

B.S.M.A.S. IN MARINE SCIENCE / MICROBIOLOGY AND IMMUNOLOGY

Overview

The Marine Science/Microbiology and Immunology degree is a Bachelor of Science degree (BSMAS) that is designed to give students a strong background in molecular and cellular aspects of microbial pathogenesis and immune defenses. The ocean, which is teeming with microbes, is explored to highlight the complex biological interactions between microbes and their hosts and the environmental factors that influence these relationships. This program is ideal for students interested in the relationship between the ocean and human health and medicine as well as those interested in pursuing a pre-medical or pre-veterinary track.

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 encompasses ocean and human health, medicine, and molecular and cellular aspects of microbial pathogenesis and immune defenses.

The Bachelor of Science double major in Marine Science/Microbiology and Immunology 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 Requirements		
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 MSC 302	Introduction to Physical Oceanography Lab	
MBE 230	Introduction to Marine Biology	3
MBE 232	Introduction to Marine Biology Laboratory	1
MSC 301	Introduction to Physical Oceanography ¹	3
MBE 465	Marine Comparative Immunology	3
or GSC 309	Microbes and the Environment	
Select 9 credit hours of approved Rosenstiel School electives within ATM, GSC, MBE, MSC, OCE or RSM courses ²		9
Microbiology and Immunology Requirements (15 Credits)		
MIC 301	Introduction to Microbes and the Immune System	3
MIC 304	Introduction to Microbes and the Immune System (Lab)	3
MIC 321	Immunobiology	3
MIC 323	Microbial Biology and Pathogenesis	3
MIC 460	Advanced Topics in Microbiology and Immunology (A)	3
or MIC 470	Advanced Topics in Microbiology and Immunology (B)	
Microbiology and Immunology Approved Electives		9
MIC 201	Modern Plagues and Society	
MIC 322	Medical Parasitology	
MIC 444	Lab Techniques and Experimental Design	
MIC 460	Advanced Topics in Microbiology and Immunology (A)	
MIC 470	Advanced Topics in Microbiology and Immunology (B) (Advanced Topics in Microbiology and Immunology (B) (NEW COURSE))	
Only 6 credit hours of Research in MIC may be applied toward the 9 MIC elective hours, any credits over 6 count as elective credits toward the 120 credits required for graduation or 150 credits for dual degree seeking students.		
MIC 451	Special Projects in Immunobiology ³	
MIC 452	Special Projects in Microbiology ³	
MIC 453	Special Projects in Parasitology ³	
Maximum of one course from outside electives can count towards the 9 MIC elective hours.		
BIL 250	Genetics	
BIL 255	Cellular and Molecular Biology	

BPH 206	Introduction to Public Health ⁴	
BPH 208	Introductory Epidemiology ⁴	
Biology Requirements		
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
or BIL 153	Introductory Biology/Chemistry Laboratory I	
BIL 160	Evolution and Biodiversity	4
BIL 161	Evolution and Biodiversity Laboratory	1
or BIL 163	Introductory Biology/Chemistry Laboratory II	
Biochemistry and Molecular Biology Requirement		
BMB 401	Biochemistry for the Biomedical Sciences	4
Chemistry Requirements		
CHM 121	Principles of Chemistry ⁵	4
CHM 113	Chemistry Laboratory I	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	2
or CHM 207	Chemical Dynamics and Organic Synthesis Laboratory	
Geological Sciences Requirement ⁷		3-4
Select one of the following:		
GSC 110	The Earth System	
GSC 111	Earth System History	
MSC 424	Origin and Geology of the Galapagos Islands. (Approval Required) ⁷	
Mathematics Requirements		
MTH 161	Calculus I ⁶	4
or MTH 171	Calculus I	
MTH 162	Calculus II (fulfills the Rosenstiel BSMAS quantitative skills requirement)	4
or MTH 172	Calculus II	
Statistics or Computational Science Requirement		3-4
Select one of the following:		
MSC 204	Environmental Statistics	
MSC 203	Foundations of Computational Marine Science	
MTH 224	Introduction to Probability and Statistics	
CSC 120	Computer Programming I	
CSC 210	Computing for Scientists	
Physics Requirements		
Select one of the following options:		10
Option 1 (recommended):		
PHY 201	University Physics I for the Sciences	
PHY 106	Physics Laboratory 1	
PHY 202	University Physics II for the Sciences	
PHY 108	Physics Laboratory 2	
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 211	University Physics I for PRISM	

PHY 106	Physics Laboratory 1	
PHY 212	University Physics II for PRISM	
PHY 108	Physics Laboratory 2	
Option 4:		
PHY 101	College Physics I	
PHY 106	Physics Laboratory 1	
PHY 102	College Physics II	
PHY 108	Physics Laboratory 2	
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
or WRS 106	First-Year Writing II	
or ENG 106	Writing About Literature and Culture	
Quantitative Skills:		
MTH 161	Calculus I (fulfilled through the major)	
or MTH 171	Calculus I	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
Total Credit Hours		129-131

¹ MSC 351 and MSC 352 taken together in the Galapagos may be used to complete the MSC 301 requirement and 3 credits of approved Rosenstiel School electives.

² At least 6 of which must be at the 300-level or higher. MSC 204 and MSC 425 do not satisfy the MSC 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/>).

³ MIC 451, MIC 452, MIC 453, all require that you have already completed MIC 304 and earned at least a B and have a 3.0 cumulative GPA with permission of Dr. Schesser or Roger, Fall and Spring Semesters.

⁴ Only for students pursuing an additional major or minor in Public Health.

⁵ Principles of Chemistry must be passed with a grade of "C-" or higher.

⁶ Calculus I must be passed with a grade of "C-" or higher.

⁷ Students who participate in the UGalapagos Program may use MSC 424 (a 3-credit course) to fulfill the Geological Sciences requirement and complete the BSMAS degree in 129 credits. All other students will need to complete 130-131 credits depending on the course used to fulfill the Statistics or Computational Science requirement.

* Transfer students seeking a Microbiology and Immunology major must earn at least 15 credit hours taken in residence in the UM Department of Microbiology and Immunology beyond MIC 301 in the courses listed above for majors.

Suggested Plan of Study

This is only a sample. There are numerous ways students can create plans of study for the Marine Science/Microbiology and Immunology 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.

Freshman Year		
Fall		Credit Hours
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
WRS 105	First-Year Writing I	3
MTH 161	Calculus I	4
Credit Hours		16
Spring		
MIC 301	Introduction to Microbes and the Immune System	3

CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
WRS 107	First-Year Writing II: STEM	3
MTH 162	Calculus II	4
Credit Hours		15
Sophomore Year		
Fall		
MBE 230	Introduction to Marine Biology	3
MBE 232	Introduction to Marine Biology Laboratory	1
MIC 304	Introduction to Microbes and the Immune System (Lab)	3
GSC 111	Earth System History	4
MSC 204	Environmental Statistics	3
A&H Cognate Course #1		3
Credit Hours		17
Spring		
MIC 321	Immunobiology	3
MIC 323	Microbial Biology and Pathogenesis	3
BIL 160	Evolution and Biodiversity	4
BIL 161	Evolution and Biodiversity Laboratory	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
Credit Hours		16
Junior Year		
Fall		
MSC Course		4
MIC Approved Elective		3
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	2
PHY 201	University Physics I for the Sciences	4
PHY 106	Physics Laboratory 1	1
Credit Hours		18
Spring		
MSC 215	Chemical Oceanography	3
MSC 301	Introduction to Physical Oceanography	3
MIC Approved Elective		3
PHY 202	University Physics II for the Sciences	4
PHY 108	Physics Laboratory 2	1
A&H Cognate Course #2		3
Credit Hours		17
Senior Year		
Fall		
MSC 216	Chemical Oceanography Laboratory ¹	1
MBE 465	Marine Comparative Immunology	3
MIC 460	Advanced Topics in Microbiology and Immunology (A)	3
BMB 401	Biochemistry for the Biomedical Sciences	4
MSC Course		3
A&H Cognate Course #3		3
Credit Hours		17
Spring		
MSC Course		3
MIC Approved Elective		3
P&S Cognate Course #1		3

P&S Cognate Course #2	3
P&S Cognate Course #3	3
Credit Hours	15
Total Credit Hours	131

¹ Students must take one laboratory from MSC 216 or MSC 302.

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 Microbiology and Immunology, acquire valuable technical skills and learn how to apply this knowledge to real-world problems, in light of increasing stress on environment and human health. 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 Microbiology and Immunology.
- 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.
- Students will be able to present and synthesize background information from scientific literature and report findings from their laboratory experiments or observations from their field work.