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Course Outline for GEOL 12L

INTRO TO OCEANOGRAPHY LAB

Effective: Fall 2017

I. CATALOG DESCRIPTION:
GEOL 12L — INTRO TO OCEANOGRAPHY LAB — 1.00 units

Laboratory course to supplement the oceanography lecture course. Introduction to the materials and techniques of oceanic science. Includes sea floor rocks, oceanic geography, bathymetric maps, seismic reflection, seawater physics and chemistry, beach sand, tides, waves, marine life and marine fossils, sea floor spreading rates, etc.

1.00 Units Lab

Prerequisite
GEOL 12 - Introduction to Oceanography
(May be taken concurrently)

Grading Methods:
Letter or P/NP

Discipline:

	MIN
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. GEOL12

IV. MEASURABLE OBJECTIVES:

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

A. explain and apply the scientific method;
B. test and identify sea floor rocks;
C. interpret bathymetric and sea floor geomorphic maps;
D. interpret landforms and sea floor geology from bathymetric maps;
E. construct bathymetric contours and cross-sections (profiles);
F. interpret and evaluate oceanic data; e.g., for pH, salinity, density, tides, tidal currents, waves, and currents, etc.
G. interpret simple seismic reflection profiles
H. calculate sea floor spreading rates from magnetic stripe information, radiometric age data, etc.;

V. CONTENT:
A. Scientific Method
B. Seawater and Marine Conditions
    1. Tides
    2. Waves
    3. Marine Weather forecasts
C. Bathymetric Maps
    1. Constructing bathymetric maps
    2. Contour lines
    3. Interpreting the geomorphology and geology from the bathymetric map
    4. Constructing cross-sections (profiles)
D. Marine Geology/Geography/Geomorphology
E. Sea-Floor Spreading
    1. Magnetic stripe records
    2. Calculation of sea floor spreading rates
F. Seismic Reflection/Refraction Profiles
    1. Interpretation of simple seismic reflection/refraction profiles
G. Sea Floor Rocks
H. Beach Sand
I. Seawater Physics and Chemistry
    1. Archimedes Principle and the determination of density

a. Explicitly applying the scientific method
b. Formal scientific lab report; including error analysis
2. Measuring pH and salinity
3. Stratification: Haloclines, pycnoclines, thermoclines, etc.

J. Radiometric Age Dating (at the discretion of the instructor if there is time in the semester for a lab on this)
K. Student-run personal field trip (at the instructor's discretion)
1. Observation, photos and notes on shoreline geologic features and/or marine life
2. Including marine conditions such as tides, waves, coastal marine forecasts, etc.

VI. METHODS OF INSTRUCTION:

A. **Directed Study** - Directed student exploration
B. **Lab** - student group exploratative and inter-student questioning (thinking and working it through with other students);
C. **Lab** - May include Marine Rock and Oceanic Map Exercises; Seawater Laboratories and/or lab manual exercises
D. **Lab** - practice quizzes; pre-lab assignments; laboratory specimens and equipment; online laboratory assignments
E. **Audio-visual Activity** - online animations and videos
F. **Observation and Demonstration** -
G. **Lab** - Internet in-class and for use on homework;
H. **Demonstration** -

VII. TYPICAL ASSIGNMENTS:

A. Sea Floor Rock Labwork
1. Use the provided testing equipment to differentiate the provided sea floor samples.
2. Figure out and confirm what identifying properties are distinctive and characteristic for each sample
3. For each sea floor sample with several varieties, figure out what distinguishing properties are common for all varieties

B. Pre-Lab Assignments/Quizzes (open book)
1. Look up the following information and vocabulary
2. Take the online open-book, prelab quiz after you have finished looking up the pre-lab information

C. In-Lab Practice Quizzes (open book); complete the practice quiz based on your pre-lab work and your lab exercise notes.
D. Field Work and/or Lab Report; possibly for a student-run personal field trip (at the instructor's discretion)
1. Observation and notes on shoreline geologic features and/or marine life
2. Including marine conditions such as tides, waves, coastal marine forecasts, etc.

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Quizzes
3. Research Projects
4. Portfolios
5. Papers
6. Oral Presentation
7. Projects
8. Field Trips
9. Simulation
10. Group Projects
11. Class Participation
12. Class Work
13. Home Work
14. Lab Activities
15. Other:
a. Laboratory exercises, assignments and reports
b. PreLab Exercises and Quizzes
c. Lab Practical Exams applying laboratory techniques
d. In-Lab Practice Quizzes
e. Lab Practical exam(s)
f. Attendance and/or participation (at the instructor's discretion)
g. Field reports
h. Laboratory Reports

B. **Frequency**

1. Laboratory exercises, assignments, reports – weeklly (one or more of these at each class meeting)
2. PreLabs and PreLab Quizzes; weekly – or at the instructor's discretion
3. Laboratory Practical Exams; at lease one (more at the instructor's discretion)
4. In-Lab Practice Quizzes; weekly – or at the instructor's discretion
5. Laboratory Reports - at the instructor's discretion

IX. TYPICAL TEXTS:

1. Johnson, R.E. *Oceanography Laboratory Manual.* 5th ed., Kendall/Hunt, 2003.
2. Weise, . *Oceanography 1L Lab Manual, .* 2nd ed., Department of Earth Sciences, 2012.
3. Chauffe, Karl, and Mark Jefferies. *Laboratory Manual to accompany Invitation to Oceanography.* 1st ed., Jones & Bartlett Learning, 2013.
4. Pipkin, , Gorsline, Casey, Dunn, and Schellenburg. *Laboratory Exercises in Oceanography.* 3rd ed., WH Freeman, 2000.
5. Garrison, T. *Oceanography: An Invitation to Marine Science.* 9th ed., Brooks-Cole, 2016.
6. Trujillo, A, and H Thurman. *Essentials of Oceanography.* 12th ed., Prentice-Hall, 2017.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. A. Lecture textbook B. Colored pencils C. Ruler and protractor D. Calculator capable of addition, subtraction, multiplication and division E. Workbook and/or handouts produced by the instructor (at the instructor's discretion) F. LPC computer access and/or print card G. Computer/Internet access at home or ability to access the LPC on-campus facilities