Degree Applicable

Glendale Community College
October, 2000
Revised April, 2011

COURSE OUTLINE

Biology 125
Marine Biology

I. Catalog Statement

Biology 125 is a general survey of the ecosystems and diversity of life in the marine environment. The course includes an introduction to the sciences of geological, chemical and physical oceanography as the basis to understand the environment where marine organisms exist. A comparative approach is used to study the physiological and anatomical adaptations of the different marine organisms to their environment. This course compares the ecology of the major marine ecosystems including: the epipelagic, deep sea, hydrothermal vents, intertidal, estuaries, coral reefs, and polar. Major aspects of evolutionary, cell and molecular theory are addressed throughout the course.

Units - 3.0
Lecture Hours - 3.0

Recommended Preparation: Eligibility for English 101.

II. Course Entry Expectations

Skill Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Math 3.

III. Course Exit Standards

Upon successful completion of the required course work, the student will be able to:
1. explain concepts in general biology using examples from the marine environment;
2. identify the basic geological, chemical, and physical characteristics of the marine environment;
3. describe the adaptations of marine organisms for survival;
4. identify the major phylogenetic groups of marine organisms;
5. compare and contrast the major marine ecosystems;
6. identify the problems caused by human impact on the marine environment and its resources.

IV. Course Content — Total Contact Hours = 48

A. Introduction to the Scientific Method — 1 hour
   1. Steps of the scientific method
   2. Facts, hypotheses, laws, and theories

B. Geological Oceanography — 3 hours
   1. Distribution of water

2. Ocean basins and major secondary seas
3. Structure of the Earth
4. Plate tectonics
    a. Evidence
    b. Sea-floor spreading
    c. Types of tectonic plate interactions

C. Chemical Oceanography 2 hours
1. Properties of water
2. Salinity
3. Dissolved gases and vertical profile of O_2 concentration
4. pH

D. Physical Oceanography 3 hours
1. Light penetration
2. Temperature profiles
    a. Permanent thermocline
    b. Seasonal thermocline
3. Pressure
4. Water circulation
    a. Coriolis effect
    b. Major surface currents
    c. Upwelling
    d. Conveyor Belt theory
    e. El Niño Southern Oscillation

E. Biological Concepts 1.5 hours
1. Cell types
2. Photosynthesis
3. Cellular respiration
4. Evolutionary theory and systematics
    a. Natural selection and organic evolution
    b. Binomial nomenclature and hierarchical classification
    c. Domains of life

F. Biodiversity 17 hours
1. Viruses
2. Prokaryotes
    a. Bacteria
    b. Archaea
3. Alveolates (Dinoflagellata)
4. Stramenopila
    a. Bacillariophyta
    b. Phaeophyta
5. Plantae
    a. Rhodophyta
    b. “Chlorophyta”
    c. Angiospermae
6. Fungi
    a. Lichens

7. Invertebrates
    a. Porifera
    b. Cnidaria
    c. Mollusca
    d. Arthropoda
    e. Echinodermata
    f. Invertebrate chordates
8. Craniates
    a. "Agnatha"
    b. Chondrichthyes
    c. "Osteichthyes"
    d. Reptilia (including birds)
    e. Mammalia

G. Principles of Ecology 1.5 hours
1. Food webs
    a. Trophic levels
    b. Transfer efficiency
    c. Microbial loop
2. Biological zonation

H. Marine Ecosystems 16 hours
1. Epipelagic
    a. Primary productivity
    b. Mechanisms of flotation
    c. Anatomy and physiology of swimming
2. Deep sea
    a. Mesopelagic, bathyal, abyssal, and hadal regions
    b. Vertical migrations
    c. Bioluminescence
    d. Vision
    e. Food availability
    f. Predator avoidance
    g. Reproduction
    h. Deep diving in marine mammals
    i. Deep-sea benthos
3. Hydrothermal vents
    a. Formation and characteristics
    b. Chemosynthesis and food web
    c. Anatomy and physiology of symbiosis in *Riftia*
4. Intertidal
    a. Causes and effects of tides
    b. Tide schedules
    c. Rocky intertidal and strategies for survival
    d. Ecological succession
    e. Soft bottom intertidal
5. Estuaries
    b. Characteristics and types
    c. Osmoregulatory mechanisms

d. Life history strategies (anadromy and catadromy)

6. Coral reefs
   a. Reproduction
   b. Nutrition
   c. Distribution
   d. Reef types
7. Polar regions
   a. Physical comparison between Arctic and Antarctic
   b. Comparative biology
   c. Case study: evolution of notothenioids

I. Human Impact 3 hours

1. Pollution
   a. Oil
   b. Chlorinated hydrocarbons (DDT)
   c. Heavy metals
   d. Sewage
   e. Global warming
2. Fisheries
   a. Major fishing areas
   b. Maximum sustainable yield and regulation
   c. Case study: California sardine
   d. Current problems
3. Human impact on biodiversity
   a. Extinction
   b. Introduced species

V. Methods of Presentation

The following instructional methodologies may be used in the course:

1. lecture;
2. multi-media;
3. online.

VI. Assignments and Methods of Evaluation

1. Midterm examinations.
2. Final examination.

VII. Textbooks

Gago, F. J., Marine Biology Outlines.
Glendale Community College, 2009.
13th Grade Textbook Reading Level.

Castro, P. and M. Huber, Marine Biology, Current Edition.
New York: McGraw Hill, 2010.
13th Grade Textbook Reading Level. ISBN: 139780073524160.

VIII. Student Learning Outcomes

1. Students will be able to explain aspects of the major geological, physical, and chemical oceanographic processes and how they affect marine organisms.
2. Students will be able to identify the defining anatomical and physiological characteristics among the major phyla of marine organisms.
3. Students will be able to explain the ecological characteristics of the major marine ecosystems and the impact that humans have had on them.