MOLLOY UNIVERSITY

School of Education and Human Services

Department of Teacher Education

EDU 5900-XX- Understanding Oceans: What Lies Beneath? (3 credits)

Summer 2026

Instructor: William Behrens

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Office hours: Upon request

Course Description:

This course provides an introduction to the science of oceanography, exploring the physical, chemical, geological, and biological processes that govern the marine environment. With a special emphasis on the largely unknown deep-sea, we will journey to the abyssal plains, hydrothermal vents, and trenches to uncover the planet's largest habitat. Students will learn how we study these vast underwater regions, the extraordinary life that thrives in extreme conditions, and the critical role the ocean plays in our global climate. This course is available for grade level and content areas.

***This course may be used as the first of three courses towards a certificate in XXX**

Shared Vision:

The Molloy University Teacher Education faculty has derived its vision for the exemplary teacher from the University's mission statement, the four pillars of the Dominican tradition, comments and input from the Professional Education Unit's Advisory Board and degree candidates as well as numerous faculty discussions rooted in the department's knowledge base which undergirds the initial and advanced programs' curriculum, pedagogy, and values

The teaching professionals who complete Molloy's teacher preparation programs are distinguished by their ability to exemplify and promote core values in their own teaching. These values include:

- ➔ Belief that all children can learn
- ➔ Learner-centered and value-centered curriculum and pedagogy

- ➔ Ethics and spirituality
- ➔ Intellectual curiosity
- ➔ Independence and risk taking, while promoting collective identity and responsibility
- ➔ Diversity, multiculturalism and pluralism, including divergent thinking
- ➔ Passion for teaching
- ➔ Commitment to students and their communities
- ➔ Civic responsibility through the promotion of social justice and interdependence
- ➔ Commitment to democracy

Course Objectives:

1. Describe the major geological, physical, and biological characteristics of the marine realm.
2. Explain the geological processes that shape the seafloor, such as plate tectonics and marine sedimentation.
3. Discuss the physical and chemical properties of seawater and how they influence ocean circulation, marine life, and climate.
4. Identify the major marine ecosystems and the adaptations of organisms, particularly those living in the deep sea.
5. Recognize the technologies and methods used to explore and study the deep ocean.
6. Evaluate the impacts of human activities on marine environments and discuss potential solutions for conservation.

Course Format:

This course will be offered online through Canvas, Molloy's learning management system and can be done entirely asynchronously or can be taken with a hybrid option. Those taking a hybrid option will meet for 1 full day of instruction on the last day of the course. Participants will select their format on the first day of online instruction. The course will open two days before the start date and close one week after the last day of class. There will be daily activities and discussions that must be completed by the due date listed. 1-2 weeks additional time to complete the final project as needed.

Required Readings, Videos, and Other Materials:

All materials will be provided throughout the course.

Course Requirements and Evaluation:

- **Discussion # 1:** Introductions (5pts)
- **Module 1**: Introduction to Oceanography (7pts)
  - The interdisciplinary field of ocean science.
  - A brief history of ocean exploration and discovery.
  - The five oceans and their key characteristics.
- **Module 2**: Earth's Geology and Ocean Basins (7pts)
  - The formation of Earth and its primitive oceans.
  - Plate tectonics, continental drift, and seafloor spreading.

    - Major ocean bottom features: mid-ocean ridges, trenches, abyssal plains, and seamounts.
- **Module 3**: The Properties of Water and Seawater (7pts)
    - The unique properties of water, such as its thermal capacity.
    - Chemical composition of seawater: salinity, nutrients, and dissolved gases.
    - Water stratification based on temperature and salinity.
- **Module 4**: Atmospheric and Oceanic Circulation (7pts)
    - The air-sea interface and its influence on global weather.
    - Wind-driven surface currents and major ocean gyres.
    - The deep ocean conveyor belt and thermohaline circulation.
- **Module 5**: Waves, Tides, and Coastal Processes (7pts)
    - The formation and characteristics of wind waves and tsunamis.
    - Tidal forces and tidal patterns around the world.
    - Coastal environments and processes, including erosion and estuaries.
- **Discussion # 2**: Earth Amazing Oceans (5pts)
- **Module 6**: Marine Sediments and Earth's Climate History
    - Types and origins of marine sediments.
    - Reconstructing past climates using sediment cores.
    - The ocean's role in the global carbon cycle and climate regulation
- **Module 7**: The Deep-Sea Environment (7pts)
    - Defining the deep sea (below 200 meters) and its characteristics: high pressure, low temperature, and perpetual darkness.
    - The ecological zones of the deep ocean, from the mesopelagic to the hadopelagic.
    - Deep-sea habitats like hydrothermal vents, cold seeps, and seamounts.
- **Module 8**: Deep-Sea Organisms and Adaptations (7pts)
    - Chemosynthesis versus photosynthesis as a primary energy source.
    - The incredible adaptations of deep-sea fauna to survive extreme conditions.
    - The biodiversity and unique ecological food webs of deep-sea communities.
- **Module 9**: Exploring the Deep (7pts)
    - Historical deep-sea exploration methods.
    - Modern technologies: Remotely Operated Vehicles (ROVs), Autonomous Underwater Vehicles (AUVs), and deep-sea submersibles like Alvin.
    - Current deep-sea exploration projects and discoveries.
- **Module 10**: Human Impacts on the Ocean (7pts)
    - Pollution sources and effects, including plastics and chemical contamination.
    - Climate change effects: ocean warming, sea-level rise, and ocean acidification.
    - Overfishing and habitat destruction.
- **Discussion # 3**: Final Thoughts (5pts)
- **Final Project**: Lesson Plan Template (15pts)

Molloy University and School of Education and Human Services Policies and Supports:

Expectations of Academic Integrity for All Students

Honor Pledge and Academic Honesty Policy

Course Withdrawals

View Withdrawal Policy for potential financial implications

View the Academic Calendar and/or the course syllabus for the last day to withdraw dates

Incompletes

Incompletes Policy

Health and Wellness

Student Health Services

Student Counseling Center (SCC)

Center for Access and Disability (Access)

Center for Access and Disability

Technical Support

Student Account, Technology and Canvas

Ally for Canvas

Supportive Tools and Resources/ Ally

Use of Proctorio for Exams/Quizzes (if applicable)

Proctorio Resources for Students

Email Accounts

Students are to utilize their Molloy e-mail account or via Canvas when communicating throughout the semester. Those who use a non-Molloy account may miss important messages. Students are responsible for responding to all methods of communication in a timely fashion relating to this course. Instructors will respond to emails from students within 24 hours. When/ if you email the instructor(s), please indicate what course you are in with the course number and section.

APA Manuscript Style

All manuscripts in the field of education are written in the style format of the American Psychological Association. Candidates in the Graduate Education Programs are required to purchase the Publication Manual of the American Psychological Association (7th ed.). (2010). Washington, DC: American Psychological Association.

All papers written in every course must adhere to the manuscript prescriptions defined in this manual.