College of San Mateo
Official Course Outline

1. **COURSE ID:** OCEN 100 **TITLE:** Oceanography
   Units: 3.0 units **Hours/Semester:** 48.0-54.0 Lecture hours; 96.0-108.0 Homework hours; 144.0-162.0 Total Student Learning hours
   Method of Grading: Letter Grade Only

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU; UC
   AA/AS Degree Requirements:
   CSM - GENERAL EDUCATION REQUIREMENTS: E5a. Natural Science
   CSU GE:
   CSU GE Area B: SCIENTIFIC INQUIRY AND QUANTITATIVE REASONING: B1 - Physical Science
   CSU GE Area B: SCIENTIFIC INQUIRY AND QUANTITATIVE REASONING: B2 - Life Science
   IGETC:
   IGETC Area 5: PHYSICAL AND BIOLOGICAL SCIENCES: A: Physical Science

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   Introduction to marine geology, chemistry, physics, and biology. Includes the carbon, oxygen, and nutrient cycle; properties of seawater; formation and evolution of ocean basins; marine organisms and ecology; ocean currents and waves; tides; coastal processes; and marine pollution.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Apply scientific inquiry and investigation of evidence to critically evaluate oceanographic principles.
   2. Communicate oceanographic principles and theories effectively.
   3. Apply scientific principles, theories, or models to explain the behavior of oceanographic phenomena.
   4. Evaluate human interactions with the oceans and the societal impacts.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Evaluate the ocean's interactions with and impacts on global weather patterns and climate (including paleoclimate).
   2. Evaluate the ocean's (and its inhabitants') interactions with and impacts on global nitrogen, oxygen, and carbon dioxide cycles.
   3. Evaluate lines of evidence that support our knowledge of ocean crust formation, ocean basin formation, and the age and overall structure of the ocean and its landforms.
   4. Solve quantitative problems associated with oceanographic topics, including applications to ocean chemistry, waves, currents, and heat storage.
   5. Interpret graphical representations of oceanographic phenomena including waves, tides, salinity, pressure, temperature, sediment distribution, shoreline features, intertidal zones, and marine adaptations.
   6. Evaluate the impacts of the ocean's chemical, physical, and geological environments on marine organisms and ecosystems.
   7. Evaluate the impacts of marine pollution and fisheries on the ocean's ecosystem.

6. **COURSE CONTENT:**
   Lecture Content:
   1. Principles of scientific inquiry
      A. History of Oceanography
      B. Reading graphs
      C. Making observations
      D. Finding patterns
      E. Testing hypotheses
      F. Making predictions
   2. Geography of the oceans
      A. Ocean sizes: volumes and depths

B. Ocean bathymetry
C. Hydrologic cycle
D. History of ocean exploration
E. Latitude and longitude

3. Ocean and Earth formation
   A. Earth systems
   B. Age of the Earth and its oceans
   C. The importance of the oceans in the formation and evolution of life
   D. The relationship between the oceans and Earth's atmosphere
4. Continental drift & plate tectonics
   A. Earth's magnetic field and paleomagnetism
   B. Magnetic anomalies on the seafloor and seafloor spreading
   C. Ocean crust formation and evolution over time
   D. The age of ocean crust compared to continental crust
   E. Ocean plate subduction and terrane accretion
   F. Types of plate boundaries and associated features
   G. Plate motion and directions
   H. Pangaea
   I. Ocean landforms produced through Plate Tectonics
   J. Hotspots
   K. Passive vs. active margins
   L. Continental shelves
5. Ocean sediments
   A. Sedimentation rates
   B. Sediment types (composition)
   C. Sediment sizes
   D. Impacts of biological organisms on sediments
   E. Calcium carbonate compensation depth
   F. Preserved paleoclimate proxies
6. Water and seawater properties
   A. Seawater composition
   B. Stratification
   C. Viscosity and its impacts on marine life
   D. Pressure and its impacts on marine life
   E. Light penetration and its impacts on marine life
   F. Carbon cycle
   G. Oxygen cycle
   H. Nutrient cycle
   I. Ocean pH and buffering
7. Air-Sea interaction
   A. Relative humidity
   B. Wind formation
   C. Hurricanes
   D. Onshore and offshore breezes
   E. Rain shadow deserts
   F. Coriolis effect
   G. Impact of the oceans on climate change and global carbon cycle
8. Ocean circulation
   A. Surface currents
   B. Thermohaline currents
   C. Upwelling
   D. Downwelling
   E. Nutrient cycle
   F. Impacts on marine pollution
9. Waves
   A. Wave types
   B. Wave speeds
   C. Results and impacts of waves approaching the shoreline
   D. Tsunami
10. Tides

A. Origin of tides
B. Amphidromic (rotary) tides
C. Interpretation of tidal data
D. Tidal impacts on marine organisms
E. Societal impacts: living with the tides

11. Beaches and coastal processes
    A. Sand formation
    B. Sand transportation
    C. Erosional and depositional landforms
    D. Impact of human structures on coastal processes
    E. Rip currents
    F. Longshore currents
12. Primary productivity
    A. Photosynthesis, respiration, and decomposition
    B. Energy transfer
    C. Carbon cycle
    D. Oxygen cycle
    E. Nutrient cycle
    F. Impacts on marine sediments
13. Marine ecology
    A. Classification of marine life
    B. Classification of marine ecosystems
    C. Marine adaptations to pressure. light, and viscosity
    D. Plankton
    E. Nekton
    F. Benthos
14. Marine pollution
    A. Different types
    B. Sources
    C. Impacts on marine life and coastal communities

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**

Typical methods of instruction may include:

A. Lecture
B. Activity
C. Discussion
D. Field Trips
E. Observation and Demonstration
F. Other (Specify): The following methodologies are appropriate. Individual faculty will use whatever mix of these they find most effective in the presentation of each topic. Lecture presentations supplemented by additional resources such as videos, animations, maps, and models; demonstrations; hands-on exercises and small-group discussions; critical thinking activities; classroom response system questions; instructor-led class discussions; hands-on experience with mineral and rock identification, in-class review games; required reading of text; required assignments on key terms and concepts, required application of relative dating principles, optional homework reviewing terms & concepts and optional field trips.

8. **REPRESENTATIVE ASSIGNMENTS**

Representative assignments in this course may include, but are not limited to the following:

Writing Assignments:

Writing assignments in which students demonstrate their ability to communicate oceanographic concepts graphically or textually. For example, drawing concept sketches and diagrams that describe the carbon cycle and how it functions in the oceans.

Reading Assignments:

Reading assignments from the textbook, video tutorials, and relevant articles and websites such as produced by the National Oceanographic and Atmospheric Administration (NOAA).

Other Outside Assignments:

Critical thinking questions and analysis of data and maps.

9. **REPRESENTATIVE METHODS OF EVALUATION**
   Representative methods of evaluation may include:
   A. Class Work
   B. Exams/Tests
   C. Homework
   D. Quizzes
   E. Instructors have considerable discretion in determining course grades, as long as final grades reflect the student's mastery of the course's student learning outcomes. Methods of evaluation include written assignments and quizzes and tests with at least some graphic-based questions, quantitative problem-solving questions, critical thinking questions, and topic-exploration projects.

10. **REPRESENTATIVE TEXT(S):**
    Possible textbooks include:
    A. Trujillo, A.P. & Thurman, H.V.. *Essentials of Oceanography*, 13th ed. Pearson, 2019

Origination Date: September 2023
Curriculum Committee Approval Date: October 2023
Effective Term: Fall 2024
Course Originator: Katryn Wiese