B.S.M.A.S. IN MARINE SCIENCE / 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.

Curriculum Requirements

Code	Title	Credit Hours
Marine Science		
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 Sch	ool electives within ATM, GSC, MBE, MSC, OCE or RSM courses ¹	12
Other Required Courses		
BIL 150	General Biology	5
& BIL 151	and General Biology Laboratory	
CHM 121	Principles of Chemistry ²	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	Calculus I ³	4
or MTH 171	Calculus I	
MTH 162	Calculus II (fulfills the Rosenstiel BSMAS quantitative skills requirement) $^{\rm 3}$	4
or MTH 172	Calculus II	
MTH 210	Introduction to Linear Algebra	3
MTH 211	Calculus III	3
or MTH 310	Multivariable Calculus	
MTH 311	Introduction to Ordinary Differential Equations	3
MSC 204	Environmental Statistics	3
or MTH 224	Introduction to Probability and Statistics	
Select one of following:		3-4
MSC 203	Foundations of Computational Marine Science	
MBE 536	Scientific Programming and Simulation Modelling	
CSC 120	Computer Programming I	
Select one of the following options:		10-11
Option 1:		
PHY 221	University Physics I	

Total Credit Hours		120
Additional Elective ⁴		1
Electives		
STEM Cognate (9 credits) (fulfilled through the major)		
People and Society Cognate		9
Arts and Humanities Cognate		9
Areas of Knowledge:		
or MTH 171	Calculus I	
MTH 161	Calculus I (fulfilled through the major)	
Quantitative Skills:		
or ENG 106	Writing About Literature and Culture	
or WRS 106	First-Year Writing II	
WRS 107	First-Year Writing II: STEM	3
WRS 105	First-Year Writing I	3
Written Communication Skills:		
General Education Requirements	·	
PHY 560	Quantum Mechanics and Modern Physics I	3
PHY 540	Classical Mechanics II	3
PHY 362	Modern Physics Honors Seminar	1
PHY 360	Introduction to Modern Physics	3
PHY 351	Intermediate Electricity and Magnetism II	3
PHY 350	Intermediate Electricity and Magnetism	3
PHY 340	Classical Mechanics I	3
PHY 321	Thermodynamics and Kinetic Theory	3
or PHY 225	University Physics III Lab	
PHY 108	College Physics Laboratory II	
or PHY 224	University Physics II Lab	
PHY 106	College Physics Laboratory I	
PHY 212	University Physics II for PRISM	
PHY 211	University Physics I for PRISM	
Option 4:		
or PHY 225	University Physics III Lab	
PHY 108	College Physics Laboratory II	
or PHY 224	University Physics II Lab	
PHY 106	College Physics Laboratory I	
PHY 202	University Physics I for the Sciences	
PHY 201	University Physics I for the Sciences	
PHY 225 Option 3:	Offiverally Milysics III Lad	
PHY 224	University Physics II Lab University Physics III Lab	
	Honors University Physics II-III	
PHY 221 PHY 230	University Physics I	
Option 2:	Habitan Star Phania at	
PHY 225	University Physics III Lab	
PHY 224	University Physics II Lab	
PHY 223	University Physics III	
PHY 222	University Physics II	
DLIV 000		

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/).

² Principles of Chemistry must be passed with a grade of "C-" or higher.

Calculus I and II must be passed with a grade of "C-" or higher.

⁴ 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.

MSC 111 Introduction to Marine Science 3 MSC 112 Introduction to Marine Science Lab 11 JCH1 12 Principles of Chemistry 4 JCHM 113 Chemistry Laboratory I 1 MRS 105 First-Year Writing I 3 MF1 16 Calculus I 4 Credit Hours 16 Spring WHY 221 University Physics I 3 SSC 111 Earth System History 4 MSS 107 First-Year Writing II: STEM 3 MSS 107 First-Year Writing II: STEM 3 MF1 162 Calculus II 4 Credit Hours 14 Spring SIL 150 General Biology 4 BIL 151 General Biology Laboratory 1 PHY 222 University Physics II 3 MTH 210 Introduction to Linear Algebra 3 MTH 211 Calculus III 3 Credit Hours 1 Sp	Freshman Year		
MSC 112 Introduction to Marine Science Lab 1 1 Principles of Chemistry 4 1 Principles of Chemistry 5 1 Principles of Chemistry 5 1 Principles of Chemistry 6 1 Principles of Chemistry 6 1 Principles of Chemistry 1 1 Principles of Chemical Oceanography Lab or 1 1 Principles of Chemical Oceanography 1 1 Principles of Ch	Fall		Credit Hours
### 121	MSC 111	Introduction to Marine Science	3
Chemistry Laboratory	MSC 112	Introduction to Marine Science Lab	1
WRS 105 First-Year Writing I 3 WITH 161 Calculus I 4 Credit Hours 16 Spring 16 Spring 1 SPHY 221 University Physics I 3 SSC 111 Earth System History 4 WRS 107 First-Year Writing II: STEM 3 WITH 162 Calculus II 4 Cordit Hours 14 Sophomore Year Fall Bill 15 General Biology 4 Bill 15 General Biology Laboratory 1 PHY 222 University Physics II 3 WITH 210 Introduction to Linear Algebra 3 WITH 211 Calculus III 3 WITH 212 Calculus III 3 WITH 213 Introduction to Physical Oceanography 3 WISC 302 Introduction to Physics II Lab 1 WITH 213 Introduction to Ordinary Differential Equations 3 WITH 214 Introduction to Ordinary Differential Equations 3	CHM 121	Principles of Chemistry	4
MTH 161 Calculus I 16	CHM 113	Chemistry Laboratory I	1
Credit Hours 16	WRS 105	First-Year Writing I	3
Spring 9HY 221 University Physics I 3 SSC 111 Earth System History 4 WRS 107 First-Year Writing II: STEM 3 WTH 162 Calculus II 4 Credit Hours 14 Sophomore Year Fall Sul 150 General Biology 4 SIL 151 General Biology Laboratory 1 PHY 222 University Physics II 3 PHY 224 University Physics II Lab 1 MTH 211 Calculus III 3 Credit Hours 15 Spring MSC 301 Introduction to Physical Oceanography 3 MSC 302 Introduction to Physics III Lab 1 PHY 223 University Physics III Lab 1 MTH 311 Introduction to Ordinary Differential Equations 3 Elective #2 Credit Hours 3 University Physics III 3 MSC 203 Foundations of Computational Marine Science 4 <	MTH 161	Calculus I	4
### 221 University Physics I		Credit Hours	16
Sec 111	Spring		
WRS 107 First-Year Writing II: STEM 3 MTH 162 Calculus II 4 Credit Hours 14 Sophomore Year Fall SIL 150 General Biology 4 SIL 151 General Biology Laboratory 1 PHY 222 University Physics II Lab 1 PHY 224 University Physics II Lab 1 MTH 210 Introduction to Linear Algebra 3 MTH 211 Calculus III 3 Credit Hours 15 Spring MSC 301 Introduction to Physical Oceanography 3 MSC 302 Introduction to Physical Oceanography Lab 3 MSC 303 Introduction to Ordinary Differential Equations 3 MSC 304 Introduction to Ordinary Differential Equations 3 Selective #1 3 Selective #1 3 Selective #1 4 MSC 203 Foundations of Computational Marine Science 4 MBE 230 Introducti	PHY 221	University Physics I	3
MTH 162 Calculus II 4	GSC 111	Earth System History	4
Cedit Hours 14	WRS 107	First-Year Writing II: STEM	3
Sophomore Vear Fall	MTH 162	Calculus II	4
Fall Fall SIL 150 General Biology 4 SIL 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 Credit Hours 15 Spring MSC 301 Introduction to Physical Oceanography 3 MSC 302 Introduction to Physical Oceanography Lab ¹ 1 PHY 223 University Physics III Lab 1 MTH 311 Introduction to Ordinary Differential Equations 3 Elective #1 3 Credit Hours 17 Junior Year Fall MSC 203 Foundations of Computational Marine Science 4 MBE 230 Introduction to Marine Biology 3 PHY 360 Intermediate Electricity and Magnetism 3 PHY 360 Introduction to Mo		Credit Hours	14
Section General Biology Association	Sophomore Year		
Selective #1	Fall		
### 222 University Physics II	BIL 150	General Biology	4
PHY 224 University Physics II Lab 1 MTH 210 Introduction to Linear Algebra 3 MTH 211 Calculus III 3 Credit Hours 15 Spring MSC 301 Introduction to Physical Oceanography 3 MSC 302 Introduction to Physical Oceanography 4 MSC 302 Introduction to Physical Oceanography 4 MSC 303 University Physics III 4 MTH 311 Introduction to Ordinary Differential Equations 3 Elective #1 3 Elective #1 3 Elective #2 Credit Hours 17 MSC 203 Foundations of Computational Marine Science 4 MSE 230 Introduction to Marine Biology 3 PHY 350 Intermediate Electricity and Magnetism 3 PHY 350 Intermediate Electricity and Magnetism 3 PHY 360 Introduction to Modern Physics 3 Elective #3 Credit Hours 16 Credit Hours 16 Credit Hours 17 Credit Hours 17 Credit Hours 18 ASC 215 Chemical Oceanography Laboratory 1 Spring MSC 215 Chemical Oceanography Laboratory 1 Chemical Oceanography Laboratory 1 Chemical Oceanography Laboratory 1 Spring MSC 216 Chemical Oceanography Laboratory 1	BIL 151	General Biology Laboratory	1
MTH 210 Introduction to Linear Algebra 3 MTH 211 Calculus III 3 Credit Hours 15 Spring MSC 301 Introduction to Physical Oceanography 3 MSC 302 Introduction to Physical Oceanography Lab ¹ 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 Credit Hours 17 Junior Year Fall 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 6 Credit Hours 16 Spring MSC 215 Chemical Oceanography Laboratory ¹ 1 <td>PHY 222</td> <td>University Physics II</td> <td></td>	PHY 222	University Physics II	
MTH 211 Calculus III 3 Spring 15 MSC 301 Introduction to Physical Oceanography 3 MSC 302 Introduction to Physical Oceanography Lab ¹ 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 7 Unior Year 17 Junior Year 17 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 6 7 Spring 6 7 MSC 215 Chemical Oceanography Laboratory ¹ 1 MSC 216 Chemical Oceanography Laboratory ¹ 1	PHY 224	University Physics II Lab	1
Credit Hours 15 Spring MSC 301 Introduction to Physical Oceanography MSC 302 Introduction to Physical Oceanography Lab 1 10 PHY 223 University Physics III Lab MTH 311 Introduction to Ordinary Differential Equations 13 Elective #1 Elective #2 Credit Hours 17 Junior Year Fall MSC 203 Foundations of Computational Marine Science 4 MEE 230 Introduction to Marine Biology 3 PHY 350 Intermediate Electricity and Magnetism 3 PHY 360 Introduction to Modern Physics 3 Elective #3 Elective #3 Credit Hours 3 MSC 215 Chemical Oceanography Laboratory 1 15 MSC 215 Chemical Oceanography Laboratory 1 15 MSC 215 Chemical Oceanography Laboratory 1 17 MSC 2016 Chemical Oceanography Laboratory 1 17 MSC 215 Chemical Oceanography Laboratory 1 18 MSC 216 Chemical Oceanography 1 18 MSC 216 Chemical Oceanog	MTH 210	Introduction to Linear Algebra	3
Spring MSC 301 Introduction to Physical Oceanography MSC 302 Introduction to Physical Oceanography Lab 1 PHY 223 University Physics III 3 PHY 225 University Physics III Lab MTH 311 Introduction to Ordinary Differential Equations Elective #1 3 Elective #2 Credit Hours TO MSC 203 Foundations of Computational Marine Science MSE 203 Introduction to Marine Biology 3 PHY 350 Intermediate Electricity and Magnetism PHY 360 Introduction to Modern Physics 3 Elective #3 Credit Hours To MSC 2015 Chemical Oceanography MSC 215 Chemical Oceanography MSC 216 Chemical Oceanography Laboratory 1 1	MTH 211	Calculus III	3
MSC 301		Credit Hours	15
Introduction to Physical Oceanography Lab 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 Credit Hours 177 Junior Year Fall 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 Credit Hours 16 Credit Hours 16 Credit Hours 17 Credit Hours 18 Credit Hours 18 Credit Hours 19 Credit Hours 19	Spring		
PHY 223	MSC 301	Introduction to Physical Oceanography	3
PHY 225 University Physics III Lab 1 MTH 311 Introduction to Ordinary Differential Equations 3 Elective #1 3 Elective #2 3 Credit Hours 17 Junior Year Fall 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 Credit Hours 16 Credit Hours 16 Credit Hours 16 KSpring MSC 215 Chemical Oceanography Laboratory 1 Chemical Oceanography Laboratory 1 Chemical Oceanography Laboratory 1 Computations of Computations of Computational Marine Science 4 Chemical Oceanography Laboratory 1 Chemical Oceanography Laboratory 1 Computations of C	MSC 302	Introduction to Physical Oceanography Lab ¹	1
MTH 311 Introduction to Ordinary Differential Equations 3 Elective #1 3 Elective #2 3 Credit Hours 17 Junior Year Fall 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 Credit Hours 16 Spring MSC 215 Chemical Oceanography 1 MSC 216 Chemical Oceanography Laboratory 1 Chemical Oceanography Laboratory 1 MSC 216	PHY 223	University Physics III	3
Selective #1	PHY 225	University Physics III Lab	1
Credit Hours	MTH 311	Introduction to Ordinary Differential Equations	
Credit Hours 17	Elective #1		
Junior Year Fall 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 Credit Hours 16 Spring MSC 215 Chemical Oceanography 3 MSC 216 Chemical Oceanography Laboratory 1 1	Elective #2		
Fall 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 Credit Hours 16 Spring MSC 215 Chemical Oceanography Chemical Oceanography Laboratory 1 1		Credit Hours	17
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 Credit Hours 16 Spring MSC 215 Chemical Oceanography 3 MSC 216 Chemical Oceanography Laboratory 1	Junior Year		
Introduction to Marine Biology PHY 350 Intermediate Electricity and Magnetism PHY 360 Introduction to Modern Physics 3 Elective #3 Credit Hours 16 Spring MSC 215 Chemical Oceanography Chemical Oceanography Laboratory 1 Chemical Oceanography Laboratory 1	Fall		
PHY 350 Intermediate Electricity and Magnetism 3 PHY 360 Introduction to Modern Physics 3 Elective #3 Credit Hours 16 Spring MSC 215 Chemical Oceanography Associated Chemical Oceanography Laboratory 1 Chemical Oceanography Laboratory 1	MSC 203	Foundations of Computational Marine Science	4
PHY 360 Introduction to Modern Physics 3 Elective #3 3 Credit Hours 16 Spring MSC 215 Chemical Oceanography 3 Chemical Oceanography Laboratory 1	MBE 230		1
Credit Hours 16 Spring MSC 215 Chemical Oceanography 3 Chemical Oceanography Laboratory 1	PHY 350	Intermediate Electricity and Magnetism	3
Credit Hours 16 Spring MSC 215 Chemical Oceanography 3 MSC 216 Chemical Oceanography Laboratory 1	PHY 360	Introduction to Modern Physics	
Spring MSC 215 Chemical Oceanography 3 MSC 216 Chemical Oceanography Laboratory 1	Elective #3		
MSC 215 Chemical Oceanography 3 MSC 216 Chemical Oceanography Laboratory 1		Credit Hours	16
MSC 216 Chemical Oceanography Laboratory ¹	Spring		
	MSC 215	Chemical Oceanography	3
PHY 321 Thermodynamics and Kinetic Theory 3	MSC 216	Chemical Oceanography Laboratory ¹	1
	PHY 321	Thermodynamics and Kinetic Theory	3

PHY 340	Classical Mechanics I	3
MSC 204	Environmental Statistics	3
Elective #4		3
	Credit Hours	16
Senior Year		
Fall		
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
	Credit Hours	16
Spring		
MSC Course		3
MSC Course		3
PHY 351	Intermediate Electricity and Magnetism II	3
Elective #6		3
	Credit Hours	12
	Total Credit Hours	122

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 cuttingedge 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.