetic Method	Ch. 7		

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding Mi'kmaq and Indigenous Relations (including the Elders in Residence program, Land Acknowledgements, Understanding Our Roots, and much more) can be found at: https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about/mission-vision-values/global-relations.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/campus_life/ssc.html).

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/content/dam/www/about/leadership-and-governance/governing-bodies/code-student-conduct.pdf

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/fair-dealing-policy.pdf

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.