

## **COURSE OUTLINE**

### **Geology 120 Earthquakes**

#### **I. Catalog Statement**

Geology 120 introduces the student to the current knowledge of earthquakes, with special reference to California, emphasizing their occurrence, causes and properties and the way the dangers from earthquakes can be reduced. The material presented is appropriate for student seeking to fulfill general science requirements as well as for those wishing to acquire a specialized knowledge of the subject.

Units - 3.0

Lecture Hours - 3.0

Prerequisite: None

#### **II. Course Entry Expectations**

Skills Expectations: Reading - 5; Writing - 5; Listening/Speaking - 5 Math - 2

#### **III. Course Exit Standards**

Upon successful completion of the required course work, the student will be able to:

1. use a seismogram to determine the location and magnitude of an earthquake and examine the scope and limitations of the magnitude and intensity scales;
2. recognize on a map the relationships of earthquakes and faults, volcanoes and plate boundaries;
3. analyze and describe the relationships between seismicity and plate tectonism, tsunamis, and hydrostatic pressure and explain the causes and mechanism of earthquakes;
4. evaluate and analyze the rationale for different methods and techniques of earthquake prediction and the information they yield about self-protection in a earthquake, and about building for earthquake-resistance.

#### **IV. Course Content**

##### **A. The nature and occurrence of earthquakes**

6 hours

1. Review of some of the recent major earthquakes such as 1995 Kobe, 1994 Northridge, 1992 Landers, 1989 Loma Prieta.
2. Earthquake epicenter, hypocenter and focal depth

- 3. The global mosaic of earthquakes
- 4. Seismicity patterns and tectonic plates
- B. Locating the earthquakes 3 hours
  - 1. The body and surface waves
  - 2. Seismographs and seismograms
  - 3. Determining the epicenter
  - 4. Seismograph arrays
- C. Earthquakes and the planetary interior 5 hours
  - 1. Earth's internal structure
  - 2. Earthquake wave propagation inside the earth
  - 3. Detecting and mapping the solid inner core
- D. Seismicity, faults, fracture zones and rifts 6 hours
  - 1. The types of faults
  - 2. The description of some recent notable fault ruptures such as 1990 Philippines, 1988 Armenia, 1979 Imperial Valley
  - 3. The transform faults
  - 4. Rift valleys and seismicity, e.g., 1811-12 New Madrid
  - 5. Mid-Atlantic fracture zones and seismicity in the eastern U.S.
- E. The cause and size of an earthquake 5 hours
  - 1. Types of earthquakes
  - 2. The elastic rebound theory
  - 3. Changes in the rocks
  - 4. Intensity of shaking
  - 5. Magnitude, energy release, and ground acceleration
- F. Volcanoes, tsunamis and earthquakes 6 hours
  - 1. Hawaiian volcanism and seismicity
  - 2. 1980 Mt. Saint Helen's and the Pacific "Ring of Fire"
  - 3. The Mammoth Lakes earthquake swarm
  - 4. Volcanism and seismicity from Yellowstone to the Columbia River
  - 5. Tsunamis and the tsunami alerts
- G. Earthquakes and water 5 hours
  - 1. The effect of water on the subsurface rocks  
e.g. the Rangely Oil Field experiment
  - 2. Liquefying wet sand
  - 3. Dam safety and earthquakes, e.g., 1967 Koyna, 1975 Oroville, 1981 Aswan, 1971 Van Norman (San Fernando Valley)
  - 4. Lunar seismicity
- H. Earthquake prediction 6 hours
  - 1. Efforts at earthquake forecasting
  - 2. Clues for recognizing impending earthquakes
  - 3. Fossil earthquakes
  - 4. The Cascadian subduction zone
  - 5. The Parkfield prediction experiment
  - 6. Calculating the odds of an earthquake
- I. Reducing the loss of life and property 6 hours
  - 1. Types of hazards

2. The 1983 Coaling, 1985 Mexico, 1989 Newcastle, 1989 Loma Prieta, 1994 Latur and the 1995 Kobe events
3. Steps to reduce hazards to homes
4. Improvements in planning and zoning
5. Major engineering structures and earthquake risk

**V. Methods of Presentation**

The following instructional methodologies may be used in the course:

1. Traditional white board and lecture format.
2. Instructor led discussion

**VI. Assignments and Methods of Evaluation**

1. Periodic hour-long written tests or quizzes
2. Comprehensive written final exam.

**VII. Textbooks**

Bolt, Bruce A. Earthquakes, 4th or current edition.  
New York, NY: W.H. Freeman  
13th Grade Textbook Reading Level ISBN 0-7167-3396-X

**VIII. SLO**

1. Students will be able to discuss the theory of plate tectonics.
2. Students will be able to discuss why earthquakes occur and how they are measured
3. Students will gain an appreciation for how science works and the difference between evidence and theory.
4. Students will be able to discuss the efforts being made to mitigate damage and loss in regions prone to earthquakes.