Mathematics Major, B.S.

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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.S. program is more comprehensive; it provides solid preparation for work or for further study in mathematics and related fields. Within the B.S. program there is an applied option, which is designed for students who are primarily interested in using mathematics for the study of other sciences.

Department Programs

Majors
- Mathematics Major, B.S. (p. 1)

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

Graduate Programs
- M.A. in Mathematics (http://catalog.unc.edu/graduate/schools-departments/mathematics)
- M.S. in Mathematics (http://catalog.unc.edu/graduate/schools-departments/mathematics)
- Ph.D. in Mathematics (http://catalog.unc.edu/graduate/schools-departments/mathematics)

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

In addition to the program requirements listed below, students must

- attain a final cumulative GPA of at least 2.0
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major course requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum of 18 hours of C or better in the major core requirements (some majors require 21 hours).

For more information, please consult the degree requirements section of the catalog (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirements).

Mathematics Majors, B.S.

Core Requirements

One of the following:
- COMP 110 Introduction to Programming
- COMP 116 Introduction to Scientific Programming
- MATH 565 Computer-Assisted Mathematical Problem Solving

MATH 381 Discrete Mathematics \( ^{1,H} \) 3
MATH 383 First Course in Differential Equations \( ^{H} \) 3
MATH 521 Advanced Calculus I \( ^{H} \) 3

One of the following:
- MATH 522 Advanced Calculus II \( ^{H} \)
- MATH 523 Functions of a Complex Variable with Applications
- MATH 528 Mathematical Methods for the Physical Sciences
- MATH 566 Introduction to Numerical Analysis

One of the following:
- MATH 533 Elementary Theory of Numbers
- MATH 534 Elements of Modern Algebra
- MATH 578 Algebraic Structures
- MATH 548 Combinatorial Mathematics
- MATH 547 Linear Algebra for Applications (preferably before the senior year) 3
- or MATH 577 Linear Algebra

At least three additional MATH courses numbered above 520, excluding MATH 528L and MATH 529L 9

Eighteen hours of C or better (not C-) in MATH courses numbered above 520

Additional Requirements

- MATH 231 or MATH 241 Calculus of Functions of One Variable I 3-4
- MATH 232 or MATH 283 Calculus of Functions of Several Variables \( ^{H} \) 4
- One or two semesters of physics chosen from the following options: 4-8
- PHYS 118 Introductory Calculus-based Mechanics and Relativity (recommended)
- PHYS 114 General Physics I: For Students of the Life Sciences
- PHYS 104 General Physics I
- & PHYS 105 and General Physics II
- PHYS 116 Mechanics
- & PHYS 117 Electromagnetism and Optics \( ^{H} \)
Mathematics Major, B.S.–Applied Option

Core Requirements

- **COMP 110** or COMP 116: Introduction to Programming or Introduction to Scientific Programming
- MATH 381: Discrete Mathematics
- MATH 383: First Course in Differential Equations
- MATH 521: Advanced Calculus I
- Five courses chosen from the following list: 
  - MATH 522: Advanced Calculus II
  - MATH 523: Functions of a Complex Variable with Applications
  - MATH 524: Elementary Differential Equations
  - MATH 528: Mathematical Methods for the Physical Sciences I
  - MATH 529: Mathematical Methods for the Physical Sciences II
- MATH 535: Introduction to Probability
- MATH 548: Combinatorial Mathematics
- MATH 564: Mathematical Modeling in the Life Sciences
- MATH 566: Introduction to Numerical Analysis
- MATH 668: Methods of Applied Mathematics I
- Sequence MATH 383L, MATH 528L, and MATH 529L
- MATH 547: Linear Algebra for Applications
- or MATH 577: Linear Algebra

Eighteen hours of C or better (not C-) in MATH courses numbered above 520

Additional Requirements

- MATH 231: Calculus of Functions of One Variable I
- or MATH 241: BioCalculus I
- MATH 232: Calculus of Functions of One Variable II
- or MATH 283: BioCalculus II
- MATH 233: Calculus of Functions of Several Variables
- One or two semesters of physics chosen from the following options:
  - PHYS 118: Introductory Calculus-based Mechanics and Relativity
  - PHYS 114: General Physics I: For Students of the Life Sciences

Remaining General Education (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) requirements and enough free electives to accumulate 122 academic hours

Total Hours: 122-126

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

1: A current or former major in statistics and analytics (mathematical decision sciences) may substitute STOR 215 for MATH 381.

Mathematics Major, B.S.–Applied Option

Core Requirements

- **COMP 110** or COMP 116: Introduction to Programming or Introduction to Scientific Programming
- MATH 381: Discrete Mathematics
- MATH 383: First Course in Differential Equations
- MATH 521: Advanced Calculus I
- Five courses chosen from the following list:
  - MATH 522: Advanced Calculus II
  - MATH 523: Functions of a Complex Variable with Applications
  - MATH 524: Elementary Differential Equations
  - MATH 528: Mathematical Methods for the Physical Sciences I
  - MATH 529: Mathematical Methods for the Physical Sciences II
- MATH 535: Introduction to Probability
- MATH 548: Combinatorial Mathematics
- MATH 564: Mathematical Modeling in the Life Sciences
- MATH 566: Introduction to Numerical Analysis
- MATH 668: Methods of Applied Mathematics I
- Sequence MATH 383L, MATH 528L, and MATH 529L
- MATH 547: Linear Algebra for Applications
- or MATH 577: Linear Algebra

Eighteen hours of C or better (not C-) in MATH courses numbered above 520

Additional Requirements

- MATH 231: Calculus of Functions of One Variable I
- or MATH 241: BioCalculus I
- MATH 232: Calculus of Functions of One Variable II
- or MATH 283: BioCalculus II
- MATH 233: Calculus of Functions of Several Variables
- One or two semesters of physics chosen from the following options:
  - PHYS 118: Introductory Calculus-based Mechanics and Relativity
  - PHYS 114: General Physics I: For Students of the Life Sciences

Remaining General Education (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) requirements and enough free electives to accumulate 122 academic hours

Total Hours: 122-126

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

1: A current or former major in statistics and analytics (mathematical decision sciences) may substitute STOR 215 for MATH 381.

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.

- MATH 521: Advanced Calculus I
- MATH 522: Advanced Calculus II
- MATH 577: Linear Algebra
- MATH 578: Algebraic Structures

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.
Special Opportunities in Mathematics

For students interested in careers or further study in mathematical life sciences.

- BIOL 101 Principles of Biology \( ^H \) 3
- CHEM 101 General Descriptive Chemistry I 3
- or CHEM 102 General Descriptive Chemistry II
- At least one of:
  - BIOL 201 Ecology and Evolution \( ^H \)
  - BIOL 202 Molecular Biology and Genetics \( ^H \)
  - BIOL 205 Cellular and Developmental Biology \( ^H \)
- At least two of:
  - BIOL 454 Evolutionary Genetics
  - BIOL 526 Computational Genetics \( ^H \)
  - BIOL 551 Comparative Biomechanics
  - BIOL 553 Mathematical and Computational Models in Biology
- MATH 521 Advanced Calculus I \( ^H \) 3
- One of:
  - MATH 522 Advanced Calculus II \( ^H \)
  - MATH 523 Functions of a Complex Variable with Applications
- MATH 528 Mathematical Methods for the Physical Sciences I
- MATH 566 Introduction to Numerical Analysis
- One of:
  - MATH 534 Elements of Modern Algebra
  - MATH 547 Linear Algebra for Applications
  - MATH 578 Algebraic Structures
  - or MATH 577 Linear Algebra
- Three or more mathematics courses numbered above 500. Consider especially MATH 524, MATH 529, MATH 535, and MATH 564

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

Honors in Mathematics

Special activities for qualified students include an undergraduate Mathematics Club, problem-solving seminars, the Putnam Mathematical Competition, and the Virginia Tech Mathematics Contest. Students interested in these activities should consult the departmental honors advisor.

Qualified undergraduate students may work as research assistants in the Fluid Laboratory or as tutors in the Math Help Center. 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 experiential education credit. MATH 296, MATH 396, and MATH 410 satisfy this requirement.