

# SIO 45: Volcanoes (Winter 2022)

MWF 10:00-10:50

Instructor: Geoffrey Cook ([gwcook@ucsd.edu](mailto:gwcook@ucsd.edu))

TA: Hugo Abe ([huabe@ucsd.edu](mailto:huabe@ucsd.edu))

Hello, and welcome to the thrilling world of volcanology! This class is designed to give students from all backgrounds an introduction to volcanism and volcanic processes. You don't need a background in geology to enjoy the class and I am confident that you will learn a great deal about planet Earth and its volcanoes

**OMICRON NOTE:** Because of the emergence of the Omicron variant, the first two weeks of this class will be remote. There is a great deal of uncertainty about instructional modality after January 18, and I just want to be clear that the syllabus and instructional modality may be subject to change pending changes to university guidelines surrounding COVID. The situation is evolving and more information regarding instructional modality (remote, in-person, etc.) will be given out as it becomes available.

I apologize in advance for any inconveniences or difficulties; please know that I will always do my best to ensure that any changes to instruction will not disadvantage student learning, grades or outcomes. I want this to be a positive and useful learning experience for everyone. I promise to be organized, enthusiastic, and engaging with the course.

## ***Learning Outcomes (students will be able to):***

- Discuss fundamental geologic principles and concepts including geologic time, plate tectonics, and the rock cycle.
- Categorize Earth materials and the processes associated with their formation.
- Compare volcanic eruptions and associated products.
- Explain why volcanoes erupt and predict where volcanic eruptions are likely to occur.
- Examine the impact volcanoes have on modern society and recognize the influence geologic processes in general have on humanity.

## ***Class Structure and Grading:***

Your grade is based on the following:

- A midterm exam (25%)
- A final exam (25%)
- Weekly Canvas quizzes based on the readings and lecture material (30%)
- Weekly activity or discussion post (20%)

Lectures will take place on MWF 10-10:50, on Zoom until announced otherwise. Lecture topics and reading assignments are listed in the schedule below. Full lecture notes (pdf's) will be posted at the beginning of each week. In addition, Zoom recordings/Podcast recordings of the lectures will be posted each week as they occur. You are expected to read the chapters assigned in the textbook. Each week I will post a Canvas quiz based on the assigned readings and the lecture notes/presentations. In addition, each week there will be one assignment or discussion post (details to follow weekly). All quizzes, discussion posts, and assignments will be open-note, open-book, and due on **Sunday at 8 PM** (Pacific Standard Time). Please be sure to submit by the deadline, late assignments will not be accepted.

### ***Textbooks and Readings***

*Volcanoes 2<sup>nd</sup> ed.* by Francis and Oppenheimer is **required** for the class. There will be weekly readings assigned, and quizzes and exam questions will be based in part on the assigned readings, so it is important that you have a copy of the text.

## **SIO 45 Schedule (Winter 2022)**

### **Week 1: 1/3/21 to 1/7/21**

- 1-3 Welcome and introduction; What is volcanology?
- 1-5 Earth basics: formation, plate tectonics, rocks and minerals, geologic processes
- 1-7 Earth basics: formation, plate tectonics, rocks and minerals, geologic processes

**Reading:** The basics: isotopes and green cheese (Ch. 1); Keeping planets cool (Ch. 2)

### **Week 2: 1/10/21 to 1/14/21**

- 1-10 Magma, volatiles, and “why” volcanoes erupt
- 1-12 Magma, volatiles, and “why” volcanoes erupt
- 1-14 Four classic eruptions

**READING:** Four classic eruptions (Ch. 3); Magma: the hot stuff (Ch. 4)

### **Week 3: 1/17/21 to 1/21/21**

- 1-17 NO CLASS (MLK Day)**
- 1-19 Types of volcanic structures and eruptive styles
- 1-21 Types of volcanic structures and eruptive styles

**READING:** Volcanoes as landscape forms (Ch. 13); Types of volcanic activity (Ch. 5)

### **Week 4: 1/24/21 to 1/28/21**

- 1-24 Products of volcanic eruptions (lava flows)
- 1-26 Products of volcanic eruptions (lava flows)
- 1-28 **No Class Independent/Asynchronous work time**

**READING:** Lava flows (Ch. 6)

### **Week 5: 1/31 to 2/4**

- 1-31 Products of volcanic eruptions (explosive volcanism)
- 2-2 Products of volcanic eruptions (explosive volcanism)
- 2-4 *Review for midterm exam (Zoom)*

**READING:** Pyroclastic eruptions: bubbles, bangs, columns, and currents (Ch. 7); What goes up must come down (Ch. 8)

### **Week 6: 2/7 to 2/11**

- 2-7 MIDTERM EXAM**
- 2-9 “Supervolcanic” eruptions and calderas
- 2-11 “Supervolcanic” eruptions and calderas

**READING:** Super-eruptions, super-volcanoes, and calderas (Ch. 11)

**Week 7: 2/14 to 2/18**

- 2-14 Volcanic hazards and monitoring
- 2-16 Volcanic hazards and monitoring
- 2-18 Volcanic risk and society

**READING:** Volcano monitoring (Ch. 17)

**Week 8: 2/21 to 2/25**

- 2-21 NO CLASS (PRESIDENT'S DAY)**
- 2-23 Case Study: Mt. St. Helens (1980 eruption)
- 2-25 Video Presentation (Canvas): Mt. Pinatubo

**READING:** Reducing Volcanic Risk (Ch. 18)

**Week 9: 2/28 to 3/4**

- 2-28 Case Study: Volcanoes of Italy
- 3-2 Case Study: Yellowstone
- 3-4 Case Study: Mt. Pinatubo (Philippines, 1991)

**READING:** Eruptions and climate (Ch. 16)

**Week 10: 3/7 to 3/11**

- 3-7 Case Study: Hawai'i (including the 2018 eruption)
- 3-9 Case Study: Iceland
- 3-11 Case Study: White Island (New Zealand)

**READING:** N/A

**Final exam: Friday (3/18/22) 8:00-11:00 (PST)**





