

Las Positas College
3000 Campus Hill Drive
Livermore, CA 94551-7650
(925) 424-1000
(925) 443-0742 (Fax)

Course Outline for GEOL 5

ENVIRONMENTAL GEOLOGY: HAZARDS & DISASTERS

Effective: Fall 2010

I. CATALOG DESCRIPTION:

GEOL 5 — ENVIRONMENTAL GEOLOGY: HAZARDS & DISASTERS — 3.00 units

Understanding and planning for the effects of natural hazards and disasters on the earth, the ecosystem and human populations. Content covers the basic natural hazard processes, where and why they occur, as well as considerations for environmental land-use planning. Environmental hazards studied include earthquakes, volcanoes, river systems (including floods and dams), landslides, coastal erosion, tsunamis, sinkholes, etc.

3.00 Units Lecture

Grading Methods:

Pass/No Pass

Discipline:

	MIN
Lecture Hours:	54.00
Total Hours:	54.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

- A. explain the scientific method; and to be able to differentiate facts from theories;
- B. discuss the common theories regarding the formation of the Earth, its atmosphere, oceans and internal layers;
- C. analyze and discuss the evidence for Plate Tectonics and to apply plate tectonics to the interpretation and analysis of basic geologic features
- D. explain what minerals are and how they are formed;
- E. categorize the three basic rock groups and the common rock types in each group; to explain their origin and classification system;
- F. demonstrate a knowledge of the Geologic Time Scale, to describe the fossil record and to explain radiometric dating and to calculate geologic ages;
- G. explain the basics of stratigraphy and to analyze relative age-dating geologic configurations;
- H. identify and explain the basics of structural geology; including folds and faults and their relationships to plate tectonics;
 - I. explain the fundamentals of mass wasting and to discuss and analyze living in mass-wasting-prone regions
 - J. explain the fundamentals and to discuss and analyze the basic aspects of planning and living in tsunami-risk zones;
- K. identify and explain where and why volcanoes occur, to identify and differentiate types of volcanoes, to explain how volcanoes relate to plate tectonics, to explain the current status of eruption prediction, and to discuss and analyze the basic aspects of planning and living in volcanic regions;
- L. explain and discuss the fundamentals of coastal erosion and to discuss and analyze the basic aspects of planning and living in shoreline regions;
- M. explain and discuss the fundamentals of river systems and to analyze and discuss the basic aspects of planning and living around rivers;
- N. explain and discuss the fundamentals of groundwater processes, sinkholes and karst topography; and to analyze and discuss the basic aspects of planning and living in karst regions.

V. CONTENT:

- A. Geologic Time
 1. Eons, Eras and Periods
 2. What geologic event occurred at the beginning/end of each Eon and Era
 3. Radiometric Age Dating
 - a. Radioactive decay and half-lives
 4. Formation of the Solar System and Earth
 5. Basic Fossil Record Through Time (trace fossils, Cambrian explosion, Age of Invertebrates, Age of Fishes, Age of Amphibians, Age of Reptiles (including dinosaurs), Age of Mammals, etc.)
- B. Plate Tectonics
 1. Evidence for, and evolution of, Plate Tectonic Theory
 2. Impact of Plate Tectonic Theory to the fundamentals of global geologic interpretations
 - a. Three Types of Plate Edges and their geologic features: volcanoes, earthquakes, etc.

- b. Hot Spots
- C. Minerals
 - 1. What are Minerals?
 - 2. How do Minerals Form?
- D. Basic Rock Types and Processes
 - 1. The Rock Cycle
 - 2. Igneous rocks and igneous activity
 - a. Basic igneous rock types
 - b. Where and how these rocks are formed
 - 3. Sedimentary rocks and their deposition
 - a. Basic Types of Sedimentary Rocks
 - b. Stratigraphy
 - 1. Relative Age Dating
 - 4. Metamorphism and metamorphic rocks
 - a. Basic Types of Metamorphic Rocks
 - b. Where and how metamorphic rocks form
 - 5. Structural Geology
 - a. Folds and Faults
 - b. Understanding Geologic Maps
- E. Mass Wasting (landslides)
 - 1. Driving forces and mechanisms
 - 2. Types of Landslides and Mass Wasting
 - 3. Building and living in landslide-prone areas
- F. Coastal Zones and Processes
 - 1. Shoreline processes, systems and hazards
 - 2. Building and living on coastlines
- G. Earthquakes
 - 1. Where and Why Do Earthquakes Occur?
 - 2. Basic Seismometers
 - 3. Types of Earthquake Waves
 - 4. Typical Seismic Record
 - 5. Locating the Earthquake Epicenter and Hypocenter
 - 6. Intensity and Magnitude Scales
 - a. Rossi-Forel and Modified Mercalli Scales
 - b. Richter Magnitude, Moment Magnitude, etc.
 - 7. Earthquake Prediction?
 - a. Common ideas of earthquake predictors (e.g., "earthquake weather", animal behavior, etc.
 - b. Has an Earthquake ever been accurately predicted?...China....
 - c. Earthquake Cycle – Parkfield, CA
 - d. Was the Loma Prieta Earthquake predicted?
 - 8. Types of earthquake hazards
 - 9. Living in earthquake-prone regions
 - a. Building and land-use planning in earthquake prone regions
- H. Tsunamis
 - 1. Processes of formation
 - 2. Identification of tsunami-prone regions
 - 3. Living, building and land-use planning in tsunami-prone regions
- I. Volcanoes
 - 1. Where and why volcanoes occur
 - 2. Types of volcanic hazards
 - 3. Living in volcanic regions
 - a. Building and land-use planning in volcanic regions
- J. Water Systems
 - 1. The Hydrologic Cycle
 - 2. River Systems
 - a. Basic Features of River Systems
 - b. Meander Migration
 - c. Floods, floodplains and their features and processes
 - d. Living near rivers
 - 1. Building and land-use planning near rivers
 - 3. Groundwater and Sinkholes
 - a. Basic Groundwater Features and Processes
 - b. Living, building and land-use planning in Karst Topography

VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. **Discussion** -
- C. CD-ROM images and animations
- D. 35mm and powerpoint slides
- E. Publisher's website
- F. **Audio-visual Activity** - Video clips
- G. Internet
- H. Online course software such as Blackboard
- I. Textbook (with textbook CD-ROM, if available)
- J. **Demonstration** -

VII. TYPICAL ASSIGNMENTS:

A. Construct a list of features to look for when attempting to determine the landslide potential of a hillside. B. List and explain the best ways to build for earthquake-prone regions. C. Read Chapters 1 thru 4. Look up the vocabulary words in these chapters and complete online Vocabulary Quiz 1. Use the textbook glossary and index, the Geologic Dictionaries available in the Science Center, and Internet search engines such as Google. D. Memorize the Eons, Eras and Periods of the Geologic Time Scale. E. Complete the Study Guide questions for Exam 2. F. Read Chapter 15 in the textbook. 1. Look up all vocabulary for this chapter. 2. Learn to identify the geomorphic features in this chapter in satellite images and regular aerial and ground photos. 3. Make sure that you understand the basic geologic processes discussed in this Chapter. 4. Complete the questions in the Study Guide that refer to the topics in this chapter. G. Research Paper. Submit a 5-10 page 12-point paper on a geologic topic approved by the instructor. H. Presentation. Create and present a 5-10 minute presentation on a geologic topic approved by the instructor.

VIII. EVALUATION:

A. **Methods**

B. **Frequency**

1. Homework can be assigned daily, weekly or all at the beginning of the term or only as needed, at the discretion of the instructor
2. Quizzes will be given daily, weekly, bi-weekly or at the discretion of the instructor
3. Quizzes/Midterms/Final Exam/Term Paper – at least 3 or 4 total. For example, there may be 2 midterms, one final exam and one term paper. Or, there may be 4 on-line quizzes, 3 in-class midterms and one in-class final exam.

IX. TYPICAL TEXTS:

1. Blatt, H. *Laboratory Exercises in Environmental Geology*. 2nd ed., McGraw Hill Publishers, 1998.
2. Foley, D *Investigations in Environmental Geology*. 3rd ed., Prentice-Hall Publishers, 2009.
3. Keller, E. *Introduction to Environmental Geology – with CD*. 4th ed., Prentice-Hall Publishers, 2008.
4. Montgomery, C.W *Environmental Geology*. 8th ed., WCB McGraw-Hill Publishers, 2008.
5. Tarbuck, E.J. and Lutgens, F.K *Earth, An Introduction to Physical Geology*. 9th ed., Pearson/Prentice Hall Publishers., 2008.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Access to the internet and computers, through the LPC Computer Center, or access to a personal computer at home with an internet connection
- B. A small booklight for taking notes while satellite and slides are discussed in class
- C. A set of colored pencils
- D. Study guides as made available by the instructor