Las Positas College
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Course Outline for BIO 60

MARINE BIOLOGY

Effective: Fall 2019

I. CATALOG DESCRIPTION:
BIO 60 — MARINE BIOLOGY — 4.00 units

Ocean as a habitat, the organisms that inhabit marine waters, their ecology, adaptations and evolution, and the role of the ocean in the ecology of the biosphere.

3.00 Units Lecture 1.00 Units Lab

Grading Methods:
Letter or P/NP

Discipline:
- Biological Sciences

	MIN
Lecture Hours:	54.00
Lab Hours:	54.00
Total Hours:	108.00

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. Describe the basic principles of geological, physical, biological, and chemical oceanography.
B. Explain basic ecological principles, at the population, community, and ecosystem levels.
C. Explain the basic theory, mechanisms, and results of evolution by Natural Selection.
D. Describe structure, and function of important marine taxa with a focus on those found along the coast of California.
E. Define and describe primary production, photosynthesis, and chemosynthesis in the ocean and explain the factors that affect primary production.
F. Compare and describe the structure, importance and controls of pelagic and benthic food webs.
G. Identify structure, important taxa, abiotic and biotic features of intertidal, near shore subtidal, pelagic, and deep-sea environments.

V. CONTENT:
A. Review of basic science, and the scientific method
B. The geography of the oceans and geology of the sea floor
    1. Overview of ocean facts and geography
    2. Profile of the ocean bottom and ocean depth zones
    3. Review of plate techtonics
C. The chemistry of seawater
    1. Properties of water
    2. Inorganic chemistry of seawater
    3. Salinity and measurements
    4. Carbon in seawater
D. Primary Production
    1. Concept of limiting nutrients
    2. Nutrients for plant growth
    3. Nutrient distribution
    4. Light penetration
E. Phytoplankton and Bacterioplankton
    1. Planktonic bacteria; cyanobacteria
    2. Phytoplankton diversity and size categories
    3. Diatoms
    4. Dinoflagellates
    5. Chlorophyll and measurement of phytoplankton productivity
    6. Light in the ocean and the relationship between photosynthesis and light intensity
    7. Factors that affect phytoplankton growth and production
F. Zooplankton
    1. Zooplankton diversity and size categories
    2. Microzooplankton -- Unicells

3. Copepods and other planktonic crustaceans
4. Holoplankton and Meroplankton
5. Features shared by planktonic organisms
6. Planktonic predators
7. How to avoid predation in the plankton

G. Introductory suvey of animal phyla
1. List of all phyla (traditional groupings and phylogenetic groupings)
2. Porifera
3. Cnidaria
4. Ctenophora
5. Annelida
6. Mollusca
7. Arthropoda
8. Echinodermata
9. Chordata

H. Nekton
1. Invertebrate examples
2. Jawless fish -- Class Agnatha
3. Cartilaginous fish – Class Chondrichthyes
4. Bony fish – Class Osteichthyes
5. Coloration
6. Migration

I. Marine mammals
1. Carnivora
2. Sirenia
3. Cetaceans

J. Marine Ecology

K. Ocean circulation
1. Winds patterns, Coriolis effect and surface currents
2. Gyres
3. Boundary currents
4. Vertical temperature, salinity and density structure of the ocean.
5. Thermohaline circulation and deep water formation

L. Open ocean ecosystems
1. Structure of pelagic food webs, traditional and the microbial loop
2. Seasonal patterns in phytoplankton production
3. Equatorial upwelling
4. Gyres
5. Polar latitudes
6. The iron hypothesis
7. Ocean's role in the global carbon cycle

M. Intertidal ecosystems
1. Waves and tides
2. Abiotic and biotic factors that structure intertidal communities
3. Intertidal communities of California

N. Coastal ecosystems
1. Coastal upwelling
2. Phytoplankton production in upwelling areas
3. Upwelling food webs
4. ENSO
5. Continental shelf ecosystems

O. Estuarine ecosystems
1. General estuarine circulation
2. Survey of estuarine habitats
3. Importance of estuaries
4. Salinity changes and estuarine animals
5. Introductions of exotic species, and other human impacts

P. Coral reef ecosystems
1. Structure, function and ecology of reef-building corals
2. Zooxanthellae and symbiosis
3. Coral reef types and formation
4. Reef zones
5. Impacts of humans

Q. Deep sea ecosystems
1. General features of the deep-sea environment
2. Patterns of invertebrate diversity, abundance and community composition
3. Adaptations of deep sea organisms including feeding strategies
4. Hydrothermal vent and vent-like ecosystems

VI. LAB CONTENT:

A. Introduction to laboratory techniques, metric system, analyzing data, the scientific method
B. Properties of Seawater
C. Spectrometry
D. Effect of different variables on Plankton growth rate
E. Microscope and Cell Structure
F. Phytoplankton and Zooplankton
G. Marine Algae/Plants
H. Photosynthetic Pigments
I. Taxonomic Classification of Invertebrates
J. Microscopic and macroscopic study of major marine taxa; may include
1. Porifera
2. Cnidaria
3. Mollusca
4. Arthropods
5. Echinoderms
6. Marine Chordates

K. Field investigation(s)

VII. METHODS OF INSTRUCTION:

A. **Lecture** -
B. **Discussion** -
C. **Lab** -
D. **Field Trips** -
E. **Projects** -
F. **Audio-visual Activity** -

VIII. TYPICAL ASSIGNMENTS:
A. Quizzes
B. Design and conduct experiment on factors that affect plankton growth
C. Dissect and study marine animals
D. Do field work and write-up results

IX. EVALUATION:
Methods/Frequency

A. Exams/Tests
Three per semester
B. Quizzes
6 per semester
C. Papers
Research report
D. Class Participation
Participation in discussions
E. Home Work
Review questions for assigned reading
F. Lab Activities
Dissections, laboratory notebook, and practical examination

X. TYPICAL TEXTS:
1. Castro, Peter, and Michael Huber. *Marine Biology*. 11th ed., McGraw-Hill Companies, Inc, 2019.
2. Levinton, Jeffrey. *Marine Biology, Function, Biodiversity, Ecology.* 5th ed., Oxford University Press, 2017.
3. Haefner, P., A.. Exploring Marine Biology, Laboratory and Field Exercises. D. C. Heath and Company , 1996.
4. Dudley, G.,H., & Sumich, J., L., & Cass-Dudley, V., L.. Laboratory and Field Investigations in Marine Life 10th ed.. Jones & Bartlett , 2018.
5. Custom lab manual
6. Student Lab Notebook (100 Carbonless Dupl Sets)

XI. OTHER MATERIALS REQUIRED OF STUDENTS:
A. Laboratory manual or custom package