BIOL C103: INTRODUCTION TO MARINE SCIENCE

Item	Value
Curriculum Committee Approval Date	04/28/2017
Top Code	040100 - Biology, General
Units	3 Total Units
Hours	54 Total Hours (Lecture Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)
Local General Education (GE)	• Area 5B Life Sciences (CB2)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5B Biological Sciences (5B)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5B Biological Sciences (5B)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B2 Life Science (B2)

Course Description

A general study of the marine environment. Examines the chemical, biological, and geological properties of the sea; the sea as a natural resource; and its geo-political and economic impact. Enrollment Limitation: MRSC C100; students who complete BIOL C103 may not enroll in or receive credit for MRSC C100. Transfer Credit: CSU; UC: Credit Limitation: BIOL C103, BIOL C103L and MRSC C100, MRSC C100L: maximum credit, 4 units.

Course Level Student Learning Outcome(s)

1. Examine and describe the special nature of the earth as a "water planet," the origins of its oceans, and its capacity to support life.
2. Explain current theories concerning the origin and evolution of life in the oceans of planet earth.
3. Identify and explain the steps in the scientific method and differentiate between pseudo-science and peer-reviewed scientific theories.

Course Objectives

- 1. Identify and differentiate the features of the oceans' basins and relate the structures observed to theories of origin.
- 2. Evaluate basic chemical oceanography in terms of the special properties of water, dissolved salts, and dissolved gasses.
- 3. Describe and differentiate the motions of the seas--as currents, waves, and tides--in terms of causes and their influences and effects upon the land.

Lecture Content

INTRODUCTION/CLASS/OVERVIEW The unique aspects of the earth water and its coverage The oceans' influence on our daily lives The similarities between the oceans chemical makeup and biological systems COSMIC ORIGINS Sequence of events leading to the formation of stars, the formation of earth and its oceans The beginnings of life in the seas Changes in earth s atmosphere from photosynthetic organisms in the seas HISTORICAL PERSPECTIVES Chronological study of major historic contributions to modern marine science Contributions of seafaring civilizations and individuals Present day marine science exploration THE WATERS OF THE EARTH Structure of the water molecule and relationships to properties of water Temperature, pressure, salinity, and density relationships Oxygen and carbon dioxide relationships in the sea Sampling at sea-techniques and equipment OCEAN'S EDGE Shoreline processes Topology of ocean floor Types of shorelines Historical geology of coastlines Beach sands and sand movement Wave reflection and refraction Human activities which alter shoreline environments THE INTERTIDAL ZONE Types of intertidal habitats Physical and chemical characteristics of the intertidal zone Biological subzones Modification to live in the intertidal zone CONTINENTAL MARGINS Features of the continental shelf, slope, and size Continental crustal material - geology Natural forces influencing continental margins Sedimentation and turbidity currents Shelf dams Submarine canyons Pleistocene Ice Age and continental margins Contrasting continental margins with oceanic basins BEYOND LANDS' END Features of deep ocean basins - topography Geological features of ocean basins - comparison to continental margins Deep ocean sediment types and properties Exploration of the deep sea floor PLATE TECTONICS The development of the theories of continental draft, sea floor spreading, and global plate tectonics Evidence supporting the theory of plate tectonics Transformed faults and translational plate boundaries Unsolved problems of the plate tectonic model Exploration of the deep sea floor ISLANDS Island types - formation and geology Seamounts and guyots The birth of the island of Surtsey Island biology MARINE METEOROLOGY Atmospheric gases Factors influencing weather and climate The earth's orbital tilt and seasons Global wind circulation patterns Major storm systems OCEAN CURRENTS Physical factors which create ocean currents General circulation patterns of surface and subsurface currents Different types of currents - geostrophic, deep, and vertical Productivity and ocean current circulation water masses WIND, WAVES AND WATER DYNAMICS Surface wind waves - characteristics and definitions Other wave phenomena - tsunamis, internal waves, seiches, etc. THE EBB AND FLOW (TIDES) Forces which generate tides Types of tides Importance of tides to humans and various marine organisms LIFE IN THE SEA; BACTERIA, PROTISTS, PLANTS INVERTEBRATES Classification and terminology Bacteria and Archaea Single-celled and multi-cellular Pr otists Multicellular plants: Kingdom Plantae Invertebrate animals: The Kingdom Animalia (sponges, cnidarians, echinoderms, mollusks, annelids, arthropods, urochordates and other minor phyla) PLANKTON - FLOATERS AND DRIFTERS Phytoplankton - types and importance Influences on phytoplankton growth, reproduction and metabolism Photosynthesis and primary productivity Zooplankton - types and importance NEKTON: SWIMMERS How nekton differ from plankton Major groups of nektonic organisms Behavioral and physiological adaptations of nektonic organisms (i.e., movement, body form, coloration, and schooling behavior) REPTILES AND BIRDS Evolutionary scheme of reptiles and birds Groups of living marine reptiles Marine birds - behavior and adaptations of oceanic birds MAMMALS - SEALS AND OTTERS General characteristics of marine mammals Evolution of marine mammals Characteristics of Pinnipedia,

Sirenia and Fissipedia Adaptations for long submergence and deep diving by marine mammals WHALES (CETACEANS) Whale groups - Mysiceti and Odontoceti Intelligence of small toothed whales Sonar systems in Odontocetes Food of Mysticetes and Odontocetes Whales and whaling LIVING TOGETHER - SYMBIOTIC RELATIONSHIPS Types and examples of symbioses - direct and indirect symbioses Mutualism, commensalism and parasitism Food chains and food webs LIGHT IN THE SEA Physical factors influencing the penetration of light in the sea Zones of light penetration Photosynthesis and plant utilization of the light spectra Animal relationships to light in the sea Bioluminesc ence SOUND IN THE SEA Physical factors influencing sound penetration in the sea Active and passive sonar Animal produced sounds - the significance of communication Whale communication LIFE UNDER PRESSURE Habitats of the ocean - based on depth and pressure The deep sea environment - food, diversity of marine life and "living fossil Sampling the deep sea POLAR SEAS Antarctica and the Arctic: differences and similarities Production in polar environments - physical, chemical and biological processes Adaptations of marine life to low water temperatures in polar seas Icebergs Exploration of polar regions TROPICAL SEAS Physical conditions in tropical seas Biological characteristics in tropical seas Strategy for survival in tropical areas Climate and its influence in tropical areas Coral reef ecology The origin and types of reefs MINERAL RESOURCES Problems associated with recovering minerals from the sea Economical importance of major resources Sources and origin of petroleum Manganese nodules: distribution and origin BIOLOGICAL RESOURCES Commercial fisheries Effects of overharvesting our biological resources Antarctica commercial fisheries and potential effects on the food web MARINE POLLUTION Problems in defining marine pollution and determining levels of ocean pollution Case studies of specific pollutants: origin, effects and results - chemical, wastewater, petroleum and thermal pollution HAWAII - A CASE STUDY Hawaiian Island formation Sea floor spreading/plate tectonics Climate, weather and tradewinds Island beach sediments - types and origin Animal colonization on the islands Coral reefs and pollution EPILOGUE Future direction of ocean research Proper management of the oceans Consequences of mismanagement

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Video one-way (ITV, video) (63)

Instructional Techniques

Lectures, assigned readings in text and government or academic oceanographic websites, discussions, exams and quizzes

Reading Assignments

Readings and end-of-chapter review questions

Writing Assignments

Discussions, short-answer questions

Out-of-class Assignments

Readings, quizzes, end-of-chapter review questions

Demonstration of Critical Thinking

Discussion analyses of current oceanographic research articles

Required Writing, Problem Solving, Skills Demonstration

Discussion analyses of current oceanographic research articles, quizzes, exams

Eligible Disciplines

Biological sciences: Master's degree in any biological science OR bachelor's degree in any biological science AND master's degree in biochemistry, biophysics, or marine science OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Thomas, David; Bowers, David. Introducing Oceanography, 2nd ed. Dunedin Academic Press, 2021 Rationale: - 2. Required Webb. R.. Introduction to Oceanography, ed. Roger Williams University. Creative Commons. (https://geo.libretexts.org/@go/page/4450), 2020

Other Resources

1. Coastline Library