B.S.M.A.S. IN METEOROLOGY AND MARINE SCIENCE

Overview

The Marine Science/Meteorology degree is a Bachelor of Science degree (BSMAS) that is designed to give students a strong background in the physical aspects of climate, as well as the interaction of the ocean and the atmosphere. The Meteorology curriculum follows the program guidelines established by the American Meteorological Society.

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 atmospheric dynamics, climate science, boundary-layer processes, cloud processes, and remote sensing. Focus areas include hurricanes (modeling, data assimilation and field observations), tropical meteorology, atmosphere-ocean coupling, climate, and climate change. Many faculty are active in fieldwork.

The Bachelor of Science double major in Marine Science/Meteorology 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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM 103</td>
<td>Survey of Modern Meteorology</td>
<td>3</td>
</tr>
<tr>
<td>ATM 243</td>
<td>Weather Forecasting</td>
<td>3</td>
</tr>
<tr>
<td>ATM 303</td>
<td>Meteorological Instrumentation and Observation</td>
<td>3</td>
</tr>
<tr>
<td>ATM 305</td>
<td>Atmospheric Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ATM 307</td>
<td>Introduction to the Physics of Climate</td>
<td>3</td>
</tr>
<tr>
<td>ATM 405</td>
<td>Atmospheric Dynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ATM 406</td>
<td>Atmospheric Dynamics II</td>
<td>3</td>
</tr>
<tr>
<td>ATM 407</td>
<td>Weather Analysis</td>
<td>4</td>
</tr>
<tr>
<td>ATM 409</td>
<td>Cloud Physics, Radiation, and Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td>MSC 111</td>
<td>Introduction to Marine Science</td>
<td>3</td>
</tr>
<tr>
<td>MSC 112</td>
<td>Introduction to Marine Science Lab</td>
<td>1</td>
</tr>
<tr>
<td>MSC 215</td>
<td>Chemical Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>MBE 230</td>
<td>Introduction to Marine Biology</td>
<td>3</td>
</tr>
<tr>
<td>MSC 301</td>
<td>Introduction to Physical Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>MSC 302</td>
<td>Introduction to Physical Oceanography Lab</td>
<td>1</td>
</tr>
<tr>
<td>MSC 216</td>
<td>Chemical Oceanography Laboratory</td>
<td>1</td>
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<tr>
<td>or MBE 232</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Introduction to Marine Biology Laboratory</td>
<td></td>
</tr>
<tr>
<td>Select 9 credit hours of approved Rosenstiel School electives within MBE, MSC, OCE or RSM courses</td>
<td>9</td>
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</tbody>
</table>

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 2
- CHM 113 Chemistry Laboratory I
- CSC 120 or MSC 203 Computer Programming I and Foundations of Computational Marine Science

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.
- MSC 204 Environmental Statistics
- MTH 161 or MTH 171 Calculus I 3

or MTH 171

Calculus I
B.S.M.A.S. in Meteorology and Marine Science

MTH 162 Calculus II (fulfills the Rosenstiel BSMAS quantitative skills requirement) 3
or MTH 172 Calculus II
MTH 210 Introduction to Linear Algebra
MTH 211 Calculus III
or MTH 310 Multivariable Calculus
MTH 311 Introduction to Ordinary Differential Equations
PHY 201 University Physics I for the Sciences
PHY 202 University Physics II for the Sciences
PHY 106 College Physics Laboratory I
PHY 108 College Physics Laboratory II

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 123

1 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.
3 Calculus I and II must be passed with a grade of "C" or higher.

Suggested Plan of Study
This is only a sample. There are numerous ways students can create plans of study for the Marine Science/Meteorology 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

<table>
<thead>
<tr>
<th>Semester</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>ATM 103</td>
<td>Survey of Modern Meteorology 3</td>
</tr>
<tr>
<td>MSC 111</td>
<td>Introduction to Marine Science 3</td>
</tr>
<tr>
<td>MSC 112</td>
<td>Introduction to Marine Science Lab 1</td>
</tr>
<tr>
<td>WRS 105</td>
<td>First-Year Writing I 3</td>
</tr>
<tr>
<td>MTH 161</td>
<td>Calculus I 4</td>
</tr>
<tr>
<td></td>
<td>Credit Hours 14</td>
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<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>ATM 243</td>
<td>Weather Forecasting 3</td>
</tr>
<tr>
<td>CHM 113</td>
<td>Chemistry Laboratory I 1</td>
</tr>
<tr>
<td>CHM 121</td>
<td>Principles of Chemistry 4</td>
</tr>
<tr>
<td>WRS 107</td>
<td>First-Year Writing II: STEM 3</td>
</tr>
<tr>
<td>MTH 162</td>
<td>Calculus II 4</td>
</tr>
<tr>
<td></td>
<td>Credit Hours 15</td>
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</tbody>
</table>
### Sophomore Year

#### Fall
- **MTH 210** Introduction to Linear Algebra 3
- **PHY 201** University Physics I for the Sciences 4
- **PHY 106** College Physics Laboratory I 1
- **MSC course (ATM 244 is recommended)** 3
- **MSC 203** Foundations of Computational Marine Science 4

#### Spring
- **ATM 303** Meteorological Instrumentation and Observation 3
- **BIL 160** Evolution and Biodiversity 4
- **BIL 161** Evolution and Biodiversity Laboratory 1
- **PHY 202** University Physics II for the Sciences 4
- **PHY 108** College Physics Laboratory II 1
- **Elective #1** 3

**Credit Hours** 15

### Junior Year

#### Fall
- **ATM 305** Atmospheric Thermodynamics 3
- **MSC 204** Environmental Statistics 3
- **MSC 215** Chemical Oceanography 3
- **MTH 211 or 310** Calculus III 3 or Multivariable Calculus
- **Elective #2** 3

#### Spring
- **ATM 307** Introduction to the Physics of Climate 3
- **ATM 405** Atmospheric Dynamics I 3
- **MSC 301** Introduction to Physical Oceanography 3
- **MSC 302** Introduction to Physical Oceanography Lab 1
- **MTH 311** Introduction to Ordinary Differential Equations 3
- **Elective #3** 3

**Credit Hours** 15

### Senior Year

#### Fall
- **ATM 406** Atmospheric Dynamics II 3
- **ATM 407** Weather Analysis 4
- **MBE 230** Introduction to Marine Biology 3
- **MBE 232** Introduction to Marine Biology Laboratory 1
- **MSC Course** 3
- **Elective #4** 3

#### Spring
- **ATM 409** Cloud Physics, Radiation, and Remote Sensing 3
- **GSC 111** Earth System History 4
- **MSC Course** 3
- **Elective #5** 3
- **Elective #6** 3

**Credit Hours** 16

**Total Credit Hours** 124

* 6 elective courses must include:
• 3 Arts and Humanities Cognate courses
• 3 People and Society Cognate courses

1. 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 Meteorology, acquire valuable technical skills and learn how to apply this knowledge to real-world problems, in a time of changing climate and 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 Meteorology
• 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.
• Meteorology students will be able to apply concepts from physics to the atmosphere of a rotating planet, to solve basic problems.
• Students will be able to apply the basic concepts of thermodynamics to the atmosphere.
• Students will learn the structure and chemistry of the troposphere and stratosphere and apply this to air quality and environmental science applications.