MATHEMATICS (BS)

CIP: 27.0101

Program Description

Mathematics is the branch of human inquiry involving the study of data, numbers, relations, shapes, space, symmetries, and how these concepts relate to each other. Despite its often abstract nature, mathematics takes inspiration from the real world and provides the logical and analytical tools for tackling many of the important problems of our time. By its very nature, mathematics provides the means to break many problems into manageable pieces that can be analyzed and solved. In fact, mathematical approaches have been central to solving problems and modeling phenomena in a wide array of disciplines. Probability and statistical analysis are fundamental for mapping and analyzing the human genome, as well as driving advancements in machine learning and artificial intelligence. Advanced mathematical theories provide the keys to analyzing the risk of rare events, a basic problem of the financial markets. In physics, geometry finds applications to particle physics, to string theory, and to cosmology. In neuroscience, exciting new research into the structure and functioning of the brain relies heavily on the insights provided by mathematical modeling. These are but a few of the contemporary problems relying on mathematical analysis. Mathematical thinking is grounded in rigor and abstraction, but draws its vitality from questions arising in the natural world as well as applications to industry and technology.

Mathematics majors acquire solid foundations in differential and integral calculus, as well as basic concepts of algebra, modern geometry, and probability. Students are introduced to classical subjects such as complex and real analysis, abstract algebra, number theory, topology, and probability. Students interested in applications of mathematics to social and physical sciences may pursue courses in numerical methods, theoretical mechanics, probability, dynamical systems, and differential equations.

General Information

Mathematics majors at NYU Abu Dhabi attain a breadth of knowledge within the field, pursue their own interests in math electives, explore the role of mathematics as an applied discipline, and undertake a capstone project. The major offers a rigorous and broad foundation in mathematics through eight required courses: *Calculus with Applications; Foundations of Mathematics; Linear Algebra; Multivariable Calculus with Applications to Science and Engineering; Ordinary Differential Equations; Analysis 1; Probability and Statistics; and Abstract Algebra 1. Mathematics students who place out of Calculus are required to complete one additional mathematics elective of their choosing.* Mathematics majors who choose to take Multivariable Calculus with Applications to Economics (for example because they plan to major in both Mathematics and Economics) must take Analysis 2. Students must achieve a minimum grade of C in foundational courses—Foundations of Mathematics, Multivariable Calculus, and Linear Algebra—prior to declaring the major, to ensure a strong foundational knowledge.

Students select Three electives. These are divided into two overlapping categories, denoted with an A (for Applied) and P (for Pure). Courses in category A have an applied flavor, courses in category P tend to be more theoretical. To attain greater depth in analysis, algebra, geometry, or probability, students choose at least one elective from category A and one from category P.

Mathematics majors must also complete three Breadth Electives. This will give students more academic freedom to explore a wider array of subjects connected to mathematics.

Study Away

The study away pathway can be found on the NYUAD Student Portal at students.nyuad.nyu.edu/pathways (http://students.nyuad.nyu.edu/pathways/). Students with questions should contact the Office of Global Education. The program strongly recommends that not more than one mathematics elective be taken while studying away.

Admissions

New York University's Office of Undergraduate Admissions supports the application process for all undergraduate programs at NYU. For additional information about undergraduate admissions, including application requirements, see How to Apply (https://www.nyu.edu/admissions/undergraduate-admissions/how-to-apply.html).

Program Requirements

Course	Title	Credits
General Education Requirements		
Physical Education (2 courses)		
Quantitative Reasoning (1 course)		
Experimental Inquiry (1 course)		
Islamic Studies (1 course)		
First-Year Writing Seminar		4
Colloquia		4
Field Colloquia (2 J-Term courses)		6
Core Competencies		
Arts, Design, and Technology		4
Cultural Exploration Analysis		4
Data and Discovery		4
Structures of Thought and Society		4
Major Required Courses		
MATH-UH 1010Q	Foundations of Mathematics	4
MATH-UH 1012Q	Calculus with Applications to Science and Engineering [1]	4
MATH-UH 1020Q	Multivariable Calculus with Applications to Science and Engineering	4
MATH-UH 1022Q	Linear Algebra	4
MATH-UH 2010Q	Ordinary Differential Equations	4
MATH-UH 2011Q	Probability and Statistics	4
MATH-UH 2012Q	Abstract Algebra 1	4
MATH-UH 2013Q	Analysis 1	4
MATH-UH 3090	Research Seminar in Mathematics (half course)	2
Mathematics Electives		
Complete 12 credits of Mathematics Electives (at least 1 from each category).		12
Category A: Applied Mathematics (see list below)		
Category P. Pure Mathematics (see list below)		
Breadth Electives		
Complete 12 credits of Breadth Electives (see list below)		12
Capstone		
MATH-UH 4001	Capstone Project in Mathematics 1	4

MATH-UH 4002	Capstone Project in Mathematics 2	4
Other Electives		
Complete enough courses to reach the minimum overall required 128 credits		32
Total Credits		**128**

[1] Math majors who place out of Calculus with Applications must take an additional Math elective in its place.

Category A: Applied Mathematics Electives

Code	Title	Credits
CS-UH 3211	Quantum Computing	4
ECON-UH 4005	Advanced Mathematics for Economists	4
MATH-UH 2410Q	Mathematical Modeling	4
MATH-UH 3410	Number Theory and Cryptography	4
MATH-UH 3411	Dynamical Systems	4
MATH-UH 3413	Numerical Methods	4
MATH-UH 3414	Partial Differential Equations	4
MATH-UH 3415Q	Stochastic Processes	4
MATH-UH 3612	Differential Geometry	4
PHYS-UH 3010	Mechanics	4
SOCSC-UH 3210	Advanced Game Theory	4

Category P: Pure Mathematics Electives

Code	Title	Credits
MATH-UH 3210	Abstract Algebra 2	4
MATH-UH 3212	Analysis 2	4
MATH-UH 3213	Advanced Probability	4
MATH-UH 3410	Number Theory and Cryptography	4
MATH-UH 3411	Dynamical Systems	4
MATH-UH 3414	Partial Differential Equations	4
MATH-UH 3415Q	Stochastic Processes	4
MATH-UH 3610	Complex Analysis	4
MATH-UH 3612	Differential Geometry	4
MATH-UH 4610	Topology	4

Breadth Electives

Code	Title	Credits
CS-UH 1001	Introduction to Computer Science	4
CS-UH 1002	Discrete Mathematics	4
CS-UH 1050	Data Structures	4
CS-UH 1052	Algorithms	4
CS-UH 2010	Computer Systems Organization	4
CS-UH 2218	Algorithmic Foundations of Data Science	4
CS-UH 2220	Machine Learning	4
ECON-UH 2010	Intermediate Microeconomics	4
ECON-UH 2020	Data Analysis: Economics	4
ECON-UH 2030	Intermediate Macroeconomics	4
ECON-UH 4210	Advanced Econometrics	4
ENGR-UH 1000	Computer Programming for Engineers	4
ENGR-UH 2011	Engineering Statics	2
ENGR-UH 2012	Conservation Laws in Engineering	2
ENGR-UH 2013	Digital Logic	2
ENGR-UH 2017	Numerical Methods	2
ENGR-UH 2019	Circuits Fundamentals	2
ENGR-UH 2026	Partial Differential Equations for Engineers	2
ENGR-UH 2027	Introduction to Data Analysis for Engineers	2
ENGR-UH 2210	Engineering Dynamics	3
ENGR-UH 2211	Solid Mechanics	2
ENGR-UH 2212	Fluid Mechanics	3
ENGR-UH 2811	Biotransport Phenomena	2
ENGR-UH 3130	Quantitative Synthetic Biology	2
ENGR-UH 3230	Finite Element Modeling and Analysis	4
ENGR-UH 3610	Signals and Systems	4
ENGR-UH 3710	Thermodynamics	3
ENGR-UH 3730	Modeling and Analysis of Dynamical Systems	3
ENGR-UH 3751	Heat Transport	3
ENGR-UH 4230	Applied Optimization	4
IM-UH 2318	Decoding Nature	4
PHIL-UH 1810	Introduction to Logic	4
PHIL-UH 2414	What's So Special About Science? Problems and Puzzles	4
PHIL-UH 2415	Philosophy of Mathematics	4
PHIL-UH 2417	Philosophical Foundations of Space, Time and Motion	4
PHIL-UH 2810	Advanced Logic	4
PHIL-UH 2910	Philosophy of Quantum Mechanics	4
SCIEN-UH 1121EQ	Foundations of Science 1-2: Physics	1.5
SCIEN-UH 1122EQ	Foundations of Science 1-2: Chemistry	3
SCIEN-UH 1123EQ	Foundations of Science 1-2: Biology	1.5
SCIEN-UH 1124C	Foundations of Science 2 Lab: Chemistry	1
SCIEN-UH 1124P	Foundations of Science 1 Lab: Physics	1
SCIEN-UH 1341Q	Foundations of Science 3-4: Physics	3
SCIEN-UH 1342Q	Foundations of Science 3-4: Chemistry	3
SCIEN-UH 1343	Foundations of Science 3-4: Biology	2
SCIEN-UH 1344BE	Foundations of Science 4 Lab: Biology	1
SCIEN-UH 1344CE	Foundations of Science 3 Lab: Chemistry	1
SCIEN-UH 1561Q	Foundations of Science 5-6: Physics	3
SCIEN-UH 1563	Foundations of Science 5-6: Biology	3
SCIEN-UH 1564BE	Foundations of Science 5 Lab: Biology	1
SCIEN-UH 1564EP	Foundations of Science 6 Lab: Physics	1
SOCSC-UH 1111	Markets	4
SOCSC-UH 2214	Applied Data Science	4
SOCSC-UH 3220	Econometrics	4

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
First-Year Writing Seminar		4
MATH-UH 1012Q	Calculus with Applications to Science and Engineering	4

Core Competency		4
General Elective		4
Physical Education		
	Credits	**16**
2nd Semester/Term		
Field Colloquia (J-Term)		3
	Credits	**3**
3rd Semester/Term		
MATH-UH 1010Q	Foundations of Mathematics	4
MATH-UH 1020Q	Multivariable Calculus with Applications to Science and Engineering	4
MATH-UH 1022Q	Linear Algebra	4
Colloquia		4
	Credits	**16**
4th Semester/Term		
MATH-UH 2011Q	Probability and Statistics	4
MATH-UH 2012Q	Abstract Algebra 1	4
Core Competency		4
General Elective		4
Physical Education		
	Credits	**16**
5th Semester/Term		
Field Colloquia (J-Term)		3
	Credits	**3**
6th Semester/Term		
MATH-UH 2010Q	Ordinary Differential Equations	4
MATH-UH 2013Q	Analysis 1	4
Breadth Elective 1		4
General Elective		4
	Credits	**16**
7th Semester/Term		
Math Elective 1		4
General Elective		4
General Elective		4
General Elective		4
	Credits	**16**
8th Semester/Term		
MATH-UH 3090	Research Seminar in Mathematics	2
Math Elective 2		4
Breadth Elective 2		4
Core Competency		4
	Credits	**14**
9th Semester/Term		
MATH-UH 4001	Capstone Project in Mathematics 1	4
Math Elective 3		4
Breadth Elective 3		4
Core Competency		4
	Credits	**16**
10th Semester/Term		
MATH-UH 4002	Capstone Project in Mathematics 2	4
General Elective		4
General Elective		4
	Credits	**12**
	Total Credits	**128**

Learning Outcomes

Upon successful completion of the program, graduates will:

1. Apply the fundamental theorems of Analysis, Algebra, Geometry, and Probability.

2. Apply appropriate mathematical and statistical techniques, both theoretical and numerical, to concrete problems.

3. Present and communicate effectively mathematical knowledge and mathematical research.

4. Learn new mathematics independently.

Policies

NYU Policies

University-wide policies can be found on the New York University Policy pages (https://bulletins.nyu.edu/nyu/policies/).

NYU Abu Dhabi Policies

A full list of relevant policies can be found on NYU Abu Dhabi's undergraduate academic policies page (https://bulletins.nyu.edu/undergraduate/abu-dhabi/academic-policies/).