

# DUAL MAJOR IN MARINE SCIENCE AND PHYSICS

## Overview

The Marine Science/Physics degree is a Bachelor of Science degree (BSMAS) that is designed to give students a strong background in the study of the spatial and temporal variability in the ocean. Measurements from current meters, profilers and satellites are used to develop models of ocean circulation, water and heat transport, and effects of circulation patterns on the biology and chemistry of the ocean.

Undergraduate students are encouraged to work with the faculty and are able to earn course credit by conducting independent research under the supervision of leading scientists in their field. Research at UM focuses on ocean/atmosphere interactions, remote sensing, biophysical interactions, and the ocean's effect on weather and climate.

The Bachelor of Science double major in Marine Science/Physics prepares students for admission to graduate programs and for careers in teaching and research as well as for technical careers in government and private industries concerned with the oceans.

This is an interdisciplinary major offered by the Rosenstiel School of Marine, Atmospheric and Earth Science in conjunction with the Physics Department.

## Curriculum Requirements

Code	Title	Credit Hours
<b>Marine Science</b>		
MSC 111	Introduction to Marine Science	3
MSC 112	Introduction to Marine Science Lab	1
MSC 215	Chemical Oceanography	3
MSC 216	Chemical Oceanography Laboratory	1
or MBE 232	Introduction to Marine Biology Laboratory	
MBE 230	Introduction to Marine Biology	3
MSC 301	Introduction to Physical Oceanography	3
MSC 302	Introduction to Physical Oceanography Lab	1
Select 12 credit hours of approved Rosenstiel School electives within ATM, GSC, MBE, MSC, OCE or RSM courses <sup>1</sup>		12
<b>Other Required Courses</b>		
BIL 150 & BIL 151	General Biology and General Biology Laboratory	5
CHM 121	Principles of Chemistry <sup>2</sup>	4
CHM 113	Chemistry Laboratory I	1
Select one of the following:		3-4
GSC 110	The Earth System	
GSC 111	Earth System History	
MSC 424	Origin and Geology of the Galapagos Islands.	
MTH 161 or MTH 171	Calculus I <sup>3</sup> Calculus I	4
MTH 162 or MTH 172	Calculus II (fulfills the Rosenstiel BSMAS quantitative skills requirement) <sup>3</sup> Calculus II	4
MTH 210	Introduction to Linear Algebra	3
MTH 211 or MTH 310	Calculus III Multivariable Calculus	3
MTH 311	Introduction to Ordinary Differential Equations	3
MSC 204 or MTH 224	Environmental Statistics Introduction to Probability and Statistics	3
Select one of following:		3-4
MSC 203	Foundations of Computational Marine Science	
MBE 536	Object-Oriented Programming and Agent-Based Modelling	
CSC 120	Computer Programming I	
Select one of the following options:		10-11

Option 1:		
PHY 221	University Physics I	
PHY 222	University Physics II	
PHY 223	University Physics III	
PHY 224	University Physics II Lab	
PHY 225	University Physics III Lab	
Option 2:		
PHY 221	University Physics I	
PHY 230	Honors University Physics II-III	
PHY 224	University Physics II Lab	
PHY 225	University Physics III Lab	
Option 3:		
PHY 201	University Physics I for the Sciences	
PHY 202	University Physics II for the Sciences	
PHY 106 or PHY 224	College Physics Laboratory I University Physics II Lab	
PHY 108 or PHY 225	College Physics Laboratory II University Physics III Lab	
Option 4:		
PHY 211	University Physics I for PRISM	
PHY 212	University Physics II for PRISM	
PHY 106 or PHY 224	College Physics Laboratory I University Physics II Lab	
PHY 108 or PHY 225	College Physics Laboratory II University Physics III Lab	
PHY 321	Thermodynamics and Kinetic Theory	3
PHY 340	Classical Mechanics I	3
PHY 350	Intermediate Electricity and Magnetism	3
PHY 351	Intermediate Electricity and Magnetism II	3
PHY 360	Introduction to Modern Physics	3
PHY 362	Modern Physics Honors Seminar	1
PHY 540	Classical Mechanics II	3
PHY 560	Quantum Mechanics and Modern Physics I	3
<b>General Education Requirements</b>		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 107 or WRS 106 or ENG 106	First-Year Writing II: STEM First-Year Writing II Writing About Literature and Culture	3
Quantitative Skills:		
MTH 161 or MTH 171	Calculus I (fulfilled through the major) Calculus I	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
<b>Electives</b>		
Additional Elective <sup>4</sup>		1
<b>Total Credit Hours</b>		<b>120</b>

<sup>1</sup> At least 6 of which must be at the 300-level or higher. MSC 204 and MSC 425 do not satisfy the Rosenstiel School elective requirement. ATM courses, GSC courses, and courses from other Schools are allowed only if taken from an approved list (<https://undergraduate.rsmas.miami.edu/academics/majors/marine-science-dual-major-programs/>).

- <sup>2</sup> Principles of Chemistry must be passed with a grade of "C-" or higher.  
<sup>3</sup> Calculus I and II must be passed with a grade of "C-" or higher.  
<sup>4</sup> This 1-credit elective is only required for students who choose a 10-credit Physics Option.

## Suggested Plan of Study

**This is only a sample.** There are numerous ways students can create plans of study for the Marine Science/Physics major. Students should feel empowered to use the information listed in the Academic Bulletin to take charge of their education, pursue their own academic interests, and create their own, unique plans of study.

<b>Freshman Year</b>		<b>Credit Hours</b>
<b>Fall</b>		
MSC 111	Introduction to Marine Science	3
MSC 112	Introduction to Marine Science Lab	1
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
WRS 105	First-Year Writing I	3
MTH 161	Calculus I	4
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
PHY 221	University Physics I	3
GSC 111	Earth System History	4
WRS 107	First-Year Writing II: STEM	3
MTH 162	Calculus II	4
<b>Credit Hours</b>		<b>14</b>
<b>Sophomore Year</b>		
<b>Fall</b>		
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
PHY 222	University Physics II	3
PHY 224	University Physics II Lab	1
MTH 210	Introduction to Linear Algebra	3
MTH 211	Calculus III	3
<b>Credit Hours</b>		<b>15</b>
<b>Spring</b>		
MSC 301	Introduction to Physical Oceanography	3
MSC 302	Introduction to Physical Oceanography Lab <sup>1</sup>	1
PHY 223	University Physics III	3
PHY 225	University Physics III Lab	1
MTH 311	Introduction to Ordinary Differential Equations	3
Elective #1		3
Elective #2		3
<b>Credit Hours</b>		<b>17</b>
<b>Junior Year</b>		
<b>Fall</b>		
MSC 203	Foundations of Computational Marine Science	4
MBE 230	Introduction to Marine Biology	3
PHY 350	Intermediate Electricity and Magnetism	3
PHY 360	Introduction to Modern Physics	3
Elective #3		3
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
MSC 215	Chemical Oceanography	3
MSC 216	Chemical Oceanography Laboratory <sup>1</sup>	1

PHY 321	Thermodynamics and Kinetic Theory	3
PHY 340	Classical Mechanics I	3
MSC 204	Environmental Statistics	3
Elective #4		3
<b>Credit Hours</b>		<b>16</b>
<b>Senior Year</b>		
<b>Fall</b>		
MSC Course		3
MSC Course		3
PHY 362	Modern Physics Honors Seminar	1
PHY 540	Classical Mechanics II	3
PHY 560	Quantum Mechanics and Modern Physics I	3
Elective #5		3
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
MSC Course		3
MSC Course		3
PHY 351	Intermediate Electricity and Magnetism II	3
Elective #6		3
<b>Credit Hours</b>		<b>12</b>
<b>Total Credit Hours</b>		<b>122</b>

<sup>1</sup> Students must take one laboratory from MSC 216 or MBE 232.

## Mission

The mission of the Rosenstiel School of Marine, Atmospheric, and Earth Science is to deepen our collective knowledge of our planet through cutting-edge scientific research on the oceans, atmosphere, geology, biota, and the human dimension, while training the next generation of scientists. We transfer the knowledge gained to our students, the national and international scientific community, and to policymakers and the public.

The educational mission of the BS degree in Marine Science at the University of Miami is to graduate students with the ability and desire to integrate knowledge of marine science into their future careers.

## Goals

Students completing this double major will be able to master a broad set of fundamental scientific knowledge in Marine Science and Physics, acquire valuable technical skills and learn how to apply this knowledge to real-world problems, in a time of increasing stress on Earth's resources and environment. The program will provide the rigor, flexibility, depth and integration to enable students to:

- Design and pursue their course of study that meets requirements of a double major in Marine Science and Physics.
- Learn from the diverse and outstanding group of professors and researchers who are experts in their fields and have active research programs.
- Undertake active research experiences, which will allow them to gain a strong understanding of the scientific process and provide them with a set of valuable experimental and computational skills.
- Prepare themselves for graduate school and for successful careers in public and private industries.

## Student Learning Outcomes

- Students will demonstrate an ability to communicate effectively.
- Students will develop analytical and quantitative skills to allow critical data analysis.
- Students will be able to do carry out supervised research in the field of marine science.