B.A. OR B.S. IN MATHEMATICS

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Major

The requirements for a major in mathematics vary according to the objectives of the student. There are **seven courses** required of all mathematics majors.

An **additional four courses** are required, selected from one of the following track options:

- Core Mathematics
- Applied Analysis
- Computational Mathematics
- Probability and Statistics
- Secondary School Teaching
- Mathematical Economics

Writing Requirement

In order to satisfy the College of Arts and Sciences writing requirement, students majoring in mathematics must obtain writing credit in one of the following courses: MTH 433, MTH 461, MTH 502, MTH 504, MTH 520, MTH 533, MTH 561, and in three more writing courses from other departments.

Curriculum Requirements

The requirements of a major in mathematics vary according to the objectives of the student. There are seven courses required of all mathematics majors. An additional four courses are required selected from one of six track options:

Core Courses and Track Options

Code	Title	Credit Hours
Courses Required for All Mathematics Majors		
MTH 161	Calculus I	4
or MTH 171	Calculus I	
MTH 162	Calculus II	4
or MTH 172	Calculus II	
MTH 210	Introduction to Linear Algebra	3
MTH 230	Introduction to Abstract Mathematics	3
MTH 310	Multivariable Calculus	3
MTH 461	Survey of Modern Algebra	3
or MTH 561	Abstract Algebra I	
MTH 433	Advanced Calculus	3
or MTH 533	Introduction to Real Analysis I	
Track Options		
Select four courses from one of the following Tracks:		12
Core Mathematics Track:		
Select four of the following:		
MTH 510	Linear Algebra	
MTH 512	Elementary Complex Analysis	
MTH 531	Topology I	
MTH 532	Topology II	
MTH 534	Introduction to Real Analysis II	
MTH 551	Introduction to Differential Geometry	
MTH 562	Abstract Algebra II	
Applied Analysis Track: [1]		
MTH 311	Introduction to Ordinary Differential Equations	
MTH 512	Elementary Complex Analysis	
Select one of the following sequences:		

MTH 513 & MTH 514	Partial Differential Equations I and Partial Differential Equations II	
MTH 515 & MTH 516	Ordinary Differential Equations and Dynamics and Bifurcations	
Computational Mathematics Track:		
MTH 320	Introduction to Numerical Analysis	
CSC 317	Data Structures and Algorithm Analysis	
MTH 520 & MTH 521	Numerical Linear Algebra and Numerical Methods in Differential Equations	
Probability and Statistics Track:		
MTH 224	Introduction to Probability and Statistics	
MTH 524 & MTH 525	Introduction to Probability and Introduction to Mathematical Statistics	
MTH 542	Statistical Analysis	
Secondary School Teaching Track: [2]		
MTH 224	Introduction to Probability and Statistics	
MTH 309	Discrete Mathematics I	
Select two of the following:		
MTH 502	History of Mathematics	
MTH 504	Foundations of Geometry	
MTH 505	Theory of Numbers	
Mathematical Economics Track:		
MTH 524 & MTH 525	Introduction to Probability and Introduction to Mathematical Statistics	
ECO 533	Advanced Microeconomic Theory	
Select one of the following:		
ECO 512	Topics in Mathematical Economics	
ECO 520	Advanced Econometrics	
ECO 521	Advanced Macroeconomic Theory	
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 106	First-Year Writing II	3
or ENG 106	Writing About Literature and Culture	
Quantitative Skills:		
Fulfilled through the Math Major		
Areas of Knowledge:		
Arts & Humanities Cognate		9
People & Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
Other Requirements [3,4]		
Second Language courses [5]		3-9
Approved Natural Science course [6]		3
Minor or additional major		15-35
Electives [7]		40-14
Total Credit Hours		**120**

1 Course work in physics is desirable.

2 This option is only for those obtaining a teaching credential.

3 For the Additional Major in Mathematics, students not in the College of Arts and Sciences should use the requirements of their school or college's degree in place of the other requirements listed here.

4 The 120 credits must include a writing intensive course in mathematics and three writing intensive courses from other departments, not including WRS 105, WRS 106 WRS 107 and ENG 106.

5 Three credits in a language other than English at 200-level or higher are required. Prerequisites may be required.

[6] For BS in Mathematics, the credits must be from Biology, Chemistry, Geological Sciences or Physics in a course that counts towards a major in that department. For BA in mathematics, the credits must be earned from Biology, Chemistry, Ecosystem Science & Policy (only ECS 111, ECS 112, or ECS 202), Geological Sciences, Marine Sciences (except MSC 313 and MSC 314), Physical Science or Physics. APY 203 and GEG 120 may also count.

[7] For BS in Mathematics, electives must include MTH 224 or CSC 120.

* **Notes**

- It would be useful for students planning to do graduate study in mathematics to complete the following courses: MTH 531, MTH 532, MTH 533, MTH 534, MTH 561, MTH 562.
- Students interested in **actuarial science** should choose the Probability and Statistics option; for these students a finance minor is recommended.
- Transfer students will be permitted to apply up to 14 transfer credit hours towards the major; however, the courses MTH 461 (or MTH 561) and MTH 433 (or MTH 533) must be completed at the University of Miami.
- A grade of C- or better is required for each course applied toward the major; the overall quality point average for University of Miami courses applied toward the major must be 2.5 or above.

Requirements for Departmental Honors in Mathematics:

Code	Title	Credit Hours
Select three of the following sequences		18
MTH 513 & MTH 514	Partial Differential Equations I and Partial Differential Equations II	6
MTH 515 & MTH 516	Ordinary Differential Equations and Dynamics and Bifurcations	6
MTH 520 & MTH 521	Numerical Linear Algebra and Numerical Methods in Differential Equations	6
MTH 524 & MTH 525	Introduction to Probability and Introduction to Mathematical Statistics	6
MTH 531 & MTH 532	Topology I and Topology II	6
MTH 533 & MTH 534	Introduction to Real Analysis I and Introduction to Real Analysis II	6
MTH 561 & MTH 562	Abstract Algebra I and Abstract Algebra II	6

* The student must attain at least a B in each course used to fulfill this requirement. In addition, the student must attain at least a 3.5 average over all courses counted toward the mathematics major and an overall (university-wide) average of at least 3.3.

Possible Plan of Study

The B.A. and B.S. degrees in Mathematics differ only in the College of Arts and Sciences general education requirements. Here is a possible plan of study.

Year One		
Fall		**Credit Hours**
MTH 161	Calculus I	4
WRS 105	First-Year Writing I	3
Language course		3
Select one of the following		3
Natural Science		
Elective		
Select one of the following		3
Cognate		
Elective		
	Credit Hours	**16**
Spring		
MTH 162	Calculus II	4

MTH 210	Introduction to Linear Algebra	3
ENG 106 or WRS 106	Writing About Literature and Culture or First-Year Writing II	3
Language course		3
Select one of the followng		3
Natural Science		
Cognate		
Elective		
	Credit Hours	**16**
Year Two		
Fall		
MTH 230 or 310	Introduction to Abstract Mathematics or Multivariable Calculus	3
Language course		3
Select one of the following		3
Natural Science		
Cognate		
Elective		
Select one of the following		3
Cognate		
Elective		
Elective		3
	Credit Hours	**15**
Spring		
MTH 310 or 230	Multivariable Calculus or Introduction to Abstract Mathematics	3
Select one of the following		3
Mathematics 200 0r 300- level track course		
Cognate		
Elective		
Cognate		3
Electives		6
	Credit Hours	**15**
Year Three		
Fall		
Select one of the following		3
MTH 433	Advanced Calculus	
MTH 533	Introduction to Real Analysis I	
Mathematics track course		
Select one of the following		3
MTH 561	Abstract Algebra I	
Mathematics track course		
Elective		
Select one of the following		3
Mathematics track course		
Elective		
Cognate		3
Elective		3
	Credit Hours	**15**
Spring		
Select one of the following		3
MTH 461	Survey of Modern Algebra	

Mathematics track course		
Elective		
Select one of the following		3
Mathematics track course		
Elective		
Select one of the following		3
Cognate		
Elecitve		
Electives		6
	Credit Hours	**15**
Year Four		
Fall		
Select one of the following		3
MTH 433	Advanced Calculus	
MTH 533	Introduction to Real Analysis I	
Mathematics track course		
Select one of the following		3
MTH 561	Abstract Algebra I	
Mathematics track course		
Elective		
Select one of the following		3
Mathematics track course		
Elective		
Select one of the following		3
Mathematics track course		
Cognate		
Elective		
Elective		3
	Credit Hours	**15**
Spring		
Select one of the following		3
MTH 461	Survey of Modern Algebra	
Mathematics track course		
Elective		
Select one of the following		3
Mathematics track course		
Elective		
Select one of the following		3
Cognate		
Elective		
Electives		6
	Credit Hours	**15**
	Total Credit Hours	**122**

Mission

The objective of the Bachelor's degree in mathematics is to provide students with a core knowledge of mathematics essential to the understanding of science and other disciplines.

Goals

Students should gain substantial problem solving and critical reasoning skills, and they should develop an understanding of the conceptual underpinnings of mathematics. The knowledge gained through this program should provide the necessary background in mathematics for those

students planning to go on to graduate study in mathematics and related fields. This knowledge should also prepare those students who will be immediately entering careers in science, business, education or other fields which are increasingly making use of mathematics.

Student Learning Outcomes

- Students will demonstrate an understanding of elementary real analysis and advanced calculus. They will understand the nature of analytic reasoning and logical analytic proofs. They will develop the ability to communicate ideas in analysis, and, in particular, the ability to formulate and present abstract arguments in analysis.
- Students will demonstrate an understanding of modern abstract algebra. They will understand the nature of algebraic reasoning and logical algebraic proofs. They will develop the ability to communicate algebraic ideas, and, in particular, the ability to formulate and present abstract algebraic arguments.
- 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.