

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 |
|---|---|--------------|
| Marine Science | | |
| MSC 111 | Introduction to Marine Science | 3 |
| MSC 112 | Introduction to Marine Science Lab | 1 |
| MSC 215 | Chemical Oceanography | 3 |
| MBE 230 | Introduction to Marine Biology | 3 |
| MSC 301 | Introduction to Physical Oceanography | 3 |
| Select two of the following: | | 2 |
| MSC 216 | Chemical Oceanography Laboratory ¹ | |
| MBE 232 | Introduction to Marine Biology Laboratory ¹ | |
| MSC 302 | Introduction to Physical Oceanography Lab ² | |
| Select 12 credit hours of approved Rosenstiel School electives within ATM, GSC, MBE, MSC, OCE or RSM courses ³ | | 12 |
| Other Required Courses | | |
| 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 ⁴ | 4 |
| CHM 113 | Chemistry Laboratory I | 1 |
| 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 | |
| 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 ⁵ | 4 |
| or MTH 171 | Calculus I | |
| MTH 162 | Calculus II ⁶ | 4 |
| or MTH 172 | Calculus II | |
| CSC/STATS Course | | 3-4 |
| Select one of the following options: ⁷ | | 10 |
| Option 1: | | |
| PHY 201 | University Physics I for the Sciences | |
| PHY 106 | College Physics Laboratory I | |

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| 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 | |
| Requirements for Second Science Major⁸ | | 32 |
| Electives | | |
| Arts and Humanities Cognate Courses | | 9 |
| People and Society Cognate Courses | | 9 |
| Elective ⁹ | | 3 |
| Total Credit Hours | | 120 |

¹ Required for Biochemistry double majors.

² Required for Engineering, Mathematics and Applied Physics double majors.

³ 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/>). CAE 330 or MAE 309 may double count for both MSC and Engineering.

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

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

⁶ Calculus II fulfills the Quantitative Skills Requirement.

⁷ Option 1 or 2 is recommended for Physics. Option 2 (University Physics) is required for Engineering and Applied Physics.

⁸ 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.

⁹ An extra elective is not required for Biochemistry.

Suggested Plan of Study - Marine Science/Biochemistry

| Freshman Year | | Credit Hours |
|---------------------|---------------------------------------|--------------|
| Fall | | |
| 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 | | |
| 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 |
| WRS 107 | First-Year Writing II: STEM | 3 |
| MTH 162 | Calculus II | 4 |
| Credit Hours | | 17 |

| | | |
|---------------------------|--|------------|
| Sophomore Year | | |
| Fall | | |
| MBE 230 | Introduction to Marine Biology | 3 |
| MBE 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 |
| Spring | | |
| BMB 401 | Biochemistry for the Biomedical Sciences | 4 |
| BMB 402 | Principles of Experimental BMB ¹ | 2 |
| CHM 222 | Organic Reactions and Synthesis | 4 |
| CHM 206 | Organic Reactions and Synthesis Laboratory | 2 |
| Elective #1 | | 3 |
| Credit Hours | | 15 |
| Junior Year | | |
| Fall | | |
| 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 |
| Spring | | |
| 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 |
| Senior Year | | |
| Fall | | |
| 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 |
| Spring | | |
| MSC 301 | Introduction to Physical Oceanography | 3 |
| MSC Course | | 3 |
| MSC Course | | 3 |
| BMB Course | | 2 |
| Elective #6 | | 3 |
| Credit Hours | | 14 |
| Total Credit Hours | | 125 |

* 6 elective courses must include:

- 3 Arts and Humanities Cognate courses
- 3 People and Society Cognate courses

¹ 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 |
|-----------------------|---|--------------|
| Fall | | |
| 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 | | |
| CHM 121 | Principles of Chemistry | 4 |
| CHM 113 | Chemistry Laboratory I | 1 |
| GSC 111 | Earth System History | 4 |
| WRS 107 | First-Year Writing II: STEM | 3 |
| MTH 162 | Calculus II | 4 |
| Credit Hours | | 16 |
| Sophomore Year | | |
| Fall | | |
| MSC 203 | Foundations of Computational Marine Science | 4 |
| MBE 230 | Introduction to Marine Biology | 3 |
| MTH 210 | Introduction to Linear Algebra | 3 |
| PHY 221 | University Physics I | 3 |
| Elective #1 | | 3 |
| Credit Hours | | 16 |
| Spring | | |
| 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 |
| Junior Year | | |
| Fall | | |
| 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 |
| Spring | | |
| 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 |
| Senior Year | | |
| Fall | | |
| MSC Course | | 3 |
| MTH 433 | Advanced Calculus | 3 |
| MTH 513 | Partial Differential Equations I | 3 |
| Elective #6 | | 3 |
| Elective #7 | | 3 |
| Credit Hours | | 15 |
| Spring | | |
| 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

** 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, 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, 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.