

Spring 2014 GEOS 355—Geological Hazards Syllabus



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Office Hours: Mon 1:30-2; 4-4:30; Wed 1:30-2; 4-4:30

Class website will be maintained on Blackboard Learn, please check frequently!
Class meets 3:00-3:50 on Mon, Wed, and Fri in PHSC 109

The purpose of this course is to provide you with the opportunity to learn the science behind geologic hazards and gain an appreciation of how these events shape both our lives and the development of societies. The course will focus on, but not be limited to, the science behind geologic hazards, a discussion of how much of a disaster is a natural phenomenon and how much a tragedy is imposed by the designs of populations. Along the way, we will develop the methodology of science and build on our writing and quantitative skills.

Format

The classroom should serve as a forum for discussion. We have all been affected by disasters and you are encouraged to share these experiences with others. Questions should flow freely at any time and remember that your question is likely shared by others.

In lieu of a traditional textbook, I will assign Internet pages for information to supplement the class lectures. We will also make use of “Google Earth” and I recommend you install it on an available computer as soon as possible. We will be reading “The Control of Nature” by John McPhee, so please read the appropriate sections prior to class discussions.

The exams (see below) will be based on the lectures, including videos. It is recommended you study by reviewing your notes and focusing on both key concepts and critical details. Terminology is important so keep track of a ‘vocabulary list.’ Don’t rely on study guides to direct your cramming! The tests will primarily be based on lectures and the “Background Information” sheets so complete them and use them for study.

Students expected to attend class meetings, take all exams, participate in class and complete the assignments. On this final note, it is *essential* that the assignments are turned in on time. *There will be a 10% loss penalty for every day you are late with an assignment, with no credit given for assignments more than 1 week late.* It is your responsibility to ensure that assignments turned in via Learn are submitted correctly.

Assessment

Assessment of your performance and perception of the material will encompass the following:

Exams = 50%: There will be three exams in this class (2 midterms (15% each) and a final exam (cumulative, 20%)), based primarily on lectures but also covering material on the web, in videos, and in the supplementary readings. The exams will comprise a combination of short questions (i.e., true false, vocabulary, multiple choice) and might include an essay question. I do not give make-up exams. Missed exams will be dealt with on an individual basis and only in the rare case that you have an excused absence that you cleared with me ahead of time (such as an illness with a doctor's note).

Assignments = 40%: Writing and communication should, of course, comprise an integral part of all your classes. In this class, assignments will be a combination of in class assignments, a news summary, and homework.

Control of Nature = 10%: We will read, have quizzes, and have in-class discussions on the three sections of John McPhee's excellent book, The Control of Nature. Please make sure you get a copy. Some portions of the book are available online for free, but not all of them are.

Tentative Grades

A	A-	B+	B	B-	C+	C	C-	D+	D	F
93	90	87	83	80	77	73	70	67	60	<60

General Education

"Geological Hazards" is an Upper Division-Natural Sciences general education course. It is included in several pathways at the university: "Diversity Pathway"; "Ethics, Justice, and Policy Studies"; and "International Studies." This course specifically addresses the following student learning objectives:

1. **Oral Communication:** Demonstrates effective listening and speaking skills necessary to organize information and deliver it effectively to the intended audience.
2. **Written Communication:** Demonstrates the ability to question, investigate and draw well-reasoned conclusions and to formulate ideas through effective written communication appropriate to the intended audience.
3. **Critical Thinking:** Identifies issues and problems raised in written texts, visual media and other forms of discourse, and assesses the relevance, adequacy and credibility of arguments and evidence used in reaching conclusions.
4. **Mathematical Reasoning:** Demonstrates knowledge of and applies mathematical or statistical methods to describe, analyze and solve problems in context.
5. **Active Inquiry:** Demonstrates knowledge of and applies research techniques and information technology appropriate to the intellectual and disciplinary context.

The students, faculty, administrators, and staff of CSU, Chico are committed to a culture of honesty in which members of the community accept responsibility to uphold academic integrity in all they say, write, and create. I expect all students to fully embrace such academic integrity. For more details please consult <http://www.csuchico.edu/prs/EMs/2004/04-036.shtml>

If you have special needs (e.g., disability, diversity) please contact me. I will do my best to accommodate your needs or direct you to help, while keeping the issue confidential.

Tentative Schedule (Jan. 2014)

See Description of Activities below for more information on weekly activities

<u>Week</u>	<u>Date</u>	<u>Topic</u>
1	22-Jan	Introduction, The Science of Geohazards
2	27-Jan	Continue Science of Geohazards Energy to Fuel Geohazards *News Homework due
3	3-Feb	Interior of the Earth
4	10-Feb	Exterior of the Earth *Earth Surface Homework due
5	17-Feb	Geologic Hazards at Plate Boundaries *Special pre- and post-class assignments
6	24-Feb	Geologic Hazards at Plate Boundaries *Special pre- and post-class assignments
7	3-Mar	Midterm #1

March 3, 2014	Midterm #1 covers weeks 1-6
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7	5-Mar	Volcanoes
8	10-Mar	Volcanoes, Earthquakes *Cooling the Lava in-class discussion and quiz
9	17-Mar	No class - Spring Break -
10	24-Mar	Earthquakes, Tsunami
11	31-Mar	31 March no class due to Cesar Chavez Day
	2 Apr	Landslides *Los Angeles Against the Mountains in-class discussion and quiz
12	7-Apr	Landslides, Energy to Fuel Surface Geohazards
	11-Apr	Midterm #2

April 11, 2014	Midterm #2 covers weeks 7-12
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13	14-Apr	Flooding *Atchafalaya in-class discussion and quiz
14	21-Apr	Flooding, Tornadoes
15	28-Apr	Tornadoes, Hurricanes
16	5-May	Hurricanes

- 17 **Final Exam (cumulative, covers weeks 1-16)**
Date and time *tentative* and will be finalized census week (week of Feb 12)
12-May 2:00-3:50 PM

Description of Activities Jan. 2014

The Science of Geohazards. We will begin the course with an introduction into the “science” of geohazards. What do scientists really know? How is the scientific method applied to the study of natural phenomena? It is critical for all citizens to have a basic understanding of both the scientific method and how science is conducted—they are not the same! From this knowledge, we can engage in a discussion of how governments and people use science in decision making, setting policy, and devising safe practices. The first Homework (News Homework) will be an investigation of news coverage of a current disaster.

The Energy to Fuel Geohazards. This week, we will build the foundation for the class by covering the major energy sources that drive geohazards. Geohazards can be divided into two groups: those driven by energy received from the Sun and those fueled by the Earth’s internal heat. We will model both of these pathways so we can better understand how they change (or not) at human timescales. How can we address which hazards are natural or anthropogenic if we do not understand the balance of energy?

Interior of the Earth. We will begin our focus of specific geohazards with those that are largely driven by the Earth’s internal heat—volcanoes and earthquakes. Before the bake and shake, we need to understand the fundamentals of plate tectonics. How does the internal energy get produced? How does it relate to the Earth as a planet? It is important to be able to view the Earth both with regards to composition as well as the material strength of the different layers. Ultimately, the internal energy may be transferred to the rigid outer shell of the Earth, or the lithosphere.

Exterior of the Earth. Now we can turn our attention to the complex deformation of the lithosphere which we clearly see as the world’s mountain belts. But are all mountains the same? The homework this week (Earth’s Surface Homework) will help you to visualize these features. We will discuss the homework and spend much of the lecture period investigating the globe via Google Earth.

Geologic Hazards at Plate Boundaries Special Modules. We will be demoing new learning modules developed by CSU Chico faculty Rachel Teasdale. Modules will include:
Unit 1a: Hazards at Transform Plate Boundaries
Unit 1b: Risk at Transform Plate Boundaries
Unit 2a: Hazards at Divergent Plate Boundaries
Unit 2b: Monitoring Hazards at Divergent Plate Boundaries
Unit 3a: Evolution of Hazards at Convergent Plate Boundaries
Unit 3b: Mitigating Impacts of Activity at Convergent Plate Boundaries

Volcanoes. With the background on the interior heat of the Earth, we will now focus on the geohazard that is near and dear to our hearts in northern California—volcanoes. Volcanoes are nature’s way of releasing excess internal heat. They become a ‘geohazard’ when the eruption affects people. Volcanoes vary geologically and, therefore, the hazards of each are different. To better understand these differences, we will begin the week with a lecture on the geology of volcanoes. Pay particular attention to how the different magmas are created and how they affect the eruption style. We will investigate the volcanoes of northern California, comparing the diversity of types. We will have an in-class discussion of the “Cooling the Lava” section in *The Control of Nature* by John McPhee and there will be a quiz on the reading.

Earthquakes. We will begin the discussion of the geology of earthquakes. We will pay particular attention to differentiating faults and relating them to plate boundaries. With this background, we can better understand why different areas of the world suffer earthquakes in different manners. We will outline the major technologies used for monitoring earthquakes. This information will help you to complete the

'Monitoring Earthquakes Homework'. You will also complete the short "Comparing Earthquakes on the Web Homework." We will compare several important historical earthquakes.

Tsunami. The amazing power of tsunami were largely relegated to the textbooks until December 26, 2006. On that date, the world became painfully aware of what geologists have been warning about for ages. How could a quarter of a million people perish from one geohazard? What can we do to better prepare? And then came Japan. We will look at the effect of a major tsunami in the Atlantic Ocean by working in small groups on the "Atlantic Tsunami Assignment."

Landslides. Landslides affect the lives of many Californians. We will explore the different types of landslides and the causes of them. Hopefully what you will learn will help you make an informed decision on where *not* to buy a house in California. We will have an in-class assignment on measuring landslides. We will discuss the "Los Angeles Against the Mountains" portion of John McPhee's *The Control of Nature* and there will be a quiz on the reading

Flooding. We will learn about the geology of rivers, which cause flooding, and the impact on river hazards on societies. We will compare some major rivers and the impact of flooding. Flooding homework. We will discuss the implications of flooding in areas close to Chico. We will discuss the "Atchafalaya" portion of John McPhee's *The Control of Nature* and there will be a quiz on the reading. There will be an in class assignment on plotting 100 year floods (Flood Assignment).

Tornadoes. This week, we will focus on the devastation wracked by tornadoes. Although tornadoes occur in many places in the world (and on other planets), they are primarily a United States phenomenon. Why? How would an increase in global temperatures affect the pattern of tornadoes? For this week's homework assignment, you will use the internet and data sets to build the background and complete an assignment (Tornado Homework). You will plot tornado tracks on Google Earth and look for patterns. Please consult Learn for more information on the assignment.

Hurricanes. Our final section on surface geohazards will be hurricanes, or more correctly, 'tropical cyclones.' We will discuss the scientific background of cyclonic systems. Where do they form? What controls their development and sustains them? How do they differ in different ocean basins? (Preparedness Homework). We will also plot several hurricane tracks on an in-class assignment (Hurricane Tracks Assignment).

Tentative In-Class and Homework Assignments

Assignments will either be based on questions I pose to you, often with a data set culled from the web or from the readings. We will read an excellent book in this class: “The Control of Nature” by John McPhee. Detailed directions will be posted on the class webpage on Blackboard for you to print or read online. The following are potential in-class assignments and homeworks:

In-Class Assignments:

Plate Boundary Assignments TBD
Atlantic Tsunami Assignment
Flood Assignment
Hurricane Tracks Assignment
Landslide Assignment

These assignments cannot be “made-up” as they are in-class. The assignments count for 20% of your total grade.

Control of Nature (Quizzes & In-class discussion/writing assignments):

Cooling the Lava
Los Angeles Against the Mountains
Atchafalaya

Control of Nature quizzes and in-class assignments are worth 10% of your total grade.

Homework:

Plate Boundary Homeworks TBD
News Homework (two pages)
Earth’s Surface Homework
Earthquakes Homeworks
Flooding Homework
Tornado Homework
Preparedness Homework

Homework is due the day of the discussion, during class. You may turn work in early. If you turn in the assignment late, you will lose 10% of the total available points for each day it is late and no credit will be given for assignments more than one week late. You will also not receive feedback on the assignment as I grade all of the assignments in one sitting. The homework will count toward 20% of your total grade.

