

# B.S.M.A.S. IN MARINE SCIENCE WITH A SECOND MAJOR

## Marine Science with a Second Major

Marine Science is an interdisciplinary program dealing with the study of the world's oceans, their physical and biological constituents, the influence of oceanic resources on human society, and the conservation and future development of these resources.

The Bachelor of Science in Marine Science is a full double major program that requires a major in Marine Science through the Rosenstiel School and a second major in one of the sciences. Approved second majors in Applied Physics, Biochemistry, Engineering (all disciplines), and Mathematics may be taken. Students interested in adding a second major in one of these disciplines should review the Applied Physics (<http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/physics/physics-applied-physics-bs/>), Biochemistry (<http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/biochemistry-molecular-biology/biochemistry-molecular-biology-nutrition-bs/>), Engineering (all disciplines) (<http://bulletin.miami.edu/undergraduate-academic-programs/engineering/>), or Mathematics (<http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/mathematics/mathematics-ba-bs/>) pages for additional requirements. Each of the areas of concentration constitutes a rigorous program requiring 120-130 credit hours for graduation.

### 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
MSC 230	Introduction to Marine Biology	3
MSC 301	Introduction to Physical Oceanography	3
Select one of the following:		1
MSC 232	Introduction to Marine Biology Laboratory <sup>1</sup>	
MSC 302	Introduction to Physical Oceanography Lab <sup>2</sup>	
Select 12 credit hours of approved electives in Marine Science <sup>3</sup>		12
<b>Other Required Courses</b>		
Select one of the following:		5
BIL 150 & BIL 151	General Biology and General Biology Laboratory	
BIL 160 & BIL 161	Evolution and Biodiversity and Evolution and Biodiversity Laboratory	
CHM 121	Principles of Chemistry <sup>4</sup>	4
CHM 113	Chemistry Laboratory I	1
ENG 105	English Composition I	3
ENG 107 or ENG 106	English Composition II: Science and Technology English Composition II	3
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>5</sup> Calculus I	4
MTH 162 or MTH 172	Calculus II Calculus II	4
CSC/STATS Course		3-4
Select one of the following options: <sup>6</sup>		10
<b>Option 1:</b>		
PHY 201	University Physics I for the Sciences	
PHY 106	College Physics Laboratory I	
PHY 202	University Physics II for the Sciences	

PHY 108	College Physics Laboratory II	
Option 2:		
PHY 221	University Physics I	
PHY 222	University Physics II	
PHY 223	University Physics III	
PHY 224	University Physics II Lab	
or PHY 225	University Physics III Lab	
Option 3:		
PHY 101	College Physics I	
PHY 102	College Physics II	
PHY 106	College Physics Laboratory I	
PHY 108	College Physics Laboratory II	
<b>Electives</b>		
Arts and Humanities Cognate Courses		9
People and Society Cognate Courses		9
Elective <sup>7</sup>		3
<b>Requirements for Second Major <sup>8</sup></b>		<b>32</b>
Total Credit Hours		120-122

<sup>1</sup> Required for Biochemistry double majors.

<sup>2</sup> Required for Engineering, Mathematics and Applied Physics double majors.

<sup>3</sup> At least 6 of which must be at the 300-level or higher. MSC 204 does not satisfy the MSC elective requirement but does satisfy the Statistics requirement. Three credits may double count for both MSC and the second major if approved by advisor.

<sup>4</sup> Principles of Chemistry must be passed with a grade of "C-" or higher.

<sup>5</sup> Calculus I must be passed with a grade of "C-" or higher.

<sup>6</sup> Option 1 or 2 is recommended for Physics. Option 2 (University Physics) is required for Engineering and Applied Physics.

<sup>7</sup> MSC 203 or RSM 521 is required for Applied Physics, Engineering, and Mathematics.

<sup>8</sup> Students should review the Applied Physics (<http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/physics/physics-applied-physics-bs/>), Biochemistry (<http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/biochemistry-molecular-biology/biochemistry-molecular-biology-nutrition-bs/>), Engineering (all disciplines) (<http://bulletin.miami.edu/undergraduate-academic-programs/engineering/>), or Mathematics (<http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/mathematics/mathematics-ba-bs/>) page for the second major requirements and credits needed.

#### Suggested Plan of Study - Marine Science/Biochemistry

Freshman Year		Credit Hours
<b>Fall</b>		
MSC 111	Introduction to Marine Science	3
MSC 112	Introduction to Marine Science Lab	1
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
ENG 105	English Composition I	3
MTH 161	Calculus I	4
		Credit Hours
		16
<b>Spring</b>		
BIL 160	Evolution and Biodiversity	4
BIL 161	Evolution and Biodiversity Laboratory	1
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
ENG 107	English Composition II: Science and Technology	3
MTH 162	Calculus II	4
		Credit Hours
		17

<b>Sophomore Year</b>		
<b>Fall</b>		
MSC 230	Introduction to Marine Biology	3
MSC 232	Introduction to Marine Biology Laboratory	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
GSC 111	Earth System History	4
MSC 204	Environmental Statistics	3
	Credit Hours	16
<b>Spring</b>		
BMB 401	Biochemistry for the Biomedical Sciences	4
BMB 402	Principles of Experimental BMB <sup>1</sup>	2
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	1-2
Elective #1		3
	Credit Hours	14-15
<b>Junior Year</b>		
<b>Fall</b>		
MSC 215	Chemical Oceanography	3
MSC 216	Chemical Oceanography Laboratory	1
BMB 507	Protein Structure, Function and Biology	3
PHY 201	University Physics I for the Sciences	4
PHY 106	College Physics Laboratory I	1
Elective #2		3
	Credit Hours	15
<b>Spring</b>		
MSC Course		3
BMB 506	Biomedical Case Studies	1
BMB 509	Molecular Biology of the Gene	3
BMB 555	Cellular Structure, Function, and Biology	3
BMB Course		2
PHY 202	University Physics II for the Sciences	4
PHY 108	College Physics Laboratory II	1
	Credit Hours	17
<b>Senior Year</b>		
<b>Fall</b>		
MSC Course		3
BMB 514	Genetics and Genomics: Principles, Mechanisms, and Use	3
Elective #3		3
Elective #4		3
Elective #5		3
	Credit Hours	15
<b>Spring</b>		
MSC 301	Introduction to Physical Oceanography	3
MSC Course		3
MSC Course		3
BMB Course		2
Elective #6		3
Elective #7		3
	Credit Hours	17
	Total Credit Hours	127-128

- \* 7 elective courses must include:
- 3 Arts and Humanities Cognate courses
  - 3 People and Society Cognate courses

<sup>1</sup> A total of 6 elective credits in BMB, including at least 2 elective credits in a BMB lab course, must be taken per the Biochemistry Requirements from the following BMB 145, BMB 245, BMB 402, or BMB 545. BMB 402 is a sample BMB lab course.

- \*\* Students interested in adding a second major in Biochemistry should review the Biochemistry (<http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/biochemistry-molecular-biology/biochemistry-molecular-biology-nutrition-bs/>) page for the official requirements needed. This is a suggested plan of study only.

## Suggested Plan of Study - Marine Science/Mathematics (Applied Analysis)

Freshman Year		Credit Hours
<b>Fall</b>		
MSC 111	Introduction to Marine Science	3
MSC 112	Introduction to Marine Science Lab	1
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
ENG 105	English Composition I	3
MTH 161	Calculus I	4
Credit Hours		16
<b>Spring</b>		
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
GSC 111	Earth System History	4
ENG 107	English Composition II: Science and Technology	3
MTH 162	Calculus II	4
Credit Hours		16
<b>Sophomore Year</b>		
<b>Fall</b>		
MSC 230	Introduction to Marine Biology	3
MSC 203	Foundations of Computational Marine Science *	4
MTH 210	Introduction to Linear Algebra	3
PHY 221	University Physics I	3
Elective #1		3
Credit Hours		16
<b>Spring</b>		
MSC 301	Introduction to Physical Oceanography	3
MSC 302	Introduction to Physical Oceanography Lab	1
MTH 311	Introduction to Ordinary Differential Equations	3
PHY 222	University Physics II	3
PHY 224	University Physics II Lab	1
Elective #2		3
Credit Hours		14
<b>Junior Year</b>		
<b>Fall</b>		
MTH 230	Introduction to Abstract Mathematics	3
MTH 310	Multivariable Calculus	3
MTH 224	Introduction to Probability and Statistics	3
PHY 223	University Physics III	3
Elective #3		3
Credit Hours		15
<b>Spring</b>		
MSC 215	Chemical Oceanography	3

MSC 216	Chemical Oceanography Laboratory	1
MSC Course		3
MTH 512	Elementary Complex Analysis	3
Elective #4		3
Elective #5		3
	Credit Hours	16
<b>Senior Year</b>		
<b>Fall</b>		
MSC Course		3
MTH 433	Advanced Calculus	3
MTH 513	Partial Differential Equations I	3
Elective #6		3
Elective #7		3
	Credit Hours	15
<b>Spring</b>		
MSC Course		3
MSC Course		3
MTH 461	Survey of Modern Algebra	3
MTH 514	Partial Differential Equations II	3
	Credit Hours	12
	Total Credit Hours	120

- \* 7 elective courses must include:
- 3 Arts and Humanities Cognate courses
  - 3 People and Society Cognate courses
  - MSC 203 or RSM 521 is required for Applied Physics, Engineering, and Mathematics.

- \*\* Students interested in adding a second major in Mathematics should review the Mathematics (<http://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/mathematics/mathematics-ba-bs/>) page for the official requirements needed. This is a suggested plan of study only.

## Mission

The mission of the Rosenstiel School of Marine and Atmospheric 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, 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.
- 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.