

GEO 3030: **LIVING WITH EARTHQUAKES AND VOLCANOES**

**Pre-Spring 2020 (Thursday–Saturday, January 2–4,
& Friday–Saturday, January 10–11, 8 am–5 pm each day)**

University of Utah, Sandy Center

– *Course Syllabus* –

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Office Hours: By appointment

Required materials:

- **Text:** There is no textbook! The primary readings for this course are on Canvas.
- **In-class materials:**
 - *Pens and pencils.* In addition to what you like to write with, please bring 3-4 pens or pencils of different colors, too.
 - *Ruler* (with mm, cm).
 - *Drawing compass.*
 - *Notebook* or other method for taking notes. Digital devices are allowed.
 - *Laptop computer or tablet* (optional but please bring one if you have one). Certain assignments refer you to certain websites, however we can work in groups if not everyone has a computer.
 - *Calculator.* If you do not bring a computer, please bring a calculator (or a phone with a calculator app that can take square roots).

Course description:

Where and why do earthquakes and volcanic eruptions occur today? How do local cultural attitudes and economic conditions affect the local consequences of earthquakes and volcanoes? The concept of plate tectonics explains global patterns of earthquakes and volcanic eruptions. Hazards, prediction, and societal impacts are considered, using examples from many countries. GEO 3030 is a Physical/Life Science Exploration (SF) course and satisfies the International Requirement (IR). *Pre- or co-requisites:* none. *Credits:* 3.

Course outcomes:

At the end of this course, you will be able to:

- Distinguish observations from interpretations.
- Demonstrate critical reasoning in the analysis of primary Earth science data.
- Describe the basic composition of the Earth's surface in terms of rocks and tectonic plates.

- Explain the occurrence of volcanoes and earthquakes in the context of plate tectonic theory.
- Describe how and why volcanic and earthquake hazards vary geographically, both due to plate tectonics but also local conditions (e.g., geology, soil, topography, human activity).
- Describe the process of predicting hazards, and explain the limitations to such predictions.
- Assess the risks of hazard occurrences.
- Describe, in specific terms, how science is used to protect life and property.

Overview:

Have you even wondered how earthquakes and volcanoes affect your life, even if you don't live anywhere near an active volcano or fault? (Spoiler alert: we live on/near both!) This course explores these dramatic phenomena and how we, as individuals and as society, respond to or live with them. 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, advanced warning, 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, Nepal, Indonesia, and New Zealand), and hence we will investigate how these events influence the lives of people and cultures around them. Although different countries are impacted by earthquakes and volcanoes in different ways, they all seek answers to the same question: How do local constraints (e.g., culture, building materials, infrastructure, government, and economics) affect the feasibility of applying scientific and engineering solutions to hazard reduction, and the construction of resilient communities? The course will emphasize the contributions of many different disciplines to the Earth sciences and the integrated nature of modern science. The course will also explore the societal value of science.

Teaching and Learning Methods:

The course includes a mix of lecture and discussions with in-class problem sets that involve exploring real-world Earth science data as well as case studies, many using team-based learning. 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.

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 the 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 (*Thursday*)

- 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 (*1st Friday*)

- Volcanism: Kinds of Eruptions
- Volcanoes: Where and Why?

Section 3: Volcanoes and People (*1st Saturday*)

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

Section 4: The Physical Basis of Earthquakes (*2nd Friday*)

- Stress, Strain, and Seismic Waves
- Earthquakes: Where and Why?

Section 5: Earthquakes and People (*2nd Saturday*)

- Earthquakes and People: Earthquake Hazards
- Living with Earthquakes: Some Examples
- Earthquake Prediction: Three Countries, Three Approaches
- Tsunamis: Multinational Impact and Response
- Summary/Review

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. Late quizzes will be accepted, but with a penalty of a 50% deduction per day late.

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 with a penalty of a 50% deduction per day late.

4) Exam

There is one exam and it is worth 30% of the total course grade. The exam is given on Canvas and is composed primarily of “short answer” questions. The exam may be taken on any day following the conclusion of the in-class portion of the course **until Sunday, January 19, 2020, at 11:59 p.m.** The 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, meaning 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.

Grades may be available as early as one week following the exam (in the “Grades” link). You may make an appointment to discuss your exam and ask questions.

5) 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 scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	<60

You can check on your progress at any time through the “Grades” tab in Canvas.

University policies:

The Americans with Disabilities Act (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 this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

University Safety Statement:

The University of Utah values the safety of all campus community members. To report suspicious activity, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu. SANDY POLICE: 801-799-3000.

Addressing Sexual Misconduct:

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

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.

Other course policies:

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.

Food and Drink:

Drinks and small snacks are allowed in the classroom. The Sandy Campus requests that lunches be eaten in the student lounge. A limited selection of food and drink is available at the Sandy Campus.

Final note: This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Structure to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas under Announcements.