

Course Outline
Earth Sciences 2240G
Catastrophic Events in Earth History

1. Course Description

Earth Sciences 2240G considers those events so dramatic and catastrophic that they leave evidence in the geologic record and can threaten life on Earth. Included will be violent volcanic eruptions, mega-earthquakes and the tsunamis arising from them, rapid climatic changes and associated storms, and impacts from asteroids and comets. As much as possible, we will use the examples of recent events and processes to help interpret what we read in the rock record.

The content of the course incorporates definitions of basic geologic terminology and concepts required to proceed irrespective of background knowledge.

Prerequisites: Completion of first year requirements.

Antirequisites: Earth Sciences 240A/B, 241A/B, 2241A/B

The course is offered *on-line only*. Course content was primarily developed by Prof. Neil D. MacRae in previous versions of 2240 and is mounted on-line only (*there is no text*).

Course Learning Objectives

- The primary goal of this course is to gain an understanding of those (predictable and unpredictable) events that catastrophically punctuate the normal evolution of Earth.
- We will learn what energy sources fuel Earth's processes in rocks, water and atmosphere, and what factors turn ordinary processes into extraordinary ones.
- We will learn the significance of geologic time and we'll learn how to read dates incorporated in ice, sediments and rocks.
- We will learn to write scientific reports; two assigned topics will be researched and presented in scientific format.

2. Instructor Information

Instructor: Dr. Sean R. Shieh

Contact: Please use the course site message facility to contact me privately.

3. Suggested Weekly Schedule

Part A: Basic Concepts and Processes

Unit 1: Introduction to Natural Processes

Week 1

- **Introduction:** The Scientific Method; Terminology
- **Chapter 1:** Philosophy of Interpretation: Catastrophism vs. Gradualism
- **Chapter 2:** Geological Age Dating

Study Guide for Unit 1

Graded quizzes for Unit 1

Unit 2: Processes Driven by Internal Energy

Week 2

- **Introduction:** Earth's Differentiation; Internal Heat Energy
- **Chapter 3:** Plate Tectonics

Study Guide for Introduction and Plate Tectonics

Graded quiz for Introduction and Plate Tectonics

Weeks 3-4

- **Chapter 4:** Earthquake Basics
- **Chapter 5:** Megathrust Earthquakes and Tsunami
- **Chapter 6:** Transform and Intraplate Earthquakes

Study Guide for Earthquakes

Graded quiz for Earthquakes and Tsunami

Weeks 5-6

- **Chapter 7:** Volcano Basics
- **Chapter 8:** Killer Volcanoes
- **Chapter 9:** Flood Basalts

Study Guide for Volcanoes

Graded quiz for Volcanoes

Mid-term Exam (2 hours); Covers content to end of Chapter 9

Unit 3: Processes Driven by External Energy

Weeks 7-8

- **Chapter 10:** Physics and Chemistry of Air and Water
- **Chapter 11:** Cyclonic Storms
- **Chapter 12:** Climate Basics
- **Chapter 13:** Climate: Past, Present, Future

Study Guide for Weather and Climate

Graded quiz for Weather and Climate

Week 9

- **Chapter 14:** Space Impacts Basics
 - **Chapter 15:** Space Impacts Case Studies
- Study Guide for Space Impacts*
Graded quiz for Space Impacts

Part B: Global Catastrophes that Caused Extinctions

Unit 4: Mass Extinctions

Weeks 10, 11 and 12

- **Introduction:** The Geological Time Scale; Terminology; Potential Causes of Mass Extinctions
 - **Chapter 16:** Precambrian Time
 - **Chapter 17:** A Trip Through the Phanerozoic
 - **Chapter 18:** End-Permian Mass Extinction: *When Life was Nearly Extinguished*
 - **Chapter 19:** End-Cretaceous Mass Extinction: *Death to the Dinosaurs!*
 - **Chapter 20:** Humans and the Holocene Extinctions
- Study Guide for Unit 4*
Graded quiz for Unit 4

Final Exam (2 hours); Content from Chapter 10 to Chapter 20, inclusive.

4. Course Materials

All course content is mounted on-line; neither texts nor supplemental materials are required.

5. Method of Evaluation

- 25% Mid-Term 2 hour written examination: **2/15 2 PM and location(s) to be determined.**
This constitutes the final examination of the first half of the course :Unit 1 and Unit 2 inclusive (i.e. to end of Chapter 9)
- 25% End-of-Term 2 hour written examination
This constitutes the final examination of the second half of the course: Unit 3 and Unit 4 inclusive (i.e. to end of Chapter 20)
- 20% Report 1 (Assigned Research Topic): **2/24**
- 20% Report 2 (Assigned Research Topic): **3/29**
- 10% Graded Quizzes (at intervals during the course; see *Weekly Schedule*)

Notes

A. You have approximately 6 weeks to complete and submit Report 1, then a further 5 weeks to complete and submit Report 2. Please be aware of the following conditions:

The “**Due Dates**” recorded on the assignment pages (*and in the Calendar entry for the course*) are the final dates of submission without penalty.

For 6 days following those “**Due Dates**” reports may be submitted, but will be subject to a mark deduction of 10 marks per late day. No reports will be accepted after that.

B. Graded quizzes may be attempted/submitted at any time, but **MUST** be submitted by the last day of classes (*NOT the day of exams*). It makes sense to do them as you go, at the end of each section to which they apply.

Accessibility Statement: Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

6. Academic Honesty and Medical Statements (PLEASE READ)

University Policies:

1) Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

<http://www.uwo.ca/univsec/handbook/appeals/scholoff.pdf>

2) Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

3) **All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism.** All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

4) If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the

Dean's Office immediately. For further information please see:

<http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here:

https://studentservices.uwo.ca/secure/medical_document.pdf