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

Course Outline for GEOL 3

HISTORICAL GEOLOGY

Effective: Spring 2014

I. CATALOG DESCRIPTION:
GEOL 3 — HISTORICAL GEOLOGY — 3.00 units

Formation and development of the earth, its oceans, atmosphere and life through time. Emphasis on the Geologic Time Scale, the fossil record, introductory biostratigraphy, radiometric dating, index fossils, fossil assemblages, paleo-ecology, mass extinctions, types of fossil preservation, paleoclimate, Ice Ages and glacial events through time, paleogeography: plate tectonic configurations throughout time, major events through the scope of Geologic Time, etc.

3.00 Units Lecture

Prerequisite
GEOL 1 - Physical Geology
or

GEOL 5 - Environmental Geology: Hazards & Disasters
or

GEOL 7 - Environmental Geology: Resources, Use Impact & Pollution

Grading Methods:
Letter or P/NP

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:

Before entering the course a student should be able to:

A. GEOL1
B. GEOL5
C. GEOL7

IV. MEASURABLE OBJECTIVES:

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

1. explain and discuss the most commonly proposed theories for the formation of the earth and solar system;
2. construct the geologic time scale; including the Eons, Eras and Periods;
3. recognize the important, notable and/or common fossils found in each basic Eon, Era and Period;
4. explain the basic methods by which fossils are formed
5. explain and discuss the fundamentals of the geologic axiom: The Present is The Key to the Past
6. explain and discuss the fundamentals of studying the history of life through correlating ancient fossil animals with current fossil animals as well as present living organisms;
7. explain and apply the methods of radiometric dating.
8. explain and discuss the basics concepts of Geologic Time in terms of the development and understanding of the geologic time scale throughout human history and the techniques and methods for interpreting the geologic time scale.
9. explain and discuss the evidence for Earth's paleo-climates throughout the Earth's history
10. explain paleo-ecology and how it is determined and interpreted in the rock and fossil record
11. explain and discuss the evidence for the plate tectonic history of the Earth, including supercontinents
12. explain, discuss, and decipher, the Earth's history through stratigraphy, relative age-dating, and sedimentary environments and structures

V. CONTENT:
A. Review
1. Earth As a System
2. Earth Materials; Rock Forming Minerals and Rocks
a. Common and important minerals

b. Igneous, Sedimentary and Metamorphic Rocks
c. Rock Cycle
3. Plate Tectonic Overview/Review

B. Concepts and Principles of Geologic Time
1. Uniformitarianism, catastophism, actualism
2. Absolute/Radiometric Dating
a. principles
b. typical radiometric isotopes used in geologic dating
3. Relative Dating
a. Law of Original Horizontality
b. Law of Superposition
c. Crosscutting Relationships
d. Inclusions
e. Unconformities; disconformities, angulary unconformities, nonconformities
4. The basic Geologic Time Scale; eras, eons & periods
5. Fossil succession
6. Stratigraphic Units
7. Event stratigraphy; marker beds & index fossils

C. Stratigraphy, Sedimentary Rocks & Environments
1. Steno's principles
2. Non-Marine Environments
3. Marginal Marine and Open-Shelf Environments
4. Deep-Sea Environments
5. Sea level changes; stratigraphic sequences; transgressions & regressions
6. Biostratigraphy
7. Interpret sequences of geologic events

D. Earth's Biosphere and its Evolution through Time
1. Diversity & basic classifications of Life
a. taxonomic groups
b. clades and their relationships
c. Archea and Bacteria
d. Protists
e. Fungi
f. Plants
g. Animals
2. Fossil and Chemical Remains of Ancient Life
a. types of fossils
b. types of fossilization
c. Environments & Ecology
1. Atmosphere
2. Terrestrial Realm
3. Marine Realm
4. Freshwater Environments
5. PaleoEcology
6. Paleoclimates
d. Evolution
1. Darwin
2. natural selection
3. Genes, DNA, chromosomes
4. populations, species and speciation
5. evolutionary convergence
6. extinctions
7. evolutionary trends

E. Plate Tectonics
1. The evidence as discovered and understood through human history
2. Plate Tectonic settings; the geology of convergent, divergent and transform margins; earthquakes, volcanoes; hot spots; plate movement; subduction; supercontinents; mountain building; rifting; accretion and suturing

F. Chemical Cycles
1. carbon dioxide
a. trends in atmospheric carbon dioxide
2. oxygen
a. oxygen isotopes
3. carbon
4. Ocean chemistry and skeletal mineralogy

G. The Story of the Earth Through Time; including the fossil record, the evolution and development of life; fossil assemblages; paleoecology; extinctions; the plate tectonic development and histories; supercontinent cycle; atmospheric changes and evolution; Ice Ages;
1. The Hadean and Archean Eons of the PreCambrian
2. The Proterozoic Eon of the PreCambrian
3. The Early Paleozoic World
4. The Middle Paleozoic World
5. The Late Paleozoic World
6. The Mesozoic World
a. The Triassic World
b. The Jurassic Worlds
c. The Cretaceous World
7. The Paleogene World
8. The Neogene World
9. The Holocene World
a. Human Evolution

VI. METHODS OF INSTRUCTION:

A. **Directed Study** - using the textbook with publisher materials as available (e.g., online flashcards, online animations, etc)
B. **Discussion** - e.g., through Class Discussion Boards and Class Wikis
C. **Audio-visual Activity** - - videos and video clips on relevant course-related topics; includes online images and animations; online quizzes with images, etc.
D. **Lecture** - when the course is offered in the traditional on-campus setting. When offered in the online, distance education, lecture material will be accessed through the textbook, online videos, online video clips, web pages on specific topics, etc.
E. **Student Presentations** - - at the instructor's discretion. May be posted to Class Discussion Boards, Class Wikis, etc.

F. **Classroom Activity** - e.g., through Class Discussion Boards and Class Wikis. etc.
G. **Projects** - e.g., through Class Discussion Boards, Class Wikis, etc. For either Group or Individual projects, as determined by the instructor.
H. **Research** - - e.g., for Group Projects and/or for term papers and/or for Discussion Board or Wiki projects.

VII. TYPICAL ASSIGNMENTS:

A. 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.
B. Memorize the Eons, Eras and Periods of the Geologic Time Scale
C. Complete the Study Guide questions for Exam 2.
D. Complete the homework assignment and problems on radiometric dating.
E. Read Chapter 15 in the textbook. This topic will not be covered during class time.
    1. Look up all vocabulary for this chapter.
    2. Make sure that you understand the basic geologic processes discussed in this Chapter.
    3. Complete the questions in the Study Guide that refer to the topics in this chapter.
F. Research Paper. Submit a 5-10 page 12-point paper on a geologic topic approved by the instructor.
G. Presentation. Create and present a 5-10 minute presentation on a geologic topic approved by the instructor.
H. Participate in the online class Discussion Board by posting information and links about unusual fossils.
I. Contribute to the online class Wiki and send the instructor an email with the content of your Wiki contributions.

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Quizzes
3. Research Projects
4. Papers
5. Oral Presentation
6. Projects
7. Group Projects
8. Class Participation
9. Class Work
10. Home Work
11. Class Performance

B. **Frequency**

1. Frequency
    a. Homework can be assigned daily, weekly or all at the beginning of the term or only as needed, at the discretion of the instructor
    b. Quizzes will be given daily, weekly, bi-weekly or at the discretion of the instructor
    c. 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. Levin, H.L.. *The Earth Through Time.* 10th ed., Wiley Text Publisher, 2010.
2. Prothero, D.R. and Dott, R.H. *Evolution of the Earth,* . 8th ed., McGraw Hill Publishers, 2009.
3. Stanley, S.M. *Earth Systems History.* . 3rd ed., W.H. Freeman & Company Publishers, 2009.
4. Wicander, R. and Monroe, J.S *Historical Geology.* 5th ed., Thomson Brooks Cole Publishers, 2009.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. A. Access to the Internet and computers, through the LPC Computer Center, or access to a personal computer at home with an Internet connection