GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95020

Course Outline

Course: PSCI 3 Division: 10 Also Listed As:

Term Effective: 201170, CURRICULUM APPROVAL DATE: 02/28/2011

Short Title: Ocean Studies

Full Title: Ocean Studies

Contact Hours/Week	Units	Number of Weeks	Total Contact Hours
Lecture: 3	3	17.34	Lecture: 52.02
Lab: 0			Lab: 0
Other: 0			Other: 0
Total: 3			Total: 52.02

Credit Status: D - Credit - Degree Applicable

Grading Modes: L - Standard Letter Grade

Repeatability: Repeatability: N - Course may not be repeated

Schedule Types: 02 - Lecture and/or discussion
72 - Dist. Ed Internet Delayed

Course Description:

Online Ocean Studies is a an introductory oceanography course provided by the American Meteorological Society to undergraduates. The course is prepared by an experienced tema of oceanographers and science educators. AMS Ocean Studies is produced in cooperation with the National Oceanographic and Atmosheric Administration.

AMS Ocean Studies examines the world ocean from an Earth system perspective. The course emphasizes (1) the flow and transformations of water and energy into and out of the ocean, (2) the physical and chemical properties of seawater, (3) ocean circulation, (4) marine life and its adaptations, (5) interactions between the ocean and the other components of the Earth system (i.e., hydrosphere, atmosphere, geosphere, and biosphere), and (6) the human/ societal impacts on and response to those Earth system interactions. AMS Ocean Studies is modeled after the highly successful AMS Weather Studies course.
ADVISORY: MATH 205.

ARTICULATION and CERTIFICATE INFORMATION
Associate Degree:
CSU GE:
IGETC:
CSU TRANSFER:
Transferable CSU, effective 201170
UC TRANSFER:
Not Transferable

PREREQUISITES:

COREQUISITES:

STUDENT LEARNING OUTCOMES:
1. Describe the flow and transformations of water and energy into and out of the ocean. Measure: Weekly lab assignments; midterm and final exams
PLO: 1
ILO: 2,3,1
GE-LO: B1
Year Assessed: 2010
2. Explain the important interactions between the ocean and other components of the Earth system. Measure: Weekly lab assignments; midterm and final exams
PLO: 1
ILO: 2,3,1
GE-LO: B1
Year Assessed: 2010
3. Discuss the human/societal impacts on, and the response to, ocean-Earth system interactions. Measure: Weekly lab assignments; midterm and final exams
PLO: 1
ILO: 2,3,1
GE-LO: B1
Year Assessed: 2010

TOPICS AND SCOPE:
Curriculum Approval Date: 02/28/2011
3 Hours
Content: Preview Week. (The material is repeated during the following week, as suggested by the AMS.) Introduction to the Online Ocean paradigm and the role of the ocean in the Earth system. Includes discussion of the ocean as a component of the global water cycle.
Student Performance Objectives (SPO): Describe the importance of the ocean as part of the Earth system; compare flat-map and global depictions of the Earth's surface; use latitude and longitude to locate ocean features on an Earth globe. List advantages of the Earth system perspective in understanding the global water cycle; explain ways in which satellite remote sensing aids our understanding of the ocean; describe the ocean as the ultimate source of fresh water everywhere on the planet.
Out-of-Class Assignments: Compare different types of maps of Earth's surface; identify interactions between the ocean and other components of the Earth system. Use satellite imagery to illustrate portions of the global water cycle; delineate the major ocean basins on a globe.
3 Hours
Content: Week 1. This material repeats that for Preview Week; see above. Introduction to the Online Ocean paradigm and the role of the ocean in the Earth system. Includes discussion of the ocean as a component of the global water

cycle.
Student Performance Objectives (SPO): Describe the importance of the ocean as part of the Earth system; compare flat-map and global depictions of the Earth's surface; use latitude and longitude to locate ocean features on an Earth globe. List advantages of the Earth system perspective in understanding the global water cycle; explain ways in which satellite remote sensing aids our understanding of the ocean; describe the ocean as the ultimate source of fresh water everywhere on the planet.
Out-of-Class Assignments: Compare different types of maps of Earth's surface; identify interactions between the oceans and other components of the Earth system. Use satellite imagery to illustrate portions of the global water cycle; delineate the major ocean basins on a globe.
3 Hours
Content: Study of the ocean basins and plate tectonics. Comparison of the topography of the ocean floor and the continents.
Student Performance Objectives (SPO): Describe the general features of the ocean bottom; compare the general bathymetry of the ocean floor with the topography of the continents; explain how features of the ocean floor provide evidence for movement of tectonic plates. Describe the ocean-bottom features in the transition zone from the continents to the mid-ocean basins; construct a profile of the ocean bottom in the land-sea transition zone; distinguish between profiles of tectonically active and passive continental margins.
Out-of-Class Assignments: Examine and describe features of the ocean bottom on global maps; relate specific features to the effect of plate tectonics. Identify tectonically active and passive regions on a cross-sectional profile; plot a vertical cross-section across the South American coast; examine the topography of the ocean bottom off the Southeastern U.S.
4 Hours
Content: Properties of ocean water including temperature, salinity, and density. Comparison of seawater with fresh water and sea ice.
Student Performance Objectives (SPO): Explain how ocean density depends on seawater temperature and salinity; identify the various properties that govern the salinity of surface ocean waters; describe the general patterns of sea surface temperature and salinity. Determine the initial freezing temperature of seawater; explain how salinity affects the temperature at which water is most dense; describe differences in physical properties of fresh water versus seawater undergoing cooling to freezing conditions; explain how ice forms in the ocean and fresh-water bodies.
Out-of-Class Assignments: Plot on a temperature-salinity (T-S) diagram to determine the effect of these variables on seawater density; identify processes that change the salinity of ocean surface waters; describe the horizontal and vertical patterns of ocean temperature and salinity. Use a T-S diagram to calculate the effect of salinity on water's initial freezing temperature and temperature of maximum density; examine vertical profiles of temperature and salinity and compute the water's density; describe the formation and distribution of sea ice.
4 Hours
Content: Marine sediments, their origin and distribution. The major source of these sediments is investigated.
Student Performance Objectives (SPO): Describe types of sediments found on the ocean bottom; explain how marine sediments arrive at the ocean floor; indicate how sediment thickness and composition change with distance from the mid-ocean ridge system. Explain why rivers differ in their sediment load delivered to the ocean; compare the rain of lithogeneous particles in the shallow waters of the continental margin with those in the deep open ocean; identify some of the

processes that govern the distribution of lithogeneous sediments in the continental margin.
Out-of-Class Assignments: Describe the distribution of marine sediment type and thickness; relate sediment thickness to the age of the ocean crust; identify the origin of marine sediments.
Explain why different rivers deliver different types and amounts of sediment to the ocean; contrast sedimentation over the continental shelf with that in the open ocean; identify examples of sediment dispersal processes operating in the continental margin.
4 Hours
Content: The atmosphere and ocean. This section investigates ocean-atmosphere connections, including the effect of solar radiation on sea-surface temperature.
Student Performance Objectives (SPO): Identify factors that influence the rates of evaporation and precipitation over the ocean; describe the general pattern of net evaporation (evaporation minus precipitation) over the world ocean; relate the pattern of net evaporation to the planetary-scale atmospheric circulation. Describe the general pattern of incoming solar radiation over the year; list the various factors that influence the amount of solar radiation which strikes the ocean surface; describe the general global pattern of sea surface temperatures in February and August; identify factors other than incoming solar radiation that influence the global pattern of sea-surface temperatures.
Out-of-Class Assignments: Relate net evaporation over the ocean to features of the atmospheric flow; identify the connection between net evaporation and surface salinity; describe how precipitation over the ocean is affected by the position of the Intertropical Convergence Zone (ITCZ). Plot and describe the annual variation of solar radiation at different latitudes; examine sea-surface temperature (SST) patterns in two different months, and compare them to patterns of incoming solar radiation; compare incoming solar radiation patterns in January and July and describe the implications for the ocean.
4 Hours
Content: Ocean currents. Wind-driven ocean circulation and ocean gyres. Density-driven circulation and water masses.
Student Performance Objectives (SPO): Demonstrate the impact of Earth's rotation on objects moving freely across its surface; describe how surface winds and Earth's rotation combine to produce movement of surface ocean waters; explain how winds, Earth's rotation, and gravity produce the circulation in ocean gyres. Describe the role of temperature and salinity in determining seawater density; distinguish between water masses in the Atlantic Ocean; explain the role of density in driving the deep ocean circulation.
Out-of-Class Assignments: Rotate a globe to illustrate the Coriolis effect and see its impact on horizontally-moving objects; describe how surface winds and the Coriolis force produce variations in sea-surface height; explain the formation of ocean gyres. Use a T-S diagram to compute seawater density; identify different water masses by their density; explain how density differences drive the circulation of the deep ocean.
3 Hours
Content: Review and Midterm Exam
Student Performance Objectives (SPO):
Out-of-Class Assignments:
3 Hours
Content: Ocean waves and tides, part 1: deep- and shallow-water ocean waves.
Student Performance Objectives (SPO): Identify the principal characteristics of deep- and shallow-water waves; describe how these characteristics change as the water becomes shallower; describe the water motions associated with shallow-water ocean waves.

Out-of-Class Assignments: Use a wave analyzer to study the characteristics of deep- and shallow-water ocean waves; describe how the characteristics of a wave change as it moves into shallower water; investigate the effect of wind on the direction and height of ocean waves.
3 Hours
Content: Ocean waves and tides, part 2: tides.
Student Performance Objectives (SPO): Describe how individual harmonic components combine to produce the observed tide; explain some of the different types of ocean tides the Moon helps to generate; interpret examples of diurnal, semi-diurnal, and mixed tides; retrieve real-time tide data from any one of more than 3000 U.S. locations.
Out-of-Class Assignments: Demonstrate how harmonic components combine to produce the observed tide; investigate the tide generation component produced by the interaction of the Earth and Moon; compare observed and predicted tides for three cities.
3 Hours
Content: The dynamic coast. Processes that alter the shoreline are presented. Impacts of tropical cyclones on the coast are also discussed.
Student Performance Objectives (SPO): Describe ways in which wind-driven, tidal, and tsunami waves impart energy in shaping shoreline features; demonstrate how wave refraction can concentrate or disperse wave energy; describe the physical mechanism responsible for longshore currents and littoral drift. Explain the impacts of tropical cyclones on the underlying ocean; describe the general pattern of hurricane hazards during landfall; describe how NOAA's Tropical Prediction Center/National Hurricane Center models hurricane dangers to low-lying coastal areas.
Out-of-Class Assignments: Depict wave refraction on a diagram and show how it may concentrate or disperse wave energy; examine satellite images of coastal features and relate these features to wave refraction; describe characteristics of the Asian tsunami of 2004. Identify the effects of a passing hurricane on the underlying ocean; describe the behavior of Hurricane Katrina as it made landfall; compare observed and predicted storm surges for a landfalling hurricane.
4 Hours
Content: Marine ecosystems. Discusses upwelling and ocean productivity. The Chesapeake Bay area is studied as an example of a particular coastal habitat.
Student Performance Objectives (SPO): Demonstrate the causes of coastal upwelling and downwelling; describe the influence of the prevailing wind and Coriolis effect on upwelling and downwelling; explain how scientists use "ocean color" to remotely monitor ocean productivity; describe how and why upwelling and downwelling enhance or suppress marine productivity. Identify the properties of the Chesapeake Bay estuary that are responsible for its high productivity; describe the seasonal temperature changes in the Chesapeake Bay estuary; explain how an estuary is transitional between a marine environment and a terrestrial environment.
Out-of-Class Assignments: Use a model to show how upwelling and downwelling depend on surface wind direction; examine spatial variations in ocean productivity on remote-sensing images; relate these productivity variations to upwelling and downwelling. Describe tidal currents in the Chesapeake Bay and their effect on salinity; identify the main features of the temperature and salinity variations in the Chesapeake Bay.
4 Hours
Content: Life in the ocean. Examines marine food webs and the physical and chemical conditions that influence ocean life.
Student Performance Objectives (SPO): Describe how energy and biomass are

transferred within a marine food web; explain the significance of the relatively low ecological efficiency in the supply of food energy at the higher tropic levels; list some of the ways marine organisms depend on one another for survival. Compare measurements of net primary production at various ocean depths over the year; explain the significance of the ocean's photic zone in primary production; explain how upwelling and seasonal variations in solar radiation influence net primary production.
Out-of-Class Assignments: Describe the energy and biomass transfer in a marine food web; identify the effects of variations of solar radiation on marine productivity; investigate the connection between rising sea-surface temperature (SST) and coral bleaching. Compare net primary production of organic matter at different ocean depths and different times of the year; describe recent trends in landing numbers of commercial fish.
3 Hours
Content: The ocean, atmosphere, and climate variability, part 1: seawater temperature, pressure, and surface ocean currents.
Student Performance Objectives (SPO): Explain why the sea surface slopes where warm and cold seawater occur side by side; describe the development of ocean surface currents in response to water temperature (and density) differences; describe how the Coriolis effect influences the direction of motion of surface ocean currents and eddies.
Out-of-Class Assignments: Use imaginary "pressure blocks" to explain the slope of the sea surface from warm to cold water; describe the velocity and thermal structure of the Gulf Stream; explain the flow in the Gulf Stream with a combination of the pressure block model and Coriolis effect; relate the explained structure of the Gulf Stream to the observed structure seen in remote-sensing images.
3 Hours
Content: The ocean, atmosphere, and climate variability, part 2: El Nino/La Nina and its associated ocean-atmosphere connection.
Student Performance Objectives (SPO): Describe the fundamental characteristics of El Nino and La Nina; explain how the ocean and atmosphere interact in the tropical Pacific; explain how conditions in the tropical Pacific affect weather and climate worldwide.
Out-of-Class Assignments: Describe the ocean and atmosphere in the tropical Pacific during neutral, El Nino, and La Nina conditions; identify significant features on maps of observed El Nino and La Nina
3 Hours
Content: The ocean and climate change. Discusses oceanic impacts on the overall Earth system, and the role of the ocean in global climate change.
Student Performance Objectives (SPO): Describe interactions between selected components of the Earth's climate system; explain the concepts of positive and negative feedback and provide examples observable in the Earth system; demonstrate how a change in one part of the Earth system can have ramifications elsewhere in the system. Explain roles the ocean plays in global climate change; describe some of the ocean processes that influence climate and climate change; explain the value of the Earth system perspective in understanding the role of the ocean in global climate change.
Out-of-Class Assignments: Identify examples of climate controls in the Earth system; describe positive and negative feedback mechanisms; briefly examine the ocean's thermohaline circulation. Relate concepts in the Ocean Paradigm to the role of the ocean in climate change; briefly evaluate the need for a globally-integrated observation system in understanding climate change.
2 Hours
Final

METHODS OF INSTRUCTION:
Online Modules
METHODS OF EVALUATION:
CATEGORY 1 - The types of writing assignments required:
Percent range of total grade: 10 % to 30 %
Other: Online forums
CATEGORY 2 - The problem-solving assignments required:
Percent range of total grade: 40 % to 45 %
Homework Problems

CATEGORY 3 - The types of skill demonstrations required:
Percent range of total grade: 0 % to %
CATEGORY 4 - The types of objective examinations used in the course:
Percent range of total grade: 40 % to 45 %
Multiple Choice

REPRESENTATIVE TEXTBOOKS:
Joseph M. Moran, Ocean Studies: Introduction to Oceanography, American Meteorological Society, 2011, or other appropriate college level text.
Reading level of text, Grade: 16 Verified by: Dana Young
Other textbooks or materials to be purchased by the student:
Ocean Studies Investigations Manual 2011-12 and Summer 2012, American Meteorological Society, 2011

SUPPLEMENTAL DATA:
Basic Skills: N
Classification: A
Noncredit Category: Y
Cooperative Education:
Program Status: 2 Stand-alone
Special Class Status: N
CAN:
CAN Sequence:
CSU Crosswalk Course Department: PSCI
CSU Crosswalk Course Number: 3
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N
Occupational Course: E
Maximum Hours: 3
Minimum Hours: 3
Course Control Number:
Sports/Physical Education Course: N
Taxonomy of Program: 191900