

LIVING WITH EARTHQUAKES AND VOLCANOES

GEO 3030
University of Utah, Sandy Center
Pre-Spring 2017 (January 3–7, 2017)

– Course Syllabus –

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Overview:

Have you even wondered how earthquakes and volcanoes affect your life, even if you don't live anywhere near a volcano or active fault? (Spoiler alert: we do live near an active fault!) This course explores these two of Earth's most spectacular phenomena and how we, as human society, respond to or live with them. We approach earthquakes and volcanoes from a variety of perspectives: the physical sciences (basic and applied), social sciences, and engineering. To understand where and why earthquakes and volcanic eruptions occur, we start by exploring the geological concepts of plate tectonics, deep time, and the persistence of processes and principles. We also include an overview of Earth materials (rocks, minerals, magmas, gases). As we will see, earthquakes and eruptions result from a multitude of geological processes ranging from the scale of atoms to that of the globe. Similarly, earthquakes and eruptions impact society both locally and globally, in ways both beneficial and hazardous. The global nature of these hazards requires collaborative international programs for prediction, mitigation, and disaster response; this course is intended to increase individual awareness of the international scope of these hazards. The global patterns of earthquakes and volcanic eruptions place particular burdens on a few countries (e.g., Japan, Indonesia, and New Zealand), and hence we will investigate how these events influence the lives of people and cultures around them. However, despite the different effects of earthquakes and volcanoes in different countries, many countries need to find their own answers to the same question: How do local constraints (e.g., culture, infrastructure, government, and economics) affect the feasibility of applying scientific and engineering solutions to hazard reduction?

The course will emphasize the contributions of many different disciplines to the Earth sciences and the integrated nature of modern science. The value of science as a thread in the larger human discourse will also be emphasized. To realize the course's goals, students will be expected to make and record scientific observations, interpret these observations, and share and debate the relative merits of different interpretations of the available data. GEO 3030 is a Physical/Life Science Exploration (SF) course and satisfies the International Requirement (IR).

Course structure:

This intensive course consists of five sections that are each divided into modules. A typical module includes a chapter from the reading, a short online quiz, an in-class lecture, and an assignment. It is expected that the reading and quiz for each module will be completed PRIOR to class, so that each class is a combination of lecture with student discussions, interactions, and hands-on projects. The sections and modules are:

Section 1: Science, Geology, and the Plate Tectonics Revolution (*Tuesday*)

Introduction and Overview

A Multiple-Perspectives Approach to Earthquakes and Volcanoes

Minerals, Rocks, and Deep Time

The Dynamic Earth: Plate Tectonics

Section 2: The Physical Basis of Volcanoes (*Wednesday*)

Volcanism: Kinds of Eruptions

Volcanoes: Where and Why?

Section 3: Volcanoes and People (*Thursday*)

Living with Volcanoes: Hazards, Prediction, and Effects Through History

Section 4: The Physical Basis of Earthquakes (*Friday*)

Stress, Strain, and Seismic Waves

Earthquakes: Where and Why?

Section 5: Earthquakes and People (*Saturday*)

Earthquakes and People: Earthquake Hazards

Living with Earthquakes: Some Examples

Earthquake Prediction: Three Countries, Three Approaches

Tsunamis: Multinational Impact and Response

Summary/Review

Textbook:

The primary readings for this course are the online course web pages (Canvas). The course does not use paper-based texts. The text was originally created by Richard Jarrard and Susan Halgedahl at the University of Utah (*Living with Earthquakes* and *Living with Volcanoes*) and has been updated by others, including Erich Petersen, Michael Davis, and myself.

[Optional Textbook Note: If these topics interest you, I would recommend the following two books: *Earthquakes* by Bruce Bolt (ISBN: 978-0716775484) and *Volcanoes* by Francis and Oppenheimer (ISBN: 978-0199254699). These are both very excellent textbooks, however they are NOT required for this class.]

Course requirements:

1) Reading

Due to the intensive nature of this course, the majority of the reading will be completed PRIOR to attending class. Each module contains one to two chapters of online reading material that will be available on Canvas.

2) Quizzes

Almost every module has an associated quiz. Online quizzes are short (5–12 multiple-choice questions) and brief (20 minute maximum). I recommend that you take each quiz right after you have completed the module reading. Online quizzes are open-book and open-note, as the quizzes have two purposes: to encourage you to keep up on your module readings and to familiarize you with the kinds of questions that you are likely to encounter on the exam. Please be aware that quizzes have due dates PRIOR to the first day of class.

Overall, quizzes are worth 20% of your final grade. There are no “make-up” quizzes.

3) Assignments

Assignments are the core of this course, and they are 50% of the total course grade. Assignments include student and group discussions, as well as hands-on projects. Many, if not all, of the assignments will be completed during class time and will involve the application and interpretation of scientific data. Science is rarely done alone and thus work will often be completed in groups. However, assignments must be submitted individually, not as a team (with few exceptions). Feel free to work together but make sure everyone contributes. It will be painfully obvious if you only copied someone’s assignment. Copied assignments, as well as the ones from which they were copied, will receive zero credit. Due dates for assignments will generally be the same day as the assignment is given. Late assignments will be accepted, but at a penalty of 50% off per day.

3) Final Exam

There is one exam, the final exam, and it is worth 30% of the total course grade. The exam is given entirely on Canvas and is composed primarily of “short answer” questions. The final exam may be taken on any day following the conclusion of the in-class portion of the course **until Sunday, January 15, 2017, at 11:59 p.m.** The Final exam is comprehensive, and will have a very stringent “time window” of 120 minutes (the same as for the quizzes, only longer) so be sure you have scheduled distraction- and disruption-free time for yourself to take the exam. I recommend **STRONGLY** that you do not wait until the last minute to take your exam, primarily to avoid technical or other difficulties.

The exam is closed-book; no notes, recorders, headphones, calculators, talking, looking at a neighbor’s answers, or getting someone else to do the problems for you. No cheating! Cheaters will not be treated charitably.

Exam grades may be available as early as the Thursday following the exam (in the

“Grades” link). You may make an appointment to discuss your exam and ask questions.

4) Attendance

The nature of this intensive course makes class attendance mandatory. Missed quizzes cannot be made-up and missed assignments will be marked late. If, for some extenuating circumstance, you are unable to attend, please contact me as soon as possible. If you already know that you will not be able to attend each class, I strongly encourage you to take the semester-length version of the course.

Grading:

The course grade is based on weighted percentages of exams, assignments, and quizzes, as follows:

Quizzes:	20%
Assignments:	50%
Final Exam:	30%

Final marks will be awarded based on the final percentage (calculated from the weightings above) converted to a letter grade according to the following straight scale: >90% (A-, A), 80–90% (B-, B, B+), 70–80% (C-, C, C+), 60–70% (D-, D, D+), <60% (E). Grades may be adjusted based on class performance. You can check on your progress at any time through the “Grades” tab in Canvas.

ADA:

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

Student responsibilities:

All students are expected to maintain professional behavior in the classroom and online, according to the University’s Code of Student Rights and Responsibilities (<http://regulations.utah.edu/academics/6-400.php>). Students have specific rights in the classroom as detailed in Section III of the Code. The Code also specifies proscribed conduct (Section V) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc.. Students should read the Code carefully and know they are responsible for its content. According to Faculty Rules and Regulations, it is the faculty’s responsibility to enforce responsible student behaviors, and I will do so, beginning with warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.

Accommodations Policy:

Some of the topics in this course may include material that conflicts with the core beliefs of some students. Please review the syllabus carefully to see if the course is one that you are committed to taking. If you have a concern, please discuss it with me at your earliest convenience.