

GEOS 105
EARTHQUAKES AND VOLCANOES
Fall, 2019

Instructor: *Prof. James Mills*

Office: JSC 214 **Phone:** 658-4669 or 658-4654 **E-mail:** jmills@depauw.edu

Office Hours: 1:30 -2:30 am MWF, or by appointment

REQUIRED TEXTS:

Hyndman, D., and Hyndman, D., 2016, *Natural Hazards and Disasters*, 5th ed., Brooks and Cole Publishers, 576 p., ISBN-13: 978-1305581692

NOTE: Read the book!! There will be material on the exams from the readings. The class PowerPoint™ slides will only provide an outline of the material, the textbook will give more in-depth discussion of the topics we cover and I will expect you to have a good understanding of topics beyond just the PowerPoint™ slides.

CLASS PERIOD:

2:50 – 3:50 pm MWF, JSC 223

ATTENDANCE:

Regular attendance is required and expected. If you must miss a lecture class due to other obligations, please be sure to get the notes from someone else in the course and check with me to see if there are any materials you need to pick up. Please read the Academic Handbook regarding class attendance policies (Page 103):

<https://www.depauw.edu/files/resources/student-handbook-aug-14-2019.pdf>

If you miss more than two weeks of class total, I reserve the right to drop you from the class.

VIDEOS:

There are numerous good videos available for this course and we will see some of them. Most of the videos will be on reserve in the Prevo Science Library. We will see a few videos during class while others will be assigned as homework. You are responsible for the material in the videos therefore I strongly encourage you to pay attention as you watch. On some videos I will assign a question sheet for you to fill out either as you watch the video, or, after viewing.

HOMEWORKS and QUIZZES:

Several homework assignments will be given during the course of the semester.

No late assignments will be accepted. On occasion, I will give a quiz from the readings, videos and lecture material. These will be unannounced and cannot be made-up.

EXAMINATIONS:

Approximately every four weeks there will be a one-hour exam. See the attached lecture syllabus for the appropriate dates. **NO MAKE-UP EXAMS WILL BE GIVEN EXCEPT FOR DOCUMENTED EMERGENCIES.** The final exam will be given on the scheduled date and will be **COMPREHENSIVE**. The final exam **MAY NOT** be taken at any other time than the officially scheduled time.

NOTE: The tests are closed book, no computers, and all cell phones must be turned off and put away.

GRADING:

Your course grade will be determined from the criteria listed below:

One-hour exams (3)	60%	(20% for each exam)
Final exam	20%	
Homework's, Quizzes, Projects	20%	

GRADE SCALE:

A	93-100%	C+	79-77%	D-	63-60%
A-	92-90%	C	76-74%	F	<60%
B+	89-87%	C-	73-70%		
B	86-84%	D+	69-67%		
B-	83-80%	D	66-64%		

SYLLABUS:

Every attempt will be made to keep the schedule outlined in this syllabus. Changes will be announced in class as necessary.

ACADEMIC HONESTY:

Note that I have a zero-tolerance policy towards cheating. Any act that places a student in unfair advantage with respect to the rest of the class will be treated according to the University procedures outlined in the Student Handbook.

IMPORTANT DATES TO REMEMBER:

Adjustment Period (Add/Drop)	August 21st – 28th
DePauw Day of Dialogue	September 25th (no class)
Midterm Grades Due	Monday, October 7th
Registration Adjustment	Friday, October 25th (last day to withdraw from a class with a grade of 'W', change a grade from P/F to grade, or, grade to P/F)
Last Day of Class	Friday, December 6th
Final Exam	Thursday, December 12th, 1:00-4:00 pm

ADA Accommodations: It is the policy and practice of DePauw University to provide reasonable accommodations for students with properly documented disabilities. Written notification from Student Accessibility Services is required. If you are eligible to receive an accommodation and would like to request it for this course, please contact Student Accessibility Services. Allow one week's advance notice to ensure enough time for reasonable accommodations to be made. Otherwise, it is not guaranteed that the accommodation can be provided on a timely basis. Accommodations are not retroactive. Students who have questions about Student Accessibility Services or who have, or think they may have, a disability (psychiatric, attentional, learning, vision, hearing, physical, medical, etc.) are invited to contact Student Accessibility Services for a confidential discussion. Student Accessibility Services is located in Union Building Suite 208 and can be reached by phone at 765-658-6267.

Please feel free to reach out to me confidentially regarding any accommodation(s) or concerns you have about the course requirements. I'm here to help!

Diversity and Inclusion: At DePauw University, we value human diversity in all its richly complex and multi-faceted forms, whether expressed through race and ethnicity, culture, political and social views, religious and spiritual beliefs, language and geographic characteristics, gender, gender identities and sexual orientations, learning and physical abilities, age, and social or economic classes. We respect the value of every member of the class, and everyone in the class is encouraged to share his or her unique perspective as an individual, not as a representative of any category. Multicultural and intercultural awareness and competencies are key leadership skills, and we intend to present material and classroom activities that respect and celebrate diversity of thought, background, and experience.

This class may challenge your assumptions, knowledge gained from previous experience, or other beliefs and will provide new and sometimes different ways of evaluating and using evidence-based models and scientific data to look at natural processes, human impacts and related individual and societal issues. If you are concerned about any aspect of this class, I encourage you to contact me confidentially so that we can talk constructively and respectfully about your concerns.

I would like to use your preferred language when addressing you, so please let me know if your preferred name (or the pronunciation of that name) differ from what I am using and I ask that each of you let me know your preferred gender pronouns if needed. Your suggestions on how to incorporate diversity in this course in a meaningful way are appreciated and encouraged.

Adapted from: Centenary College's Diversity Statement

Religious Holy Days: DePauw University embraces the religious diversity of its students, faculty, and staff. Accordingly, faculty members are expected to excuse students from class and be flexible with respect to deadlines for required coursework in order to enable students to observe religious holy days. Faculty are also expected to make it possible for students observing holy days to make up any work they miss, provided arrangements are made in advance. Students are expected to notify their instructors of their intent to observe holy days at least one week in advance of these days. For the sake of this policy, "holy days" are defined as periods of time in which either:

- a. activities required by normal class participation are prohibited by a religious tradition, or
- b. a special worship obligation is required by a religious tradition.

Students with questions or concerns about this policy should contact the Office of Student Academic Life.

Photos: Courtesy of the United States Geological Survey



WEEKLY LECTURE SYLLABUS

Week	Topics	Reading
M= Marshak (On Reserve) H&H = Hyndman/Hyndman		
SECTION 1. An Introduction to the Materials and Processes that Make-up and Shape the Earth		
Aug. 21	Introduction, The Scientific Method, Atoms and Minerals, The Rock Groups	M: Minerals, Intro to Rocks
26	The Earth - Its Crust and Interior Continental Drift and Plate Tectonics	M: Earth's Interior H&H: Chp. 2 M: Chp. 2
SECTION 2. EARTHQUAKES		
Sept. 2	Plate Boundaries, Faults, Earthquake Signals	M: Chp. 8 H&H: Chp. 3
9	Earthquake Magnitudes, Causes of Earthquakes <u>Transform Boundary Quakes</u> ; The San Andreas Fault, "The Big One" San Francisco, 1906; Loma Prieta, 1989; San Fernando, California, 1971; Northridge Earthquake, 1994	M: Chp. 8. H&H: Chp. 3 Chp. 4 – pgs. 84-91
16	Anatolian Fault, Turkey; <u>Subduction Zone Earthquakes</u> ; Anchorage, Alaska 1964; Chile, South America 1960; Sumatra 2004, Tohoku (Fukushima) 2011	H&H: Chp. 3 Chp. 4 (pgs. 84-91) Chp. 5

EXAM #1 Monday, September 16th

Sept.	23	Pacific Northwest, USA <u>Rift Zone Quakes</u> ; New Madrid, Missouri, 1811-12; Indiana; Earthquake <u>Hazards</u> : Landslides, Liquefaction, Fires, Tsunamis	H&H: Chp. 3
	30	Earthquake Hazard Mitigation, Earthquake Prediction	H&H: Chp. 4

SECTION 3. VOLCANOES

Oct.	7	<u>Magmas: Origin and Modification</u> ; Rift Zones, Subduction Zones, Hot Spots	M: Chp 4 H&H: Chp. 6
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EXAM #2 Wednesday, October 9th

FALL BREAK October 12th – 20th

	21	<u>Volcanic Products</u> : Lavas vs. Ash; Eruption Dynamics	M: Chp. 5 H&H: 7
		BASALTS	
	28	<u>Volcanoes from the Sea</u> : Oceanic Crust Basalts	H&H: Chp. 6
Nov.	4	<u>Cinder Cones</u> : Mt. Paricutin, Mexico	H&H: Chp. 6
	11	<u>Flood Basalts</u> : Columbia Plateau, USA	M: Chp. 5
		ANDESITES	
		Mt. St. Helens	H&H: Chps. 6, 7
	18	Mt. Pinatubo, Philippines; Nevada del Ruiz, South America; Mt. Rainier Washington; Mt. Pele, Martinique; Vesuvius, Italy	H&H: Chps. 6,7

EXAM #3 Monday, November 18th

	25	RHYOLITES Crater Lake, Oregon <u>Calderas</u> : Rabul, Papua New Guinea; Toba, Indonesia; Campi Flegrei, Italy	H&H: Chps. 6,7
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THANKSGIVING BREAK November 27th – December 1st

Dec.	2	<u>Calderas</u> : Long Valley, California; Yellowstone National Park Mono Domes and Inyo Craters, California Volcanic Hazard Analysis, Predicting Eruptions	H&H: Chps. 6,7
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Last Day of Class: Friday, December 6th

FINAL EXAM: Thursday, December 12th, 1:00 – 4:00 pm

Philosophical Musings on Earthquakes and Volcanoes

"San Franciscans are used to earthquakes, but this one was different. The houses didn't squeak, the houses roared. The earth moved back and forth as if it was in a big box and somebody was shaking it back and forth. In the distance, from the north of the city, the smoke began to fill the skies. And the whole sky beyond the north part of the Bay was lit up and burning from the horrible fires that came out of the Marina District. Then we heard, very vaguely, that the Bay Bridge had collapsed. That was real scary."

- Randy Shilts, *The San Francisco Chronicle*

"A few days after the main shudder, they told us the quake had lasted only 15 seconds. But that is in real time. Earthquake time isn't real time."

- Stephanie Salter, *The San Francisco Examiner*

"Let it be noted, this was the first time a stadium, not the fans, did 'The Wave'."

- Dick Draper, *The San Mateo Times*

"The definitive thing is, we don't know what the hell is going on here."

- Malcolm Clark, *U.S. Geological Survey*

"I was feeling sorry for myself because I couldn't find something that fell off my shelf. Then a seven-year-old boy came by and said he couldn't find his house."

- Cyndi Forbes, *Santa Cruz, California resident*

"Vancouver. Vancouver. This is it!"

- Last words of David Johnston, *Geologist at Mt. St. Helens*

"You wouldn't believe it! You wouldn't believe it!"

- Last words of Gerry Martin, *photographer at Mt. St. Helens*

"(Mt. St. Helens)... Someone said it was like a moonscape, but it's much worse than anything I've ever seen in pictures of the moon's surface. Fortunately, the (loss of) people in that region (was) minimal, but it is literally indescribable in its devastation."

- President Jimmy Carter, *May 22, 1980*

"General, you had better stuff your pockets with jam. We're about to be toast."

- U.S. Geological Survey seismologist to the commanding General of Clark Air Force Base, *Philippines during the eruption of Mt. Pinatubo*

"In their stark isolation, some terrified victims watch helplessly as lava swallows their homes. Some shovel away the ash as fast as it falls. Some impede advancing lava-flows with rubble. Some try to outpace hot blasts. Some hide in the cellar. Some wander about in shock. Some simply pray. Some ring church bells. Some bang drums. Some let off fireworks. Some sacrifice virgins. Some panic. Some collect their goods and their families and flee into the stifling darkness. Some try to help their neighbours. Some take warnings seriously. Some dismiss them as myths. Some follow pundits and false prophets. Some react with intelligent forethought and prescience. Some execute efficient plans. Others run around like headless chickens. Just as they always will. To witness a great eruption closely is an awesome privilege. To survive is a bonus."

- *Vulcan's Fury; Man against the volcano: Scarth, A., 1999, Yale University Press, New Haven, Connecticut*

Professor Jim Mills

Dept. of Geosciences

Fall, 2019

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	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-9:00					
9:00-10:00					
10:00-11:00					
11:00-12:00					
12:00-1:00					
1:00-2:00	GEOS 117 12:30-1:30		GEOS 117 12:30-1:30		GEOS 117 12:30-1:30
2:00-3:00	Office Hour 1:30-2:30		Office Hour 1:30-2:30		Office Hour 1:30-2:30
3:00 – 4:00	GEOS 105 2:50-3:50		GEOS 105 2:50-3:50		GEOS 105 2:50-3:50
4:00 - 5:00	Faculty				
5:00 - 6:00	Meeting				
6:00 – 7:00					
7:00 – 8:30					
8:30 – 9:00					

GEOS 105 = Earthquakes and Volcanoes, JSC 223

GEOS 117 = Weather, Climate, and Climate Change, JSC 223