Laboratory Contact Hours: 48-54; Homework Hours: 0; Total Student Learning Hours: 48-54

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

OCEANOGRAPHY 113 – OCEANOGRAPHY LABORATORY

3 hours laboratory, 1 unit

Catalog Description
Hands-on oceanographic laboratory experience to accompany and augment OCEA 112. Includes laboratory and field investigations of the marine environment emphasizing the geological, chemical, physical and biological aspects of the ocean.

Prerequisite
"C" grade or higher or "Pass" in OCEA 112 or equivalent or concurrent enrollment

Entrance Skills
Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:
1) Describe and explain the basic concepts of plate tectonics.
2) Describe the major physical features of the seafloor and explain their origin.
3) Describe and explain the fundamental principles of waves and tides.
4) Relate seawater density to depth, salinity and temperature, and describe typical profiles of each.
5) List the major chemical components of seawater.
6) Describe and explain the basic principles of atmospheric and oceanic circulation.
7) Categorize the main forms of marine life to the phylum level.
8) Describe and explain the special conditions imposed on life by the marine environment.
9) Categorize the resources the ocean provides humanity and assess the damage to the marine environment caused by their misuse.
10) Apply fundamental principles of physical, chemical and biological science to the study of the oceans.

Course Content
1) Navigation: latitude, longitude, the UTM coordinate system, navigational and bathymetric charts
2) Marine geology and geophysics: sampling techniques, isostacy, sediment analysis, measurement of beach profiles
3) Chemical oceanography: sampling techniques, measurement of salinity, pH, dissolved oxygen, nutrients
4) Physical oceanography: sampling techniques, measurement of temperature, seawater density, water clarity, wave parameters, tidal parameters, current speed
5) Biological oceanography: sampling techniques, taxonomy, measures of abundance, diversity, life processes
6) Data analysis and presentation: statistical analysis, interpretation, presentation of data

Course Objectives
Students will be able to:
1) Design and perform laboratory and field experiments to test hypotheses.
2) Analyze, interpret and organize data according to accepted methods in geology, physics, chemistry and biology.
3) Present scientific data in cogent and defensible ways.
4) Construct bathymetric profiles and contour charts.
5) Determine various aspects of waves including period, height, wavelength, speed.

6) Relate coastal sediments to wave conditions.
7) Measure current speeds at different depths.
8) Compute the volumetric exchange of seawater due to tidal flushing in an enclosed basin.
9) Measure seawater temperature, salinity and density, and use them to produce Temperature-Salinity (TS) diagrams.
10) Determine the relationship between settling rate of sediments and particle size, particle density and fluid viscosity.
11) Measure light attenuation in seawater and relate it to suspended particle density.
12) Identify marine organisms to the phylum level.

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) Weekly laboratory reports that demonstrate students' ability to formulate and test hypotheses, analyze and present data on oceanographic topics. An example would be a 2-3 page report describing measurements of wave height, wave period and wavelength, and computation from these of significant wave height, frequency and wave speed.
2) Periodic quizzes that demonstrate students' ability to apply the principles demonstrated in the laboratory. An example would be the computation of wave period given wave speed and wave length.

Special Materials Required of Student
None

Minimum Instructional Facilities
1) Lab with large flat work tables, chairs, electrical outlets, PC computers with monitors, storage cabinets, marker boards, bright lighting, computer projection system, overhead projector
2) Wet laboratory with source of water
3) Oceanographic equipment to include the following:
   a. Current drifters
   b. Conductivity, Temperature, and Depth (CTD) sensor
   c. Dissolved oxygen sensor
   d. Fluorometer
   e. Refractometers
   f. Depth sounder
   g. Secchi disk
   h. Bottom grab sampler
   i. Core sampler
   j. Plankton net
4) Laboratory equipment to include the following:
   a. Dissecting scopes
   b. Navigational charts
   c. Settling tubes
   d. Plankton splitters
   e. Laboratory scales
   f. Glassware including graduated cylinders and beakers

Method of Instruction
1) Lecture and discussion
2) Lab demonstration
3) Lab assignments
4) Guest speakers

Out-of-Class Assignments
1) Preparation for laboratory investigations including pre-reading and preparation of labs
2) Preparation of lab reports
3) Field investigations

Texts and References
1) Required (representative example): Tems, Caitlin. *OCEA 113: Oceanography Lab Manual*, 2018.
2) Supplemental: Trujillo, A.P & H.V. Thurman. *Essentials of Oceanography*, 12th edition, 2017.

Exit Skills
Students having successfully completed this course exit with the following skills, competencies and/or knowledge:
1) Design and perform laboratory and field experiments to test hypotheses.
2) Analyze, interpret and organize data according to accepted methods in geology, physics, chemistry and biology.
3) Present scientific data in cogent and defensible ways.
4) Construct bathymetric profiles and contour charts.
5) Determine various aspects of waves including period, height, wavelength, speed.
6) Relate coastal sediments to wave conditions.
7) Measure current speeds at different depths.
8) Compute the volumetric exchange of seawater due to tidal flushing in an enclosed basin.
9) Measure seawater temperature, salinity, and density, and use them to produce Temperature-Salinity (TS) diagrams.
10) Determine the relationship between settling rate of sediments and particle size, particle density, and fluid viscosity.
11) Measure light attenuation in seawater and relate it to suspended particle density.
12) Identify marine organisms to the phylum level.

Student Learning Outcomes
Upon successful completion of this course, students will be able to:
1) Apply the process of scientific inquiry in a laboratory environment to develop hypotheses, run experiments and generate data, analyze experimental results, and draw conclusions about oceanographic investigations.
2) Investigate oceanographic issues in the field environment by using the scientific process to observe, hypothesize, and synthesize oceanographic phenomenon and communicate this knowledge if an effective and coherent manner.
3) Discuss and communicate geopolitical issues related to oceanography with the goal of exploring resolutions to the issues.