

# MARINE SCIENCES

## Program Overview

The Marine Sciences minor, offered by the Department of Earth and Chemical Sciences, introduces students to fundamental biological and physical marine processes, as well as advanced topics through a selection of upper level electives. In these courses, students have the opportunity to visit coastal environments and aquariums to learn first-hand about marine processes as well as using the plankton lab and aquarium lab on campus. This minor enables students to learn more about the earth's oceans, how they are changing in response to human actions, and how students can help promote marine conservation and sustainable use.

## Degree Offered

- Minor in Marine Sciences

## Contact

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**Program Website:** Marine Sciences (<https://www.rider.edu/academics/colleges-schools/college-arts-sciences/science-technology-math/undergraduate/marine-sciences-minor/>) (<https://www.rider.edu/academics/colleges-schools/college-arts-sciences/science-technology-math/undergraduate/marine-sciences-minor/>)

**Associated Department:** Earth and Chemical Sciences (<https://www.rider.edu/academics/colleges-schools/college-arts-sciences/science-technology-math/faculty-departments/earth-chemical-sciences/>)

## Related Programs

- Earth Sciences (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/earth-sciences/>) (for Secondary Education majors)
- Environmental Sciences (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/environmental-sciences/>)
- Environmental Studies (<http://catalog.rider.edu/undergraduate/colleges-schools/arts-sciences/majors-minors-certificates/environmental-studies/>)

## Marine Sciences Minor Requirements

(22-24 credits)

Environmental Sciences majors with Marine concentration may not select this minor.

Code	Title	Credits
<b>Geological, Environmental, and Marine Sciences</b>		
Complete all of the following:		
GEO 100 & GEO 102	Earth Systems Science and Earth Materials and Processes Lab	4

MAR 120 & MAR 121	Oceanography and Introductory Oceanography Lab	4
<b>Biology</b> 4		
Complete all of the following:		
BIO 115 & 115L	Principles of Biology I and Principles of Biology I Lab	
<b>or</b>		
BIO 116 & 116L	Principles of Biology II and Principles of Biology II Lab	
<b>and</b>		
BIO 272 & 272L	Intro to Marine Biology and Marine Biology Laboratory	4
<b>Electives</b> 6-8		
Select two of the following:		
ENV 320 & 320L	Global Biogeochemistry and Global Biogeochemistry Lab	
ENV 340	Field Methods and Data Analysis	
GEO 306 & 306L	Sedimentology and Stratigraphy and Sedimentology and Stratigraphy Lab	
MAR 340	Marine Processes and Environments: Seminar	
MAR 401 & 401L	Marine Ecology and Marine Ecology Lab	
MAR 410	Physical Oceanography	
<b>Total Credits</b>		<b>22-24</b>

## Courses and Descriptions

### MAR 120 Oceanography 3 Credits

In this course, students will investigate the geological, chemical, physical, and biological processes that shape the ocean. Emphasis will be placed on how these processes interact with each other and with human populations. These interactions influence important global phenomena that impact all our lives, including weather and climate, the distribution of marine organisms and other natural resources, and coastal processes. Understanding these phenomena will enable students to make more informed decisions and contribute to serious global marine issues. Students will learn through a combination of hands-on exercises designed to foster a deeper understanding of the scientific content as well as the scientific process, practical experiences with real data, readings, and some lectures. CLAS general education areas addressed: DP & GP.

### MAR 121 Introductory Oceanography Lab 1 Credits

This lab course introduces students to the fundamental aspects of geological, chemical, physical and biological oceanography. Students learn through inquiry-based, hands-on exercises and activities using actual data collected in the lab and in the field. Independent projects and local field trips during lab and on weekends may be required. One three-hour lab per week. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum.

**MAR 340 Marine Processes and Environments: Seminar 3 Credits**

This course is designed as a seminar course. Therefore, students will learn to lead class discussions, to analyze and critique peer-reviewed journal articles, and to enhance their presentation skills. Students will interpret graphical, spatial, and numerical data to support their positions. Content will emphasize the interactions among marine processes, biological features, and geologic landforms.

**Prerequisite(s):** A minimum grade of D in MAR 120 and GEO 100 or GEO 113.

**MAR 401 Marine Ecology 4 Credits**

The purpose of this course is to introduce students to fundamental principles in ecology, as it relates to marine systems. Topics include the marine environment and its influence on the organisms living there; biodiversity and speciation; factors regulating population dynamics in marine systems; larval and fisheries ecology; species interactions such as predation, competition, and symbiosis; factors regulating productivity and energy flow in marine systems; and marine conservation. Hands-on laboratory exercises will provide students with the opportunity to design and conduct experiments related to marine ecology, and to collect, analyze, and interpret data from those experiments. Ecosystem modeling will also be introduced. Three hours of lecture and one three-hour lab per week. Weekend field trips may be required.

**Prerequisite(s):** D or better in MAR 120 and either BIO 115 or 116.

**MAR 401L Marine Ecology Lab 0 Credits**

This lab is a co-requisite and must be taken with the corresponding course.

**Corequisite(s):** MAR 401.

**MAR 410 Physical Oceanography 3 Credits**

Introduction to the physical aspects and processes of the oceans and their influence on marine ecosystems and Earth processes. Topics include distribution of salinity and water temperature and their effect on water movement, the oceanic heat budget, atmospheric and oceanic interactions, ocean currents including surface and deep water circulation, waves, tides, and medium- to small-scale circulation features. Throughout the course, emphasis is placed on how these physical processes affect the biology and chemistry of the ocean. Three hours of lecture per week. Weekend field trips may be required.

**Prerequisite(s):** MAR 120.

**BIO 115 Principles of Biology I 4 Credits**

An introductory biology course focusing on major themes of biology: what is life?; Cells as fundamental structure and functional unit of life; information transmission, storage and retrieval; Diversity and unity of life explained by evolution. Three hours of lecture and one three-hour lab per week.

**Corequisite(s):** BIO 115L.

**BIO 115L Principles of Biology I Lab 0 Credits**

This lab is a co-requisite and must be taken with the corresponding course.

**Corequisite(s):** BIO 115.

**BIO 116 Principles of Biology II 4 Credits**

An introductory biology course focusing on major themes of biology: Energy and matter to carry out life's essential functions; Interdependent relationships characterize biological systems (homeostasis, growth & development); Behavior of living things; Ecology and the environment. Three hours of lecture and one three-hour lab per week.

**Corequisite(s):** BIO 116L.

**BIO 116L Principles of Biology II Lab 0 Credits**

This lab is a co-requisite and must be taken with the corresponding course.

**Corequisite(s):** BIO 116.

**BIO 272 Intro to Marine Biology 4 Credits**

Introduces students to the study of marine environments, emphasizing the diversity, ecology, and physiology of marine animals, algae, and plants. Aspects of the human impact on marine environments are also discussed.

**Prerequisite(s):** BIO 115 with a minimum grade of C, or BIO 116 with a minimum grade of C.

**BIO 272L Marine Biology Laboratory 0 Credits**

This lab is a co-requisite and must be taken with the corresponding course. Course

**Prerequisite(s):** BIO 115 or BIO 116.

**GEO 100 Earth Systems Science 3 Credits**

Investigates the major global processes that occur on Earth. These processes can be grouped into four major systems: atmosphere, hydrosphere, lithosphere, and cosmosphere. Each system interacts with and affects the other systems creating, in a sense, a single Earth process. With this approach, the student will view the Earth as a whole, and understand that the many seemingly separate components that make up this planet are, in fact, a set of interacting processes, that operate in cycles through time, within a single global system. Three hours of lecture per week. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum.

**GEO 102 Earth Materials and Processes Lab 1 Credits**

This lab course introduces students to the origin, identification, and significance of geologic materials, processes, and landforms. Hands-on experiences with mineral and rock specimens, topographic and geologic maps, and GPS and other data collection techniques are emphasized, along with field trip and in-lab observations, measurements, and interpretations. One three-hour lab per week.

**Prerequisite(s):** concurrent enrollment in, or prior completion of, GEO 100 or GEO 113 is required.

**GEO 306 Sedimentology and Stratigraphy 4 Credits**

The principles of weathering, erosion, transportation, and deposition of sediment are the focus of this course. Sediment characteristics are examined to identify the processes involved in transporting grains and the specific environment in which the grains were deposited. Students will learn how to collect, analyze, and interpret sedimentary data and how to interpret surface and subsurface stratigraphic data using various techniques, such as lithostratigraphic, biostratigraphic, and geophysical, correlations. Field trips will expose students to different sedimentary environments and provide opportunities for students to learn how to conduct fieldwork. Three hours of lecture and one three-hour lab per week. Weekend field trips may be required. Prerequisite(s): GEO 100.

**Corequisite(s):** GEO 306L.

**GEO 306L Sedimentology and Stratigraphy Lab 0 Credits**

This lab is a co-requisite and must be taken with the corresponding course.

**Corequisite(s):** GEO 306.

**ENV 320 Global Biogeochemistry 4 Credits**

This course introduces students to global biogeochemical processes in the earth system and their influences on marine and terrestrial ecosystems. With a focus on systems thinking and interdisciplinary science, students will learn about the interactions of the biosphere, lithosphere, hydrosphere and atmosphere through elemental cycling and energy transfers. The course extends from the origin of our planet to the modern earth system and considers the anthropogenic impacts of climate change and pollution on humans and other species. Students will analyze scientific data with examples in regulatory and research settings. Students will also gain first-hand experience with field methods including sampling ocean and freshwater using various techniques and equipment and interpreting chemical data. Field trips may be required for this course. Course

**Prerequisites:** GEO 100 or GEO 113; GEO 102; CHE 120 & 121.

**ENV 320L Global Biogeochemistry Lab 0 Credits**

This course introduces students to global biogeochemical processes in the earth system and their influences on marine and terrestrial ecosystems. With a focus on systems thinking and interdisciplinary science, students will learn about the interactions of the biosphere, lithosphere, hydrosphere and atmosphere through elemental cycling and energy transfers. The course extends from the origin of our planet to the modern earth system and considers the anthropogenic impacts of climate change and pollution on humans and other species. Students will analyze scientific data with examples in regulatory and research settings. Students will also gain first-hand experience with field methods including sampling ocean and freshwater using various techniques and equipment and interpreting chemical data. Field trips may be required for this course. Course

**Prerequisites:** GEO 100 or GEO 113; GEO 102; CHE 120 & 121.

**ENV 340 Field Methods and Data Analysis 3 Credits**

This course will provide students with practical experience in field methods and data analyses within environmental and marine sciences. The course will apply advanced scientific methods such as field-based exercises, GIS or coding analyses, statistical analyses, and database management. Students will also complete an independent or group project focused on a relevant topic. Local field trips during lab and potentially longer trips on weekends may be required. This course earns 3 Engaged Learning points in Civic and Community Engagement (CCE.)

**Prerequisite(s):** D or better in (MTH 105, or MTH 106, or MTH 210) and GEO 100, GEO 102, ENV 100, and MAR 120; or Permission of Instructor.