Earthquakes, Volcanoes, and other Natural Disasters Course Syllabus

Department of Earth and Environmental Sciences

ERTH/GEOG 1060 Winter 2026

Wed & Fri 11:35 – 12:55

Kenneth C Rowe Management Building Auditorium Room 1028 (Potter Auditorium)

Instructor: **John Gosse**	John.Gosse@dal.ca for issues regarding **tests**, **e-textbook, lecture material, or Brightspace**. Please email for appointment time. My office hours are Wed 1:00 to 3:30 pm.
Co-Instructor: **Mike Young**	Mike.Young@dal.ca for questions pertaining to **accessibility/accommodations,** the Google Earth® **Homework Assignments**, and the **Question Sets.** Office hrs 13:30 to 14:30 on Fridays – through Microsoft Teams (direct link in Homework content page on Brightspace). Many questions can be answered by email – please reach out for assistance or appointments outside of office hours.

Each week we will typically introduce the causes and controls of a natural hazard process and discuss how we evaluate and mitigate their magnitude, frequency, and risks. Lectures will be supported by algebra-based Question Sets and the Google Earth®-based Homework Assignments.

Course Description

Earthquakes, meteorite impacts, rapid climate change, volcanic eruptions, hurricanes, landslides, wildfires, solar flares, and floods are natural hazards that affect our economy, public policy, and safety. Where, why, and how frequently do natural disasters occur? Are precise predictions possible? This course, aimed at the non-specialist, investigates these intriguing questions. Excerpts from various media, in conjunction with lectures and discussions, are used to study the causes, consequences and perceptions of natural hazards. Global and Canadian examples of recent and noteworthy disasters are used to assess local risk and track real-time events worldwide. The course will provide a balanced treatment of the subject so science, arts, and professional school undergraduates can gain practical experience and knowledge about how we study natural hazards and attempt to minimize loss of life and property. During the semester you will travel to accompany us on field research on natural hazards around the world.

Google Earth® Software: You will install onto your desktop or laptop **Google Earth Pro on desktop.** Do not use *Google Earth on web* or *Google Earth on mobile versions* of this software because some tools are not available for certain questions. Additionally, it can be difficult to make precise measurements needed for the calculations in the assignments.

University Prerequisites: Open attitude toward science and mathematics.

All course information and activities will be available through Brightspace at Dalhousie University.

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Learning Objectives

Obj 1. The student will explain the triggers, conditions, basic dynamics, and energy sources that drive each natural hazard studied
Condition – Given a geophysical or climatic hazardous process
Behaviour – The student will distinguish the elements of the hazards system and the forces and energy that control magnitude and frequency
Criterion – The student will correctly explain the drivers

Obj 2. The student will know or calculate magnitude, frequency, energy, or recurrence interval for a given hazard
Condition – Given data for a hazardous process
Behaviour – The student will evaluate rates, energies, and probabilities of a given hazard magnitude, including any unit conversions
Criterion – The values calculated will be correct

Obj 3. The student will recall different approaches to monitor natural hazards
Condition – Given a natural hazard
Behaviour – The student will explain current approaches used to obtain information to generate forecasts and predictions for each natural hazard, including hindcasting over thousands of years
Criterion – The student can devise a valid strategy to monitor a hazard

Obj 4. The student will acquire an appreciation for the financial and human risks for each hazard
Condition – Given examples of natural disasters
Behaviour – The student will compare different disasters of given hazard types, will compare the significance of difference hazards, and explore what controls vulnerability to the hazard
Criterion – The student uses specific examples from past natural disasters to appraise how location, wealth, and population density control damage and fatality level for a nation

Obj 5. The student will assess the potential for a natural hazard
Condition – Given a physical address on the planet Earth
Behaviour – The student will consider the probability of any natural hazard or hazardous condition
Criterion – The qualitative assessment will be supported with geological or meteorological, historical, statistical, and modeling evidence

Obj 6. The student will use quantitative approaches for predicting hazard magnitude, frequency, and probability
Condition – Given empirical-based algebraic relationships between hazards and controlling factors
Behaviour – The student will use algebra to establish magnitudes, frequencies, or probabilities of various hazards
Criterion – The student will calculate correct answers in the Question Sets and Homework Assignments

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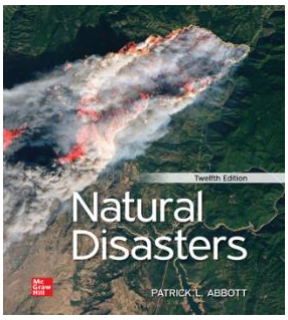
ERTH/GEOG 1060 TEXTBOOK for Winter 2026



Course eBook: *REQUIRED*
Natural Disasters, 12th edition by Patrick Abbott

Best to purchase through Dalhousie's Book Store from this link:
https://bookstore.dal.ca/CourseSearch/?course[]=SUB,202620,ERTH,ERTH1060,01

Important considerations:

1. Edition: Buy or rent the 12th edition *eBook*. It is the most current edition, and in this course, we will refer to examples that are covered in this edition but not in older editions. There are data provided in Tables that have been updated to 2022, and we will often use those data.

2. Is an older edition ok? **No**. There is enough new content (maybe 20%) from the previous edition that you will be missing some important information.

3. Formats: Besides the *eBook*, which enables digital searching, the textbook may be available in bound (soft cover) and loose leaf. Contact the publisher or other vendors to purchase those or other formats.

4. Learning Management Systems: We will be using only **BRIGHTSPACE** for our learning management system. We are *not using* McGraw Hill Higher Education Learning System 'CONNECT'. We are also not implementing any of the Assignment or other tools offered by McGraw Hill, but you may find some other study enhancements the offer to be useful (they are not required).

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ERTH/GEOG 1060 Winter 2026 Syllabus

Topic	Week of	Topic	Reading
Hazard Concepts	Jan 7	Course overview, natural hazard types and perspectives	Ch. 1,2,9
	Jan 9	Natural hazard trends, risk assessments, and controlling factors	
	Jan 14	Deadliest and costliest hazards, and energy sources for natural hazards	
	Jan 16	Models, forecasts, and frequency-magnitude relationships	
Tectonic forces, earthquakes, and volcanic eruptions	Jan 21	Introduction to plate tectonics and faults	Ch. 3,4
	Jan 23	Earthquakes and seismicity	Ch 5
	Jan 28	Paleoseismology and earthquake mitigation	
	Jan 30	Volcanic eruptions	Ch 6,7
	Feb 4	VEI and eruption prediction and mitigation	
	Feb 6	Munroe Day, no lecture	
Tsunamis	Feb 11	Tsunami dynamics, risks	Ch 8
	Feb 13	Tsunami prediction, mitigation	
	Feb 18	Winter Break, no lecture	
	Feb 20	Winter Break, no lecture	
	Feb 25	Mid Term Test Review	
	Feb 27	**Mid Term Test**	
Mass Wasting	Mar 4	Landslide hazards and risks in Canada	Ch 15
Climatogenic hazards	Mar 6	Atmospheric dynamics, latent heat	Ch 9
	Mar 11	Severe frontal storms-risks and prediction	Ch 10
	Mar 13	Tornadoes-risks, prediction, and mitigation	
	Mar 18	Hurricanes-risks, prediction, and mitigation	Ch 11
	Mar 20	Stream flooding and flood hydrographs	Ch 13
	Mar 25	Stream flooding, return interval, flood risk, and sinking deltas	
	Mar 27	Wildfire risks and mitigation	Ch 14
Extra-terrestrial hazards	Apr 1	Impacts, cosmic rays, and extraterrestrial hazards	Ch 17
	Apr 3	Good Friday, no lecture	
Our changing risks	Apr 8	Climate change effects on natural disasters and IPCC's take	Ch 12
	Apr 9	Review for Final Exam	
	TBA	Final Exam	

This is a tentative schedule. Campus closures, visiting speakers, and opportunities to discuss natural disasters that occur during the semester may impact the lecture schedule, but not the due dates for homework assignments, question sets, or the mid-term exam.

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Course Assessment

Google Earth® Homework Assignments	25%
Question Sets	15%
Mid Term Test (required)	25%
Final Exam (required, cumulative)	35%
Total	**100%**

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

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

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Homework Assignments (25%):

There are a total of six assignments, numbered 0 through 5 (see assignment schedule below). You will complete the assignments on your own. Assignments will be administered as *Quizzes* on Brightspace. The Google Earth® Intro assignment is mandatory and must be completed with a grade of at least 80% to access assignments 1 through 5. The intro assignment is worth 3% of the course score. The remaining assignments are worth 22%. The lowest grade you score on a non-intro GE assignment will be dropped from the final grade calculation (so only 4 of the 5 numbered assignments will be counted). This means you have the option of choosing not to hand in one of the numbered assignments. If you do not submit two assignments, one of them will receive a grade of zero regardless of why you did not submit. Plan ahead, attempt the assignments early so you are not affected by sickness, travel, or unexpected events. The Brightspace server portal for assignments will close at **11:30 pm Atlantic Time** on the due date for the assignment. Do not leave your submission until the evening it is due. The 11:30 pm deadline is a hard deadline unless there is a medical emergency (flu does not count as an emergency). Computer or internet issues or religious events that prevent timely submission, even if they are not caused by you, are not an excuse for a late assignment.

Assignment Schedule

- You will be given at least three attempts for the assignments.
- Depending on your background, some assignments will take more than 3 hours.
- The assignments may be completed prior to the relevant lectures. However, in many instances the lecture material and textbook will provide context and definitions that are useful to completing the assignment.
- Assignments become unavailable after 11:30 pm Atlantic Time on the due date, no exceptions including sickness or computer/internet issues.
- We drop the lowest score or one assignment you failed to complete.
- Assignment-0 must be completed before you can open Assignments-1 through 5.
- Weightings are 3% of course for Assignment 0, then 5.5% for four of the remaining five assignments.
- Email Mike Young for assistance with assignment issues.

Assignment	Date Out	**Date Due**
0. GoogleEarth® Intro	W Jan 7	W Jan 14*
1. Faults	W Jan 14	**W Jan 28**
2. Volcanoes	W Jan 28	**W Feb 11**
3. Tsunami	W Feb 11	**W Feb 25****
4. Hurricanes	W Mar 4	**W Mar 18**
5. River Flooding	W Mar 18	**W Apr 1**

* The GoogleEarth® Intro assignment will not have a set due date; however, this assignment **must be completed with a minimum grade of 80% to access assignments 1 through 5**. It is recommended the assignment be completed by January 14.

**Note that assignment 3 on Tsunamis is due Wednesday February 25th. Tsunamis will be included on the mid-term test on Friday February 27th.

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Question Sets (15%):

These are algebra-based questions that provide you with an opportunity for more quantitative learning. Each question set will have practice questions. **Attempt the practise examples first** before opening a graded question set in the *Brightspace Quizzes*. The practice questions will take more than an hour for many of you. Each graded question set is designed to be completed in less than 1 hour. You will have one additional attempt to get a better score if you have time. While you can open the question set at any time after it is posted, you have only one hour to complete your attempt(s) before the due date and time. There are five question sets (3% each), and your score out of 15 is the sum of your scores for all five Question Sets. The question sets are due by 11:30 pm on the due date. Brightspace will not allow submissions after that time, no exceptions, even for power outages or internet issues (you have 2 weeks, consider the due date to be within the first week). If you do not submit, your score for that Question Set will be zero.

Question sets	Date Posted	Date Due (11:30pm)
QS1-Potential and Kinetic Energy	Su Jan-11	Su Jan-25
QS2-Earthquake Energy	Su Jan-25	Su Feb-8
QS3-SPLASH equation (included on mid-term test)	Su Feb-8	Su Feb-22
QS4-Latent Heat	Su Feb-22	Su Mar-8
QS5-Pre-instrument stream paleoflooding	Su Mar-15	Su Mar-29

Tests (60% total):

The mid-term test and final exam are compulsory components of this course. Both are closed book, with no technology allowed other than pencil and eraser to fill in the CROWDMARK® bubble sheet. The test questions will be mostly multiple choice, but some will require ordering, or are true and false or fill-in-the-blank style. Each question will have the same value and there will be at least one bonus question. We will provide more information about the tests later in the semester. You are responsible for material contained in the lectures, homework assignments, question sets, and textbook. The tests *emphasize the lecture material and disasters occurring this semester,* but assumes you have completed all homework assignments, question sets, and readings.

The mid-term test (25%), 12:35 pm February 27, in the lecture auditorium, for topics up to and including Tsunamis and all homework and question sets due before that date. Duration: 60 minutes.

The final exam (35%), date, time, and location will be posted on the Dal.Ca exam schedule website in February. This exam is cumulative, although a greater proportion will be on topics, question sets, and assignments *since* the mid-term test. Duration: 2 hours.

IMPORTANT!

We will not know the date of the final exam until February. DO NOT schedule flights departing Halifax before you know when the final exam will occur.

Missing the mid-term because you are taking an extended leave is not a reasonable excuse. Please consider taking another course if you cannot make the mid-term test.

Make-up tests

For those who have emailed John on or before the originally-scheduled test time, you must provide an explanation for missing the test. The make-up test will not be the same as the original tests, and will take place in a different location, about 10 days after the original test.

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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 the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.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-dal/internationalization.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/about-dal/agricultural-campus/student-success-centre.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: http://www.dal.ca/cultureofrespect.html

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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/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

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/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.html

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.

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Faculty of Science

Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates): http://www.dal.ca/academics/important_dates.html
Classroom Recording Protocol: https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/class-recording-protocol.pdf
Dalhousie Grading Practices Policies: https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/grading-practices-policy.pdf
Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html
Sexualized Violence Policy: https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/sexualized-violence-policy.pdf
Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html
General Academic Support – Advising (Truro): https://www.dal.ca/campus_life/ssc.html
Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html
On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html
Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html
Mi'kmaq and Indigenous Relations: https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html
Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803: https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations/elders-in-residence-and-traditional-knowledge-keepers.html
Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html
International Centre: https://www.dal.ca/campus_life/international-centre.html
LGBTQ2SIA+ Collaborative: https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion/community-specific-groups/lgbtq2sia-collaborative.html
Dalhousie Libraries: http://libraries.dal.ca/
Copyright Office: https://libraries.dal.ca/services/copyright-office.html
Dalhousie Student Advocacy Services: https://www.dsu.ca/dsas?rq=student%20advocacy
Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/ombudsperson.html
Human Rights and Equity Services: https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion/human-rights-and-equity-services.html
Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html
Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html
Faculty of Science Advising Support: https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html

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Safety

Biosafety: http://www.dal.ca/dept/safety/programs-services/biosafety.html
Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html
Radiation Safety: http://www.dal.ca/dept/safety/programs-services/radiation-safety.html
Laser Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html