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Course Outline for GEOL 3L
HISTORICAL GEOLOGY LABORATORY
Effective: Fall 2013

I. CATALOG DESCRIPTION:

GEOL 3L — HISTORICAL GEOLOGY LABORATORY — 1.00 units

Laboratory exercises to support and reinforce the Historical Geology lecture course. Includes lab exercises in rocks and minerals, relative and absolute age-dating, biostratigraphy, radiometric dating, the construction of geologic histories from geologic map data, types of fossil preservation, fossil identification and morphology of the common and important fossils throughout the Geologic Time Scale. Formation and development of the earth, its oceans, atmosphere and life through time. Prerequisite: Geology 3 lecture (may be taken concurrently with this lab).

1.00 Units Lab

Prerequisite

GEOL 3 - Historical Geology
with a minimum grade of C
(May be taken concurrently)

Grading Methods:

Letter or P/NP

Discipline:

	<u>MIN</u>
Lab 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. GEOL3

IV. MEASURABLE OBJECTIVES:

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

1. recognize and identify the basic rocks types (e.g., within the igneous, sedimentary and metamorphic groups) and common minerals (e.g., quartz, calcite, feldspar, etc.)
2. apply the methods of radiometric dating to the calculation of geologic ages;
3. apply the methods of relative age-dating to the unraveling and deciphering of geologic sequences and histories;
4. identify and explain the various types of fossilization;
5. recognize and identify the common or important fossils from the basic time periods;
6. decipher biostratigraphy problems;
7. interpret geologic histories from geologic map data;
8. construct the geologic time scale; including the Eons, Eras and Periods;
9. interpret the history of the earth through analysis and correlation of ancient sediments with current sedimentary environments.
10. recognize and interpret plate tectonic geologic features, settings and ramifications; with emphasis on the interpretation of past plate tectonic events and histories (including supercontinent cycles) from the geologic evidence present today;
11. decipher and interpret PaleoClimates and PaleoEcology, Evolution and Extinctions from available Geologic evidence (applying the paleo-principles and understandings covered in the lecture section)

V. CONTENT:

Includes lab exercises in relative and absolute age-dating, biostratigraphy, radiometric dating, the construction of geologic histories from geologic map data, types of fossil preservation, fossil identification and morphology of the common and important fossils throughout the Geologic Time Scale. Formation and development of the earth, its oceans, atmosphere and life through time, including paleoclimates, plate tectonics and supercontinents, and biological ecology, evolution and extinction. Includes a review of Geology 1 lab introduction to rocks and minerals and interpreting geologic cross-sections.

A. Rock and Mineral Review

1. review of how to test and identify rocks and minerals
2. review of common rocks and minerals

- B. Relative Dating
 - 1. Interpreting the geologic order of events
 - a. Law of Horizontality
 - b. Law of Superposition
 - c. Cross-cutting relationships
- C. Absolute Age Dating
 - 1. Half-life calculations and exercises
 - a. Principles of radioactive decay
 - b. Half-lives
 - c. Common types of radiometric elements used to date geologic fossils and strata
 - 1. 40K/40Ar
 - 2. 87Rb/87Sr
 - 3. 238U/206Pb
 - 4. 235U/207Pb
 - 5. 14C/14N
 - 6. And other radiometric elements as deemed appropriate by the instructor
 - d. Calculation of radiometric ages
 - e. Understanding the errors inherent with radiometric dating
- D. Types of Fossilization
 - 1. Trace fossils, molds and casts
 - 2. Dessication
 - 3. Recrystallization
 - 4. Permineralization
 - 5. Replacement
 - 6. Carbonization
 - 7. Coprolites
 - 8. Gastroliths
- E. Identification and familiarization with representative fossils from throughout the geologic time scale
 - 1. Ediacaran fauna
 - 2. Stromatolites
 - 3. Trilobites
 - 4. Brachiopods
 - 5. Rugose corals
 - 6. Belemnites
 - 7. Ammonites
 - 8. Sponges
 - 9. Bryzoans
 - 10. Stemmed crinoids
 - 11. Conodonts
 - 12. Shark's teeth
 - 13. Graptolites
 - 14. Eurypterids
 - 15. And other fossils as deemed appropriate by the instructor
- F. Biostratigraphy exercises including biological ecology, evolution and extinction.
- G. Interpretation of Geologic Cross-sections
 - e.g., Geologic Histories from Geologic Map Data
- H. Paleoclimate evidence and interpretation
- I. Paleogeographic reconstruction
 - 1. Plate Tectonics and Supercontinents
- J. Other appropriate historical geology exercises; examples include
 - 1. constructing and interpreting cladograms
 - 2. Paleogeographic reconstruction; Plate Tectonics and Supercontinents

VI. METHODS OF INSTRUCTION:

- A. Specimens (e.g., fossils)
- B. **Field Trips** - at the instructor's discretion
- C. **Lab** - laboratory exercises and activities; lab manual, CD-ROM (if available), publisher's website (if available), instructor's website (if available and may include the use of campus online software such as Blackboard) - in addition to on-campus laboratory activities and exercises.
- D. **Discussion** - At the instructor's discretion, and dependent on the type of laboratory exercise or activity, discussion may be held in-class as part of a lab with the entire class, or in small lab groups, and/or online in Discussion Boards or course chatrooms to facilitate lab group work as appropriate.
- E. Presentations at the instructor's discretion, and may include: 1. Cd-rom/dvd images and animations 2. slides 3. Demonstrations 4. Video clips 5. Internet and online materials, websites, quizzes, bulletin boards, etc.

VII. TYPICAL ASSIGNMENTS:

- A. Complete laboratory exercise(s) in relative dating. B. Memorize the Eons, Eras and Periods of the Geologic Time Scale
- C. Complete laboratory exercise(s) on Types of Fossilization. D. Presentation. Create and present a 5-10 minute presentation on a geologic topic approved by the instructor. E. Field Reports

VIII. EVALUATION:

A. **Methods**

- 1. Exams/Tests
- 2. Quizzes
- 3. Research Projects
- 4. Papers
- 5. Oral Presentation
- 6. Projects
- 7. Field Trips
- 8. Group Projects
- 9. Class Participation
- 10. Class Work
- 11. Home Work
- 12. Lab Activities

B. **Frequency**

1. Frequency

- a. Laboratory exercises, assignments, reports – weekly (at each lab meeting)
- b. PreLabs and PreLab Quizzes; weekly – or at the instructor's discretion
- c. Laboratory Practical Exams; at least two
- d. In-Lab Practice Quizzes; weekly – or at the instructor's discretion
- e. Field Trip – at the instructor's discretion

IX. TYPICAL TEXTS:

- 1. Poort, J.M., and Carlson, R.J.. *Historical Geology; Interpretations and Applications*. 7th ed., Prentice-Hall, 2010.
- 2. Smith, J.C. Levin, H.L. and Smith, M.S *Earth History; Laboratory Studies* . 9th ed., McGraw Hill Publishers, 2008.
- 3. Peterson, M.S, and Ritter, S. *Interpreting Earth History; A Manual in Historical Geology*. 7th ed., WCB McGraw-Hill, 2010.

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 set of colored pencils
- C. A calculator that can calculate logarithms
- D. Study guides/instructions/lab exercises as made available by the instructor