

BIOL 0015 - MARINE BIOLOGY

Catalog Description

Advisory: Eligibility for ENGL 1A

Hours: 108 (54 lecture, 54 laboratory)

Description: An introduction to the basic biological and ecological properties of major saltwater environments, including the conservation of and human impacts on marine resources. Designed for both science and non-science majors. Laboratory hours may be partially fulfilled by required field trips. Hiking and boat travel may be necessary. (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Analyze the physical and biological factors shaping the evolution of adaptations in marine organisms.
- CSLO #2: Explain the role of geological and chemical processes in structuring the marine environment.
- CSLO #3: Evaluate the impacts of human activities on marine and intertidal ecosystems.

Effective Term

Fall 2022

Course Type

Credit - Degree-applicable

Contact Hours

108

Outside of Class Hours

108

Total Student Learning Hours

216

Course Objectives

Course objectives are linked to items from the Course Content Outline (in parentheses).

Lecture Course Objectives:

1. Explain the fundamental concepts of marine biology and ecology. (#1)
2. Distinguish between the various geological processes impacting ocean topography. (#1, #2)
3. Identify factors affecting the global variations in water chemistry and temperature. (#1, #2)
4. Evaluate the causes and impacts of various types of water movement on marine and intertidal ecosystems. (#2)
5. Outline the factors affecting the adaptations and evolution of organisms in the various marine and intertidal ecosystems. (#2, #3, #4)
6. Assemble a list of representative organisms for the various marine and intertidal ecosystems and explain their ecological roles. (#1, #3, #4)
7. Diagram a simple marine food web, evaluate the impact of primary productivity on a food web, and compare and contrast food webs from various marine and intertidal ecosystems. (#3, #4)
8. Evaluate the economic and conservation significance of marine and intertidal ecosystems. (#5)

9. Synthesize current knowledge to describe the impact of humans on marine and intertidal ecosystems. (#5)

Laboratory Course Objectives:

1. Develop, implement and test a scientific hypothesis. (#1, #10, #12)
2. Identify marine and intertidal organisms representative of major taxonomic groups using keys and field guides. (#3-#10, #12)
3. Compare and contrast the key characteristics and ecological roles of the major groups of marine and intertidal organisms. (#2-#9)
4. Observe the correlations between structure and function in organisms. (#2-#9, #12)
5. Explore the impacts of human activities on marine and intertidal ecosystems. (#1, #10-#12)
6. Construct a protocol for sampling intertidal environments. (#10, #12)

General Education Information

- Approved College Associate Degree GE Applicability
 - AA/AS - Life Sciences
 - AS - Life Science Lab
- CSU GE Applicability (Recommended-requires CSU approval)
 - CSUGE - B2 Life Science
 - CSUGE - B3 Lab Activity
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
 - IGETC - 5B Biological Science
 - IGETC - 5C Laboratory Science

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Classroom Discussions
 - Example: To assess lecture course objective #5, "Outline the factors affecting the adaptations and evolution of organisms in the various marine and intertidal ecosystems", students might participate in a classroom discussion about the physical and biological factors affecting a species (e.g. gravity, competition, etc.) and what adaptations have evolved enabling the species to be successful in its environment. Students could be evaluated based on participation, accuracy of information, and completeness of information.
- Essay Examinations
 - Example: To assess lecture course objective #5, "Outline the factors affecting the adaptations and evolution of organisms in the various marine and intertidal ecosystems", students answer an essay question on an exam that asks them to describe the physical and biological factors affecting a species (e.g. gravity, competition, etc.) and what adaptations have evolved enabling the species to be successful in its environment. Students could be evaluated on accuracy and completeness of their answer.
- Objective Examinations
 - Example: To assess lab course objective #3, "Compare and contrast the key characteristics and ecological roles of the major groups of marine and intertidal organisms", students might answer objective questions on a quiz or exam involving the identification of the taxon of a specimen or the identification of the diagnostic features used to make a particular taxonomic

designation. Students could be evaluated based on the accuracy and completeness of their answer.

- Problem Solving Examinations

- Example: To assess lab course objective #3, "Compare and contrast the key characteristics and ecological roles of the major groups of marine and intertidal organisms", students might be asked to use an unknown laboratory specimen to demonstrate their ability to correctly identify the taxon of the specimen and to describe the features that warrant that taxonomic designation. Students could be evaluated based on their accuracy and completeness in describing the key features and their accuracy in making a final taxonomic identification.

- Projects

- Example: To assess lab course objective #1, "Develop, implement and test a scientific hypothesis", students might develop and carry out an experiment on some aspect of marine biology. Students could be evaluated based on the completeness of the project, including the presence of a clear experimental plan, the identification of hypothesis and predictions, description of appropriate data collection methodology, evidence of participation in experimental set up and data collection, and documentation of experimental results.

- Reports

- Example: To assess lab course objective #1, "Develop, implement and test a scientific hypothesis", students might develop and carry out an experiment on some aspect of marine biology and document the experiment in a written lab report. Students could be evaluated based on completeness of the report, quality of the information included in the report, and scientific accuracy of conclusions drawn.

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. To address lab course objective #3, "Compare and contrast the key characteristics and ecological roles of the major groups of marine and intertidal organisms", the instructor might demonstrate the identification of diagnostic morphological characteristics of a selected group, such as echinoderms, using preserved specimens available in the laboratory. Students will then be able to identify and describe these characteristics on laboratory specimens.
2. To address lab course objective #2, "Identify marine and intertidal organisms representative of major taxonomic groups using keys and field guides", the instructor might demonstrate the use of keys and field guides while on field trips. Students will then be able to correctly use keys and field guides to determine the identification of organisms encountered in the field.

Lecture:

1. To address lecture course objective #2, "Distinguish between the various geological processes impacting ocean topography", the instructor might prepare lectures that explain these geological processes and their results. The lectures could include examples

of these processes (e.g. volcanoes, erosion, etc.), supplemented by images and/or videos where appropriate. Students will then be able to correctly answer homework or exam questions asking them to compare and contrast these processes.

2. To address lecture course objective #9, "Synthesize current knowledge to describe the impact of humans on marine and intertidal ecosystems", the instructor might lead an in-class discussion about the various types of human activities and their impacts, both positive and negative.

Distance Learning

1. To address lecture course objective #1, "Explain the fundamental concepts of marine biology and ecology", the instructor might prepare a lecture to post online that explains these concepts (e.g. energy transfer, species interactions, etc.) and provides examples. This online lecture might include text, audio (with transcript), and/or captioned video presentation of information. The students will be listening and/or watching this lecture, taking notes, asking clarifying questions (via chat, Zoom, email, etc.), making connections to previous lecture topics and/or material learned in previous classes, and applying this information to successfully complete homework assignments and/or lab activities throughout the semester. A student can demonstrate mastery of this objective in multiple ways. One example is to successfully answer an online multiple choice or essay exam question asking them to correctly explain a fundamental marine biology concept, such as the role of plate tectonics in substrate formation via ocean floor spreading and uplifting. Another example is to ask the student to create an annotated diagram of a fundamental ecological concept, such as the flow of energy through a pelagic marine food web. Students could create this diagram digitally and upload the file to the course LMS, or create the diagram on paper and then scan/photograph the diagram and upload the resulting file to the course LMS.
2. To address lecture course objective #7, "Diagram a simple marine food web, evaluate the impact of primary productivity on a food web, and compare and contrast food webs from various marine and intertidal ecosystems", the instructor might guide students in an online discussion of the features of marine food webs, asking students to consider specific examples of trophic levels and/or marine ecosystems.

Typical Out of Class Assignments Reading Assignments

1. Read an article on a topic pertinent to the course (e.g. status of sea otters in California, impact of atmospheric carbon dioxide on ocean chemistry, etc.) and use that information to answer questions (in writing or verbally in class), respond to an essay prompt, or to supplement material presented in lecture.
2. Read the chapter in the textbook about the current impacts of climate change on marine environments and use that information to compare/contrast with the past impacts of climate change.

Writing, Problem Solving or Performance

1. Review a guide to sustainable seafood choices. Based on that, research and then describe the current status of a species that is considered sustainable and a species that is not sustainable in a short written report (1-3 pages).
2. Participate in a strategy game or simulation (e.g. Fish Banks) that involves the use of marine resources. At the end

of the activity summarize the decision making processes that occurred during the game, and the impact of those decisions on the ecosystem.

Other (Term projects, research papers, portfolios, etc.)

1. Maintain a field journal documenting experiences and observations on class field trips. A field journal can consist of a combination of narrative, data, diagrams, maps, and/or sketches. 2. Write a research paper that provides a focused view of the ecology and conservation status of a marine species, and then use that paper as the basis of a presentation (oral/visual) to the class.

Other materials and-or supplies required of students that contribute to the cost of the course.

Required Materials

- Marine Biology
 - Author: Castro and Huber
 - Publisher: McGraw Hill
 - Publication Date: 2019
 - Text Edition: 11th
 - Classic Textbook?:
 - OER Link:
 - OER:
- Beachcomber's Guide to Seashore Life of California
 - Author: Sept
 - Publisher: Harbour Publishing
 - Publication Date: 2009
 - Text Edition: 2nd
 - Classic Textbook?:
 - OER Link:
 - OER:
- Marine Biology Coloring Book
 - Author: Niesen
 - Publisher: HarperCollins
 - Publication Date: 2000
 - Text Edition: 2nd
 - Classic Textbook?:
 - OER Link:
 - OER:
- Between Pacific Tides
 - Author: Ricketts and Calvin
 - Publisher: Stanford University Press
 - Publication Date: 1985
 - Text Edition: 5th
 - Classic Textbook?:
 - OER Link:
 - OER:
- Introduction to the Biology of Marine Life
 - Author: Morrissey, Sumich and Pinkard-Meier
 - Publisher: Jones & Bartlett
 - Publication Date: 2018
 - Text Edition: 11th
 - Classic Textbook?:
 - OER Link:
 - OER: