

# MATHEMATICS MAJOR, B.A.

Mathematics has always been a fundamental component of human thought and culture, and the growth of technology in recent times has further increased its importance.

Students majoring in mathematics may enter either the B.A. or the B.S. program. The B.A. program is more flexible than the B.S. program; it allows students to specialize in mathematics and at the same time either to follow a broad liberal arts program or to specialize in a second area (possibly even taking a second major). MATH 521 is a key class in the curriculum and MATH 381 is a key to prepare for it. Your degree plan should be built with these classes as the backbone, and they should be taken in the second and third year by most students. Please see the sample plan for additional information and suggestions.

## Student Learning Outcomes

Upon completion of the mathematics program (B.A., B.S.), students should be able to:




- Demonstrate mastery of the core of mathematics recognized as essential by national professional mathematics organizations
- Demonstrate mathematical reasoning and problem-solving skills
- Demonstrate the ability to construct logical arguments and mathematical proofs
- Demonstrate the ability to apply mathematical knowledge and skills in context and interpret results


## Requirements

In addition to the program requirements, students must

- earn a minimum final cumulative GPA of 2.000
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (<https://catalog.unc.edu/undergraduate/degree-requirements/>).

Code	Title	Hours
<b>Core Requirements</b>		
MATH 347	Linear Algebra for Applications (previously offered as MATH 547)	3
or MATH 577	Linear Algebra	
MATH 381	Discrete Mathematics <sup>1, H</sup>	3
MATH 383	First Course in Differential Equations <sup>H</sup>	3
MATH 521	Advanced Calculus I <sup>H</sup>	3
At least three more MATH courses numbered above 500. <sup>2</sup>		9
<b>Additional Requirements</b>		
MATH 231	 Calculus of Functions of One Variable I <sup>H, F</sup>	4
MATH 232	 Calculus of Functions of One Variable II <sup>H, F</sup>	4
MATH 233	 Calculus of Functions of Several Variables <sup>H, F</sup>	4

or MATH 235  Mathematics for Data Science

**Total Hours** **33**

- H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.
- F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

<sup>1</sup> A current or former major in statistics and analytics may substitute STOR 215 for MATH 381.

<sup>2</sup> For this requirement, taking the three lab courses MATH 383L + MATH 528L + MATH 529L counts as one 500-level course.

All General Education requirements apply (see the General Education Requirements (<https://catalog.unc.edu/undergraduate/ideas-in-action/>) in this catalog).

Following are suggested course selections (within the degree requirements) for students who have an interest in a particular direction.

## Course Suggestions for Pure Mathematics

These courses provide a solid theoretical understanding of central mathematics and excellent preparation for graduate study in mathematics or the mathematical sciences.

Code	Title	Hours
MATH 521	Advanced Calculus I <sup>H</sup>	3
MATH 522	Advanced Calculus II <sup>H</sup>	3
MATH 577	Linear Algebra	3
MATH 578	Algebraic Structures	3




Enough upper-level mathematics courses to satisfy the degree requirements


- H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

Those planning graduate study in mathematics or the mathematical sciences may consider taking some of MATH 653, MATH 676, MATH 680, or subsequent courses.

## Course Suggestions for Mathematical Economics

Suitable for students planning to go on to graduate school in economics or a related area, or pursue a career in economics, business, or finance. Note: With three more ECON courses numbered above 400, the requirements for the B.A. in economics could also be satisfied.





Code	Title	Hours
ECON 101	 Introduction to Economics <sup>H, F</sup>	4
ECON 410	 Intermediate Microeconomics <sup>H</sup>	4
ECON 420	Intermediate Macroeconomics <sup>H</sup>	3
At least two of:		6
ECON 510	 Advanced Microeconomic Theory <sup>H</sup>	
ECON 511	Advanced Game Theory in Economics <sup>H</sup>	

ECON 520	Advanced Macroeconomic Theory <sup>H</sup>	
MATH 521	Advanced Calculus I <sup>H</sup>	3
At least three of:		9
MATH 522	Advanced Calculus II <sup>H</sup>	
MATH 524	Elementary Differential Equations	
MATH 535	Introduction to Probability	
MATH 550	Topology	
MATH 555	Introduction to Dynamics	
MATH 564	Mathematical Modeling in the Life Sciences	
Either:		6
MATH 535/ STOR 435	Introduction to Probability	
STOR 555	Mathematical Statistics	
Or:		
ECON 400	 Introduction to Data Science and Econometrics <sup>H</sup>	
MATH 347	Linear Algebra for Applications or MATH 577 Linear Algebra	

<sup>H</sup> Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

<sup>F</sup> FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

### Course Suggestions for Future High School Teachers

Code	Title	Hours
MATH 231	 Calculus of Functions of One Variable I <sup>H, F</sup>	4
MATH 232	 Calculus of Functions of One Variable II <sup>H, F</sup>	4
MATH 233	 Calculus of Functions of Several Variables <sup>H, F</sup>	4
MATH 381	Discrete Mathematics <sup>H</sup>	3
MATH 383	First Course in Differential Equations <sup>H</sup>	3
At least one of:		3
MATH 534	Elements of Modern Algebra	
MATH 535	Introduction to Probability	
MATH 548	Combinatorial Mathematics	
MATH 550	Topology	
MATH 347	Linear Algebra for Applications	3
or MATH 577	Linear Algebra	
MATH 521	Advanced Calculus I <sup>H</sup>	3
MATH 533	Elementary Theory of Numbers	3
MATH 551	Euclidean and Non-Euclidean Geometries	3
STOR 155	 Introduction to Data Models and Inference <sup>F</sup>	3
The Supplemental General Education requirement		9





<sup>H</sup> Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

<sup>F</sup> FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

## Sample Plan of Study

Sample plans can be used as a guide to identify the courses required to complete the major and other requirements needed for degree completion within the expected eight semesters. The actual degree plan may differ depending on the course of study selected (second major, minor, etc.). Students should meet with their academic advisor to create a degree plan that is specific and unique to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC-Chapel Hill in the fall term. Some courses may not be offered every term.

In the first two years, students are required to complete the standard calculus sequence as well as discrete mathematics, linear algebra, and first course in differential equations. At the beginning of their third year, students take advanced courses in mathematics. They have a great deal of flexibility in tailoring their program to meet their individual interests.

Code	Title	Hours
<b>First and Second Years</b>		
MATH 231	 Calculus of Functions of One Variable I <sup>H, F</sup>	4
MATH 232	 Calculus of Functions of One Variable II <sup>H, F</sup>	4
MATH 233	 Calculus of Functions of Several Variables <sup>H, F</sup>	4
or MATH 235	 Mathematics for Data Science	
MATH 381	Discrete Mathematics <sup>1, 4, H</sup>	3
MATH 383	First Course in Differential Equations <sup>3, H</sup>	3
MATH 347	Linear Algebra for Applications <sup>3</sup>	3
or MATH 577	Linear Algebra	
<b>Third and Fourth Years</b>		
MATH 521	Advanced Calculus I <sup>H</sup>	3
At least three more MATH courses numbered above 500. <sup>2</sup>		9
<b>Total Hours</b>		<b>33</b>

<sup>H</sup> Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

<sup>F</sup> FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

<sup>1</sup> A current or former major in statistics and analytics may substitute STOR 215 (<https://catalog.unc.edu/search/?P=STOR%20215>) for MATH 381 (<https://catalog.unc.edu/search/?P=MATH%20381>).

<sup>2</sup> For this requirement, taking the three lab courses MATH 383L + MATH 528L + MATH 529L counts as one 500-level course.

<sup>3</sup> One of these courses could be moved to the third year with minimal consequence.

<sup>4</sup> MATH 381 is a key course to prepare for MATH 521. Students with double majors should take MATH 381 over similar courses offered in other departments.

## Special Opportunities in Mathematics

Special activities for qualified students include an undergraduate Mathematics Club, problem-solving seminars, and the Putnam Mathematical Competition. Qualified students may pursue opportunities as undergraduate learning assistants or tutors in the Math Help Center. Students interested in these activities should consult the undergraduate student services manager for additional information.

Qualified students can conduct original research with the guidance of a faculty member, usually in conjunction with the preparation of an honors project. Study Abroad opportunities include semester or yearlong programs in a variety of countries. The Archibald Henderson Medal and the Alfred Brauer Prize recognize outstanding performance and promise in mathematics.

Undergraduate honors research projects as well as some internships or study abroad programs might qualify for research and discovery or experiential education credit in the General Education curriculum. MATH 296 satisfies this requirement.

## Honors in Mathematics

Special honors (H) sections are given in some mathematics courses when student demand is sufficient (for example, MATH 62H, MATH 231H, MATH 232H, MATH 233H, MATH 381H, MATH 383H).

Promising students are encouraged to work toward a bachelor's degree with honors in mathematics. This program consists of nine or more courses approved by the departmental honors advisor and satisfactory completion of an honors project completed over the two semesters. The honors project is conducted in association with a departmental faculty member on a topic approved by the departmental honors advisor, and spans two semesters of independent research, during which time the honors candidate must be enrolled in MATH 691H and MATH 692H. The final report on the project includes both a written description and an oral presentation before a committee of three faculty (including the project advisor) approved by the departmental honors advisor. The committee will then report to the departmental honors advisor, who, in conjunction with a subcommittee of the undergraduate committee, will make the final recommendation on awarding a degree with honors or highest honors. The candidate must have a 3.5 grade point average in mathematics courses to begin an honors project and must maintain the 3.5 average through the completion of the senior year.

## UNC-BEST

The UNC Baccalaureate Education in Science and Teaching (UNC-BEST) Program is a collaboration between the School of Education and the College of Arts and Sciences and is designed to allow undergraduate mathematics (and science) majors interested in teaching high school mathematics the opportunity to earn their degree and obtain licensure as a North Carolina high school mathematics teacher in four years. For more details, see the School of Education (<https://catalog.unc.edu/undergraduate/programs-study/best-minor/>) section of the Catalog.

## Department Programs

### Majors

- Mathematics Major, B.A. (p. 1)
- Mathematics Major, B.S. (<https://catalog.unc.edu/undergraduate/programs-study/mathematics-major-bs/>)

### Minor

- Mathematics Minor (<https://catalog.unc.edu/undergraduate/programs-study/mathematics-minor/>)

### Graduate Programs

- M.A. in Mathematics (<https://catalog.unc.edu/graduate/schools-departments/mathematics/>)
- M.S. in Mathematics (<https://catalog.unc.edu/graduate/schools-departments/mathematics/>)
- Ph.D. in Mathematics (<https://catalog.unc.edu/graduate/schools-departments/mathematics/>)

## Contact Information

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