

Earthquakes, Volcanoes, and other Natural Disasters Course Syllabus

Department of Earth and Environmental Sciences

ERTH/GEOG 1060 Winter 2024

Monday Evenings 5:35 to 8:25 pm

Kenneth C Rowe Management Building Auditorium Room 1028

Professor: Dr. John Gosse	John.Gosse@dal.ca for issues regarding tests, Brightspace, TopHat and accessibility/accommodations. Office hrs 2:00-4:00 Mondays and 11:00-12:00 Wednesdays, Oceanography Wing of the LSC Room 4616, email for appointment time.
Instructor: Dr. Jillian Bambrick-Banks	Jill.Banks@dal.ca for questions pertaining to the Google Earth® Homework Assignments , via <i>Collaborate-Ultra</i> in Brightspace.
Teaching Assistant: Jessica Albert (MSc Geology)	Jessica.Albert@dal.ca for questions pertaining to the Question Sets, e-textbook, or lecture notes . Please email for appointments.

During the three hours 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 interactive learning and completion of the Question Sets or 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 me 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 it is very difficult to make precise measurements needed for the calculations in the assignments.

We will employ **TopHat®** to help enhance interaction during the lectures.

University Prerequisites: Open attitude toward science and mathematics.

All course information and activities will be available through [Brightspace](#) at Dalhousie University.

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

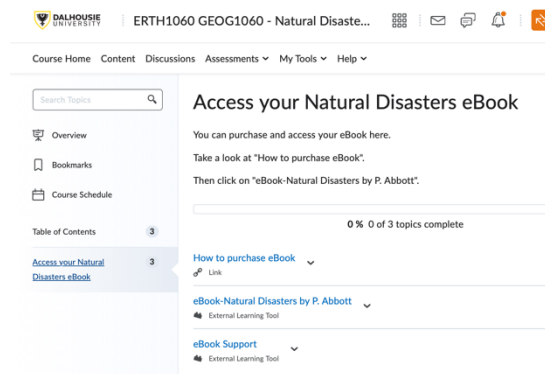
Behaviour – The student will consider the probability of any natural hazard or hazardous condition

Criterion – The qualitative assessment will be supported with geological or meteorological, historical, statistical, and modeling evidence

ERTH/GEOG 1060 TEXTBOOK for Winter 2024



Course eBook: **REQUIRED**
Natural Disasters, 12th edition by Patrick Abbott
Best to purchase through our Brightspace Page...



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.** In the past I have indicated that students can make do with a previous edition. However, 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).

ERTH/GEOG 1060 Winter 2024 Syllabus

Topic	Date	Approximate Topic	Reading
Overview	Jan 8	Course overview, natural hazards perspectives, models, and trends	Ch. 1
Energy	Jan 15	Energy of Natural Hazards and exponential equations, plate tectonics	Ch. 2,3
Earthquakes	Jan 22	Plate tectonics, faults, earthquake risks, seismology	Ch. 3,4
	Jan 29	Seismic wave physics, seismic gaps, earthquake prediction and mitigation	Ch. 4, 5
Volcanoes	Feb 5	Volcanic eruption hazards, chemistry factors, measurements	Ch. 6,7
	Feb 12	Volcanic eruption predictions, mitigation	Ch. 6,7
	Feb 19	<i>Nova Scotia Heritage Day - University closed, Winter Study Break</i>	<i>No lecture</i>
Test and Tsunamis	Feb 26	Mid-term test , Tsunami risks and dynamics	Ch. 8
Mass Wasting	Mar 4	Tsunami prediction and mitigation, submarine mass wasting, rock avalanches	Ch. 8, 15
Hurricanes	Mar 11	Atmospheric dynamics, frontal storms, blizzards, tornado risks, mitigation	Ch. 9, 10
Tornadoes	Mar 18	Hurricane risks, hurricane dynamics and evolution, mitigation	Ch. 11
Floods	Mar 25	Stream flooding, stream hydrograph, flood mitigation, sinking deltas	Ch. 13
Wildfire & Impacts	Apr 1	Wildfire, and discussion on climate change and IPCC	Ch. 14, 12

Note that 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.

Course Assessment

Homework Assignments	30%
Question Sets	15%
Mid Term Test (required)	25%
Final Exam (required, cumulative)	30%
Total	100%
Bonus up to 5% for Top Hat participation	+5%

**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)	

Homework Assignments (30%):

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 4% of the course score. The remaining assignments are worth 26%. 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 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 4% of course for Assignment 0, then 6.5% for four of the remaining five assignments.
- Email Dr. Bambrick-Banks for assistance with assignment issues.

Assignment	Date Out	Date Due
0. GoogleEarth® Intro	M Jan 8	M Jan 22*
1. Faults	M Jan 22	M Feb 5
2. Volcanoes	M Feb 5	M Feb 26
3. Tsunami	M Feb 26	M Mar 11
4. Hurricanes	M Mar 11	M Mar 25
5. River Flooding	M Mar 25	M Apr 8

* 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 22.

Question Sets (15%):

These are calculation-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-14	Su Jan-28
QS2-Earthquake Energy	Su Jan-28	Su Feb-11
QS3-SPLASH equation (<i>not on mid-term test</i>)	Su Feb-18	Su Mar-3
QS4-Latent Heat	Su Mar-3	Su Mar-17
QS5-Pre-instrument stream discharges	Su Mar-17	Su Mar-30

Tests (55% total):

There will be a mid-term test and a final exam. Both are **closed book, with no technology allowed other than pencil and eraser to fill in the scantron 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%), 5:35 pm February 26, in the lecture auditorium, for topics up to and including volcanic eruptions and all homework and question sets due before that date. Duration: 1 hour.

The final exam (30%), 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. The make-up exam will be scheduled for some time in early June as I am out of the country to teach field school immediately after the exam.

IMPORTANT!

DO NOT schedule flights departing Halifax before you know when the final exam will occur, or arrange your transportation to commence after exam week.

Bonus points for Top Hat participation (5% max):

To help increase class interaction we will employ Top Hat during each lecture. Students participating will receive 0.5 pts on each question that is attempted but incorrect, and 1 pt for correct answers or any poll questions. These points will determine the bonus score out of 5% to be added to your course final score. Because the questions are often poll (survey) questions, participation is only possible during the lecture. Yes, it is possible to achieve even more than 105% in this course because the tests may have bonus questions too (typically one student per year...that student just receives an A+ on their transcript, but the global fame is worth it).

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>

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/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.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.

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/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

Dalhousie Grading Practices Policies:

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

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/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html

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/about-dal/agricultural-campus/ssc/academic-support/advising.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

Indigenous Connection: <https://www.dal.ca/about-dal/indigenous-connection.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://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>

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

South House Sexual and Gender Resource Centre: <https://southhousehalifax.ca/about/>

LGBTQ2SIA+ Collaborative: <https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/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/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Human Rights and Equity Services: <https://www.dal.ca/dept/hres.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>

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>