B.S.M.A.S. IN METEOROLOGY AND MATHEMATICS

Overview

The Bachelor of Science degree program prepares students for further graduate studies as well as for non-academic professional applications. The program follows standards established by the American Meteorological Society (AMS), emphasizing a math and physics background for understanding the physical processes governing the motion and composition of the atmosphere.

Undergraduate students are encouraged to work with the faculty and are able to earn course credit and senior theses by conducting 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 degree program is meant for students planning to continue with graduate studies in atmospheric science, or for those who will pursue a technical career in this area in government or private industry.

Curriculum Requirements (Applied Analysis)

Code	Title	Credit Hours
Atmospheric Science		
ATM 103	Survey of Modern Meteorology	3
ATM 243	Weather Forecasting	3
ATM 265	Atmospheric Chemistry	3
ATM 303	Meteorological Instrumentation and Observation	3
ATM 305	Atmospheric Thermodynamics	3
ATM 307	Introduction to the Physics of Climate	3
ATM 405	Atmospheric Dynamics I	3
ATM 406	Atmospheric Dynamics II	3
ATM 407	Weather Analysis	4
ATM 409	Cloud Physics, Radiation, and Remote Sensing	3
Mathematics Core		
MTH 161	Calculus I [1]	4
or MTH 171	Calculus I	
MTH 162	Calculus II (fulfills the Rosenstiel BSMAS quantitative skills requirement) [1]	4
or MTH 172	Calculus II	
MTH 210	Introduction to Linear Algebra	3
MTH 224	Introduction to Probability and Statistics	3
or MSC 204	Environmental Statistics	
MTH 230	Introduction to Abstract Mathematics	3
MTH 310	Multivariable Calculus	3
MTH 311	Introduction to Ordinary Differential Equations	3
MTH 433	Advanced Calculus	3
or MTH 533	Introduction to Real Analysis I	
MTH 461	Survey of Modern Algebra	3
or MTH 561	Abstract Algebra I	
Applied Analysis Courses *		
MTH 512	Elementary Complex Analysis	3
Select one of the following Sequences:		6
MTH 513 & MTH 514	Partial Differential Equations I and Partial Differential Equations II	
MTH 515 & MTH 516	Ordinary Differential Equations and Dynamics and Bifurcations	
Additional Required Courses		
MSC 111	Introduction to Marine Science	3
MSC 112	Introduction to Marine Science Lab	1

CSC 120	Computer Programming I	4
or MSC 203	Foundations of Computational Marine Science	
PHY 201	University Physics I for the Sciences	4
PHY 106	College Physics Laboratory I	1
PHY 202	University Physics II for the Sciences	4
PHY 108	College Physics Laboratory II	1
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)		
Electives		
Additional Electives		9
Total Credit Hours		**120**

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

* A track in Probability and Statistics is also available.

Suggested Plan of Study with Applied Analysis Track

This is only a sample. There are numerous ways students can create plans of study for the Meteorology and Mathematics 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**
ATM 103	Survey of Modern Meteorology	3
MSC 111	Introduction to Marine Science	3
MSC 112	Introduction to Marine Science Lab	1
MTH 161	Calculus I	4
WRS 105	First-Year Writing I	3
	Credit Hours	**14**
Spring		
ATM 243	Weather Forecasting	3
ATM 265	Atmospheric Chemistry	3
MSC 204	Environmental Statistics	3
MTH 162	Calculus II	4
WRS 107	First-Year Writing II: STEM	3
	Credit Hours	**16**
Sophomore Year		
Fall		
MTH 210	Introduction to Linear Algebra	3
MTH 311	Introduction to Ordinary Differential Equations	3
PHY 201	University Physics I for the Sciences	4
PHY 106	College Physics Laboratory I	1

Elective #1 (ATM 244 recommended)		3
	Credit Hours	**14**
Spring		
ATM 303	Meteorological Instrumentation and Observation	3
MTH 230	Introduction to Abstract Mathematics	3
PHY 202	University Physics II for the Sciences	4
PHY 108	College Physics Laboratory II	1
Elective #2		3
	Credit Hours	**14**
Junior Year		
Fall		
ATM 305	Atmospheric Thermodynamics	3
MTH 310	Multivariable Calculus	3
CSC 120 or MSC 203	Computer Programming I or Foundations of Computational Marine Science	4
Elective #3		3
Elective #4		3
	Credit Hours	**16**
Spring		
ATM 307	Introduction to the Physics of Climate	3
ATM 405	Atmospheric Dynamics I	3
MTH 433	Advanced Calculus	3
MTH 461	Survey of Modern Algebra	3
Elective #5		3
	Credit Hours	**15**
Senior Year		
Fall		
ATM 406	Atmospheric Dynamics II	3
ATM 407	Weather Analysis	4
MTH 513 or 515	Partial Differential Equations I or Ordinary Differential Equations	3
Elective #6		3
Elective #7		3
	Credit Hours	**16**
Spring		
ATM 409	Cloud Physics, Radiation, and Remote Sensing	3
MTH 512	Elementary Complex Analysis	3
MTH 514 or 516	Partial Differential Equations II or Dynamics and Bifurcations	3
Elective #8		3
Elective #9		3
	Credit Hours	**15**
	Total Credit Hours	**120**

* 9 elective courses must include:

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

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 Meteorology at the University of Miami is to graduate students with the ability and desire to integrate knowledge of meteorology into their future careers.

Goals

Students completing this double major will be able to master a broad set of fundamental scientific knowledge in Meteorology and Mathematics, 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:

- Pursue a course of study that provides both depth and breadth in Meteorology and Mathematic courses.
- Prepare themselves for public and private sector employment, graduate school, and successful careers.
- Students should gain substantial problem solving and critical reasoning skills, and they should develop an understanding of the conceptual underpinnings of mathematics and meteorology.

Student Learning Outcomes

- Students will be able to apply and use the equations that govern physical atmospheric processes and responses to explain fundamental principles and behaviors of the atmosphere and to solve quantitative problems.
- Students will be able to utilize and interpret observations and model output to evaluate atmospheric processes and phenomena.
- Students will be able to use a computer programming language to investigate weather and climate phenomena and to analyze and visualize data.
- Students will be able to carry out supervised research in the field of atmospheric science.
- Students will demonstrate an ability to effectively communicate scientific information.
- Students will acquire a solid understanding of advanced material within a mathematics "specialty path" which synthesizes and extends their lower-division work. The path is selected by the individual student depending on his/her particular interests.