El Camino College

COURSE OUTLINE OF RECORD - Official

I. GENERAL COURSE INFORMATION

Subject and Number: Oceanography 10
Descriptive Title: Introduction to Oceanography

Course Disciplines: Earth Science

Division: Natural Sciences

Catalog Description: This introductory course in oceanography presents the ocean in terms of its physical, chemical and biological environments. The topics include studies of: formation and modification of various wave types; tidal behavior; formation of water masses and ocean currents; beaches and the changing shoreline; coral reefs; physical and chemical properties of ocean water; marine environments; marine sediments; origin of sea floor and coastline features; the spreading sea floor and drifting continents.

Conditions of Enrollment: **Recommended Preparation**
eligibility for English 1A

Course Length: [X] Full Term [ ] Other (Specify number of weeks):
Hours Lecture: 3.00 hours per week [ ] TBA
Hours Laboratory: 3.00 hours per week [ ] TBA
Course Units: 4.00

Grading Method: Letter
Credit Status Associate Degree Credit

Transfer CSU: [X] Effective Date: Prior to July 1992
Transfer UC: [X] Effective Date: Prior to July 1992

General Education:

El Camino College: **1 – Natural Sciences**
Term: Other: Approved

CSU GE: **B1 - Physical Science**
Term: Other: Approved
B3 - Laboratory Sciences
Term: Other: Approved

IGETC:

5A - Physical Science with Lab

Term: Fall 1991 Other:

5C - Science Laboratory

Term: Fall 1991 Other:

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

1. BASIC KNOWLEDGE SLO Students can identify the salient features of the basic concepts of oceanography. This includes the ability to recall the definitions of the specialized vocabulary of oceanography.
2. STUDENTS' RELATIONSHIP WITH THEIR ENVIRONMENT SLO Students recognize and can accurately articulate how the ocean affects humans' lives and how human activities affect the ocean.
3. NATURE OF SCIENCE SLO Students can identify the key elements of the scientific method in popular accounts of scientific research in magazines, newspapers, etc.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the El Camino College SLO webpage at http://www.elcamino.edu/academics/slo/.

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Explain the theory of plate tectonics and the formation and evolution of ocean basins through time and evaluate the data upon which the theory is based.

   Essay exams

2. Analyze the chemical and physical principles involved in the changing characteristics of ocean water and how these properties affect the behavior and movement of seawater.

   Objective Exams

3. Explain interactions between the ocean and atmosphere, including how the ocean affects climate and the impact of global warming on the ocean.

   Essay exams

4. Compare and contrast the formation of surface ocean currents and the circulation of deep ocean water in terms of wind forces, Coriolis effect, and thermohaline differences.

   Objective Exams

5. Explain how various wave phenomena such as refraction, reflection, standing waves, wave dispersion, the formation of surf, and the formation of tsunamis affect the formation of waves on the ocean.

   Objective Exams

6. Evaluate the formation of tides in terms of dynamic and equilibrium theories and the daily and monthly cycles of tides and why these cycles occur.

   Essay exams

7. Explain the origin of coastal features such as marine terraces, barrier islands, spits, and tombolos in terms of wave energy, tidal influx, and sediment dynamics.

    Essay exams

8. Explain the origin and movement of marine sediments through the oceanic environment and explain the chemical and biological factors involved in the deposition and modification of sediments.

    Essay exams

9. Analyze the nature and distribution of productivity within the marine environment and the movement of energy through higher trophic levels.

    Essay exams

10. Compare and contrast the adaptations of organisms within different marine environments in terms of their response to physical and chemical factors.

    Objective Exams

11. Interpret nautical charts, bathymetric maps and profiles.

    Laboratory reports

12. Perform dimensional analysis calculations and calculate percent, area, and volume.

    Laboratory reports

13. Prepare and analyze graphs, including time-series graphs, histograms, multivariate graphs, scatter plots, and pie charts.

    Laboratory reports

14. Utilize the scientific method to assemble a logical chain of reasoning from observation to inference.

    Written homework

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	6	I	A. INTRODUCTION TO THE EARTH AND OCEANS 1. History of Oceanography 2. The Scientific Method 3. Theories of the Formation of the Universe, the Solar System, the Atmosphere, and the Ocean
Lecture	5	II	A. PLATE TECTONICS 1. Interior of the Earth 2. Data Supporting the Theory and the Development of the Theory 3. Plate Boundaries and Motion i. Convergent Boundaries ii. Divergent Boundaries iii. Transform Boundaries
Lecture	3	III	A. SEDIMENTS 1. Kinds of Sediments: Lithogenous, Biogenous, and Hydrogenous

			2. Sources and Movement
Lecture	4	IV	A. OCEAN WATER 1. The Chemical and Physical Properties of Water and Seawater
Lecture	6	V	A. OCEAN-ATMOSPHERE INTERACTIONS 1. Climate Zones 2. Atmospheric Circulation 3. Hurricanes 4. The Greenhouse Effect and Global Warming
Lecture	4.5	VI	A. OCEAN CIRCULATION 1. Wind-driven Surface Currents 2. Geostrophic Currents 3. Thermohaline Circulation 4. El Niño
Lecture	4.5	VII	A. WAVES 1. Growth of Waves and Surf 2. Interference 3. Dispersion 4. Refraction 5. Reflection 6. Tsunami 7. Storm Surge
Lecture	3	VIII	A. TIDES 1. Daily and Monthly Cycles 2. Equilibrium Theory of the Tides 3. Dynamic Theory of the Tides 4. Seiches
Lecture	6	IX	A. COASTLINES 1. Depositional and Erosional 2. Emergent and Submergent 3. Coastal Water Bodies and Circulation
Lecture	6	X	A. HUMAN IMPACTS ON THE OCEAN 1. Resources (extraction) 2. Pollution 3. Overfishing
Lecture	6	XI	A. PRODUCTIVITY OF AND ENERGY FLOW THROUGH MARINE ENVIRONMENTS 1. Spatial and Temporal Distribution and Variation of Productivity 2. Controls on Productivity 3. The Flow of Energy through Different Ecosystems (intertidal, open ocean, deep-sea, coral reefs, kelp forests)

			4. Organisms Adaptations to the Physical and Chemical Conditions in Different Ocean Ecosystems
Lab	3	XII	A. Map Skills 1. Latitude and Longitude 2. Nautical Charts 3. Map Projections 4. Map Scales
Lab	3	XIII	A. Contour Maps 1. Reading Bathymetric and Profile Contour Maps 2. Making Contour Maps 3. Creating a Profile using a Bathymetric Contour Map
Lab	3	XIV	A. Plate Tectonics 1. Plate Boundaries 2. Hotspots 3. History of Plate Movement
Lab	3	XV	A. Sediments 1. Changes in Sediment Characteristics from Mountain to Coast 2. Changes in Sediment Characteristics from Beach to Deep Basins 3. Grain Size and Wave Size 4. Sources of Sediments on the Hawaiian Islands 5. Changes in Beach Minerals from Summer to Winter 6. Kinds of Light-Colored Sands 7. Deep-Ocean Sediments 8. Sediment Cores and Plate Tectonics
Lab	1	XVI	A. Sedimentary Rocks 1. Identification of Sedimentary Rocks 2. Depositional Environment of Sedimentary Rocks
Lab	4	XVII	A. Water and Seawater Chemistry 1. Adhesion, Cohesion, Surface Tension, and Capillarity 2. Solubility 3. Latent Heat of Evaporation 4. Diffusion and Temperature 5. pH of Fluids 6. Buffering 7. Heat Capacity 8. Density, Temperature, and Salinity 9. Density and Buoyancy 10. Electrical Attraction
Lab	3	XVIII	A. Climate Change

			1. Carbon Dioxide in the Atmosphere 2. Local and Global Changes in Temperature 3. Changes in the Earth's Climate in the Past 4. Global Warming and the Ocean
Lab	3	XIX	A. Ocean Currents 1. Drifter Data 2. Gyres 3. Ocean Circulation and Satellite Images of Ocean Temperature 4. Upwelling and Downwelling 5. Thermohaline Circulation 6. El Niño
Lab	3	XX	A. Waves 1. Basic Wave Characteristics 2. Standing Waves 3. Progressive Waves 4. Progressive Waves on a Beach 5. Speed of Shallow- and Deep-Water Waves 6. Internal Waves
Lab	2	XXI	A. Tsunami 1. Tsunami Height and Wavelength 2. Simulation of a Tsunami in California 3. Tsunami Speed and Run-Up 4. Tsunami Safety
Lab	2	XXII	A. Tides 1. Reading Tide Charts 2. Changes in Tides Over a Month 3. Tides and Humans
Lab	3	XXIII	A. Shorelines 1. The Origin of Waves 2. Wave Climate along the Coast of California 3. Wave Refraction and the Longshore Transport of Sand 4. Estuaries and Wetlands 5. Rivers and Deltas 6. Barrier Islands, Bars, Spits, and Tombolos 7. Sea Cliffs, Wave-Cut Terraces, and Marine Terraces 8. Headlands, Coves, Sea Stacks, and Sea Arches 9. Hard Stabilization
Lab	3	XXIV	A. Remote Sensing 1. The San Andreas Fault

			2. Mt. St. Helens 3. Hawaii 4. Hurricane Andrew 5. Average Precipitation 6. Flooding in Bangladesh 7. Ozone Holes over the Poles 8. Average Wind Speed over the Ocean 9. Average Wave Height 10. Average Sea Surface Temperature 11. El Niño 12. Spatial Distribution of Phytoplankton 13. Tides in Wattenmeer Bay 14. The Adriatic Sea 15. The Gulf Stream 16. Oil Tanker Accident 17. Changes in Sea Ice around Antarctica 18. Coral Reefs 19. The Netherlands
Lab	3	XXV	A. Primary Productivity 1. The Coastal Ocean 2. Water Temperature 3. The Coast of California 4. The Equator 5. Samples of Plankton 6. Seasonal Productivity 7. Harmful Algae Blooms 8. Measuring Primary Productivity
Lab	3	XXVI	A. Coral Reefs 1. Coral Biology 2. Kinds of Coral Reefs 3. Spatial Distribution of Coral Reefs 4. Zonation of Coral Reefs 5. Coral Reefs and Humans
Lab	3	XXVII	A. Rocky Shoreline Alternate Site Meeting 1. Headlands and Coves 2. Waves 3. Marine and Wave-Cut Terraces 4. Tides 5. Sea Cliff Erosion 6. Sediments 7. Life along a Rocky Shore

Lab	3	XXVIII	A. Sandy Shoreline Alternate Site Meeting 1. Sediments 2. Beach Profile 3. Tides 4. Rip Currents 5. Waves 6. Longshore Transport and Hard Stabilization 7. Life on a Sandy Beach 8. Pollution
Lab	3	XXIX	A. Pier Alternate Site Meeting 1. Plankton Sample 2. Secchi Disk 3. Surface Temperature, Salinity, pH, and Oxygen 4. Temperature and Salinity Below the Surface and in the Harbor 5. Weather and Waves 6. Hard Stabilization 7. Pollution 8. Tides
Lab	3	XXX	A. Cabrillo Aquarium Alternate Site Meeting 1. Salinas de San Pedro (Saltmarsh) 2. Coastal Cliffs 3. Habitats and Feeding Styles 4. Kelp and Kelp Forests 5. Sandy and Muddy Shores 6. Wetlands 7. The Deep Ocean 8. Anatomy of Marine Mammals
Total Lecture Hours		54	
Total Laboratory Hours		54	
Total Hours		108	

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. **PRIMARY METHOD OF EVALUATION:**

Substantial writing assignments

B. **TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:**

After reading the chapter on plate tectonics, write a one-page description of the development of the theory of seafloor spreading. Include specific examples of evidence that supports the theory.

C. **COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:**

1. In a one-page essay, describe how the construction of coastal engineering structures like groins, seawalls, etc. affect the coastline, and explain how and why they alter the coastline.
2. Suppose that there was no Moon. Write a one-page essay describing how the tides would be different. In other words, would high tides be higher than they are now or not as high as they are now? Would low tides be lower or not as low? Would sea level change from high tide to low tide more frequently or less frequently? How often would spring and neap tide conditions occur? In each case, explain your reasoning.

D. **OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:**

Essay exams
Objective Exams
Quizzes
Reading reports
Written homework
Laboratory reports
Field work
Homework Problems
Term or other papers
Multiple Choice
Completion
Matching Items
True/False
Presentation

V. INSTRUCTIONAL METHODS

Demonstration
Discussion
Group Activities
Internet Presentation/Resources
Laboratory
Lecture

Multimedia presentations

Other (please specify)

Alternate Site Meetings: Aquarium Visit, Cruise, Measurements from a Pier, Rocky Shoreline, Sandy Shoreline

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

Study

Answer questions

Required reading

Problem solving activities

Written work

Observation of or participation in an activity related to course content

Estimated Independent Study Hours per Week: 6

VII. TEXTS AND MATERIALS

A. **UP-TO-DATE REPRESENTATIVE TEXTBOOKS**
Thurman & Trujillo. Essentials of Oceanography. 11th Edition ed. Prentice Hall, 2013.
Earth Science Faculty. Exploring Southern California Oceanography Laboratory Manual. ECC Bookstore, 2013.

B. **ALTERNATIVE TEXTBOOKS**

C. **REQUIRED SUPPLEMENTARY READINGS**

D. **OTHER REQUIRED MATERIALS**

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification

B. Requisite Skills

Requisite Skills

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification
Non-Course Recommended Preparation eligibility for English 1A	Course objectives for OCEA-10 include evaluating the validity of different hypotheses based on observational evidence (continental drift, causes of tidal patterns, origin of shoreline features, etc.). Methods of evaluation in this course include essay exams, reading reports, written homework, lab reports, and term papers. Therefore, students should able to use written sources of information to support an argument and address counterarguments in writing.

D. Recommended Skills

Recommended Skills
Course objectives for OCEA-10 include evaluating the validity of different hypotheses based on observational evidence (continental drift, causes of tidal patterns, origin of shoreline features, etc.). Methods of evaluation in this course include essay exams, reading reports, written homework, lab reports, and term papers. Therefore, students should able to use written sources of information to support an argument and address counterarguments in writing. In addition, students should be able to compose a term paper. ENGL A - Read and apply critical thinking skills to college-level expository prose for the purposes of writing and discussion.ENGL A - Apply appropriate strategies in the writing process including prewriting, composing, revising, and editing techniques.ENGL 84 - Select and employ reading strategies to interpret the content of a college-level textbook, with special focus on constructing a thesis statement and providing valid support. ENGL 84 - Identify an implied main idea (thesis), and support with major and minor details, from a longer text or novel. ENGL A - Demonstrate ability to incorporate into draft revision information received in peer review and one-on-one tutorials.ENGL 84 - Interpret a book-length work through discussion, journal writing, or composition writing. ENGL A - Plan, write, and revise 500-word multi-paragraph expository essays including an introduction and conclusion, exhibiting coherence and unity, avoiding major grammatical and mechanical errors that interfere with meaning, and demonstrating awareness of audience, purpose, and language choice.ENGL 84 - Compare and contrast college-level texts to evaluate content. ENGL A - Utilize MLA guidelines to format a document, to cite sources in the text of an essay, and to compile a Works Cited list.

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

Course created by A. B. Cockrum and R. H. Arntson on 11/30/1969.

BOARD APPROVAL DATE:

LAST BOARD APPROVAL DATE: 11/17/2014

Last Reviewed and/or Revised by Thomas Noyes on 02/21/2014

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