Lecture Contact Hours: 48-54; Outside-of-Class Hours: 96-108;
Laboratory Contact Hours: 48-54; Outside-of-Class Hours: 0;
Total Student Learning Hours: 192-216

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Biology 105 – Marine Biology

3 hours lecture, 3 units
3 hours laboratory, 1 unit
Total units: 4

Catalog Description
This introductory college-level course uses marine organisms and their interrelations with their aquatic environment in order to develop an understanding of modern biological principles and processes that are basic to all forms of life. Emphasis is placed on marine organisms, their ecology, and their evolutionary adaptations to marine habitats of the ocean environment. Topics include the marine environment and its organisms: plankton, plants, invertebrates, fishes, birds, reptiles, and mammals. An exploration of human impacts to this environment provides students with historical and foundational knowledge towards ecological stewardship. This course is intended for all students interested in marine biology.

Prerequisite
None

Course Content
1) Lecture:
   a. The world ocean as it relates to
      1) Ocean circulation patterns.
      2) Adaptations to and spatial distribution of life in the sea.
   b. Ecology of ocean ecosystems and biological magnification.
   c. Photosynthesis and reproduction in marine plants.
   d. The benthos.
      1) Animal-seafloor relationships.
      2) Larval dispersal.
      3) Coral reefs.
      4) Abyssal communities.
      5) Intertidal communities.
      6) Estuaries.
      7) Benthic plant communities.
   e. Phytoplankton and patterns of marine primary productivity.
   f. Pelagic animals.
      1) The pelagic environment.
      2) Feeding and migration.
      3) Buoyancy.
      4) Locomotion.
      5) Reproduction.
   g. Characteristics, taxonomy and evolution of marine invertebrates.
   h. Taxonomy, evolution and adaptations in marine mammals.
   i. Human Impacts on the Marine Environment.
      1) Fishing activities and consequences.
      2) Complicating effects of marine pollutants.
      3) Climate Change
      4) Past and present stewardship efforts on the part of different cultures, government and nonprofit agencies. Special emphasis on the efforts of the local Kumeyaay nation and other local Native American groups.
   j. The process of achieving understanding in science.

k. Early efforts in marine exploration
l. Application of the science

2) Laboratory: In addition to examining and illustrating many of the topics discussed in lecture, students will:
   a. Proper use of scientific method to explore questions in marine biology and proper use of laboratory equipment: e.g. microscopes, spectrophotometers, pH meters, fume hood, salinity hydrometers and refractometers.
   b. Marine invertebrate identification and classification.
   c. Adaptations to and spatial distribution of marine plant life as a result of photosynthetic pigments.
   d. Phytoplankton and zooplankton biology, identification, and adaptive advantages of zooplankton vertical migration.
   e. Marine mollusk functional anatomy, dissection.
   f. Homeostasis in ectotherms compared to endotherms.
   g. Echinoderm functional anatomy, reproduction and larval dispersal.
   h. Marine fish functional anatomy, dissection and identification.
   i. Marine mammal functional anatomy, physiological changes as part of the dive reflex and acoustics of toothed whales.
   j. Field Studies include Rocky Intertidal Zone- zonation patterns, plant and invertebrate diversity and adaptations; Estuarine Habitat- Intro to field studies: transect building, data collection, species identification; Public marine aquarium and/or museum study.
   k. Library “field trip”- explore skills needed to sort and find peer-reviewed and/or reputable source information.

Course Objectives

Students will be able to:

1) List and define the basic approaches used in science to achieve understanding of natural marine systems.
2) Use scientific methods and processes to analyze and select the most plausible of several alternative explanations for a set of observations.
3) Define the basic mechanisms of organismal reproduction, genetic inheritance, and the process of organic evolution.
4) Describe the physical structure found in all ecosystems and specifically the physical aspects of the ocean ecosystem and explain how those environmental factors select for organismal adaptations.
5) List and describe the major steps involved in natural selection, and provide at least one example of how natural selection accounts for the observed diversity of life in the sea.
6) List the general criteria that define the major kingdoms of life.
7) Describe the dominant members and the biology of major taxonomic groups of marine organisms.
8) Differentiate the structures of typical prokaryotic and eukaryotic cells and between typical plant and animal cells.
9) Describe the concept of homeostasis, the self-regulation necessary to maintain optimal conditions for survival in changing marine environmental conditions.
10) Apply a systems-oriented approach to explaining the interrelationships within living organisms, as well as between living organisms and their physical, chemical, and energy components of marine environments.
11) Analyze the results of laboratory experiments performed in class that require data analysis; interpretation of data, graphs and tables; and mathematical calculations; and relate these results to the principles discussed in the lecture portion of the course.
12) Complete laboratory assignments using proper English grammar, and correct spelling of all words including, and especially, technical language appropriate to subject matter.
13) Exhibit basic Climate Change literacy. Explain and understand the Water Cycle and Carbon Cycle and the anthropogenic mechanisms in which the Carbon Cycle is being modified as it relates to Climate Change.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay, exams, skills demonstration or, where appropriate, the symbol system.

1) Written exams include both essay and objective questions and a final exam.
2) Laboratory quizzes.

3) Term projects utilizing library and internet resources and fieldwork, e.g.: study of various species of marine invertebrates and/or study of marine plants.
4) Laboratory assignments requiring data analysis, interpretation of data, graphs and tables and mathematical calculations.
5) Application of skills in scientific critical thinking to analyze peer-reviewed journal articles

Special Materials Required of Student
1) Travel to field trip sites may be required

Minimum Instructional Facilities
1) Smart classroom with overhead projector/screen
2) Biological teaching laboratory equipped with running water, chilled marine tank, vacuum, air, hood and electrical outlets; also storage space for marine plant and animal specimens. Dedicated classroom computer and multimedia projectors, screen, black or white board. Proximity to biology laboratory prep room, computers with data analysis, graphics and web browsing software
3) Special requirements:
   a. Compound and dissecting microscopes
   b. Selected charts and models
   c. Preserved and living specimens for dissection and observation
   d. Selected prepared microscopic slides
   e. Refrigerated salt water aquarium
   f. Various required chemicals
   g. Facilities for multimedia presentations, including a computer at the instructor's station
   h. Classroom computers in laboratory for student use during laboratory exercises

Method of Instruction
1) Lecture and discussion
2) Multimedia presentations
3) Use of Learning Resource Center resources
4) Laboratory demonstrations, experiments, dissections and studies with small working groups of students
5) Field studies

Out-of-Class Assignments
1) **Reading**: Assigned textbook chapters, instructor-provided study guides, and assigned journal articles.
2) **Writing / Analysis**: Short written reflections, data analyses, or problem-solving exercises that ask students to interpret experimental results, connect and apply concepts from lecture and lab to real-world examples. Written or oral presentation requiring the summarizing of journal articles and the application of research skills into a cohesive body of work. Written lab exercises and reports, including sketching, answering questions, collecting data, graphing data and writing summaries of analysis.
3) **Other**: Student use of online resources to find reputable scientific information for assignments and presentation.

Texts and References
1) Required (representative examples):
   a. Castro, Peter, and Michale Huber. *Marine Biology*. 12th Edition. McGraw-Hill, 2023.
   b. Karleskint, George, et al. *Introduction to Marine Biology*. 4th Editon. Valore Books, 2020.
   c. Karleskint, George, et al. *Lab Manual for Introduction to Marine Biology*. 4th Edition. Valore Books, 2020.
2) Supplemental: Lab manual developed by instructor

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1) Explain the ocean as a dynamic habitat by describing its physical and chemical characteristics.
2) Apply scientific inquiry to marine systems by using the tools of scientific inquiry to observe, identify, classify, and investigate marine organisms.
3) Evaluate the relationship between humans and plants through lenses of biotechnology, agriculture, and/or sustainability, considering both benefits and ethical or ecological implications.