Mathematics Major, B.S.

Contact Information
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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
- Demonstrate the ability to construct logical arguments and mathematical proofs

In addition to the program requirements, 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/#degreerequirementstext).

Mathematics Majors, B.S.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Core Requirements</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One of the following:</td>
<td>3</td>
</tr>
<tr>
<td>COMP 110</td>
<td>Introduction to Programming</td>
<td></td>
</tr>
<tr>
<td>COMP 116</td>
<td>Introduction to Scientific Programming</td>
<td></td>
</tr>
<tr>
<td>MATH 565</td>
<td>Computer-Assisted Mathematical Problem Solving</td>
<td></td>
</tr>
<tr>
<td>MATH 381</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 383</td>
<td>First Course in Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 521</td>
<td>Advanced Calculus I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>One of the following:</td>
<td></td>
</tr>
<tr>
<td>MATH 522</td>
<td>Advanced Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 523</td>
<td>Functions of a Complex Variable with Applications</td>
<td></td>
</tr>
<tr>
<td>MATH 528</td>
<td>Mathematical Methods for the Physical Sciences I</td>
<td></td>
</tr>
<tr>
<td>MATH 566</td>
<td>Introduction to Numerical Analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One of the following:</td>
<td>3</td>
</tr>
<tr>
<td>MATH 533</td>
<td>Elementary Theory of Numbers</td>
<td></td>
</tr>
<tr>
<td>MATH 534</td>
<td>Elements of Modern Algebra</td>
<td></td>
</tr>
<tr>
<td>MATH 578</td>
<td>Algebraic Structures</td>
<td></td>
</tr>
<tr>
<td>MATH 548</td>
<td>Combinatorial Mathematics</td>
<td></td>
</tr>
<tr>
<td>MATH 547</td>
<td>Linear Algebra for Applications (preferably before the senior year)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>or MATH 577 Linear Algebra</td>
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<tr>
<td></td>
<td>At least three additional MATH courses numbered above 520, excluding MATH 528L and MATH 529L</td>
<td>9</td>
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<tr>
<td></td>
<td>Eighteen hours of C or better (not C-) in MATH courses numbered above 520</td>
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<tr>
<td></td>
<td><strong>Additional Requirements</strong></td>
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</tr>
<tr>
<td>MATH 231</td>
<td>Calculus of Functions of One Variable I</td>
<td>3-4</td>
</tr>
<tr>
<td>or MATH 241</td>
<td>BioCalculus I</td>
<td></td>
</tr>
<tr>
<td>MATH 232</td>
<td>Calculus of Functions of One Variable II</td>
<td>3-4</td>
</tr>
<tr>
<td>or MATH 283</td>
<td>BioCalculus II</td>
<td></td>
</tr>
<tr>
<td>MATH 233</td>
<td>Calculus of Functions of Several Variables</td>
<td>4</td>
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<tr>
<td></td>
<td>One or two semesters of physics chosen from the following options:</td>
<td>4-8</td>
</tr>
<tr>
<td>PHYS 118</td>
<td>Introductory Calculus-based Mechanics and Relativity (recommended)</td>
<td></td>
</tr>
<tr>
<td>PHYS 114</td>
<td>General Physics I: For Students of the Life Sciences</td>
<td></td>
</tr>
</tbody>
</table>
One or two semesters of physics chosen from the following options:

- MATH 233
- MATH 232
- MATH 231

Additional Requirements

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

- MATH 547

Five courses chosen from the following list:

- MATH 521
- MATH 383
- MATH 381
- COMP 110

Core Requirements

- Title
- Hours
- COMP 110 Introduction to Programming H 3
- or COMP 116 Introduction to Scientific Programming
- MATH 381 Discrete Mathematics 1, H 3
- MATH 383 First Course in Differential Equations H 3
- MATH 521 Advanced Calculus I H 3

Five courses chosen from the following list: 2

- MATH 522 Advanced Calculus II H
- MATH 523 Functions of a Complex Variable with Applications
- MATH 524 Elementary Differential Equations
- MATH 528 Mathematical Methods for the Physical Sciences I 2
- MATH 529 Mathematical Methods for the Physical Sciences II 2
- MATH 535 Introduction to Probability
- MATH 548 Combinatorial Mathematics
- MATH 564 Mathematical Modeling in the Life Sciences 2
- MATH 566 Introduction to Numerical Analysis 2
- MATH 661 Scientific Computation I 2
- MATH 668 Methods of Applied Mathematics I 2
- Sequence MATH 383L, MATH 528L, and MATH 529L 2
- 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

- Title
- Hours
- MATH 231 Calculus of Functions of One Variable I H 3
- or MATH 241 BioCalculus I
- MATH 232 Calculus of Functions of One Variable II H 3
- or MATH 283 BioCalculus II
- MATH 233 Calculus of Functions of Several Variables H 4

One or two semesters of physics chosen from the following options: 4-8

PHYS 104 General Physics I
& PHYS 105 and General Physics II

PHYS 114 General Physics I: For Students of the Life Sciences

PHYS 116 Mechanics
& PHYS 117 and Electromagnetism and Optics H

At least four courses in the Division of Natural Sciences and Mathematics (beyond the General Education (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) requirements), but not in mathematics.

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

- Title
- Hours
- COMP 110 Introduction to Programming H 3
- or COMP 116 Introduction to Scientific Programming
- MATH 381 Discrete Mathematics 1, H 3
- MATH 383 First Course in Differential Equations H 3
- MATH 521 Advanced Calculus I H 3
- Five courses chosen from the following list: 2 15
- MATH 522 Advanced Calculus II H
- MATH 523 Functions of a Complex Variable with Applications
- MATH 524 Elementary Differential Equations
- MATH 528 Mathematical Methods for the Physical Sciences I 2
- MATH 529 Mathematical Methods for the Physical Sciences II 2
- MATH 535 Introduction to Probability
- MATH 548 Combinatorial Mathematics
- MATH 564 Mathematical Modeling in the Life Sciences 2
- MATH 566 Introduction to Numerical Analysis 2
- MATH 661 Scientific Computation I 2
- MATH 668 Methods of Applied Mathematics I 2
- Sequence MATH 383L, MATH 528L, and MATH 529L 2
- 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

- Title
- Hours
- MATH 231 Calculus of Functions of One Variable I H 3
- or MATH 241 BioCalculus I
- MATH 232 Calculus of Functions of One Variable II H 3
- or MATH 283 BioCalculus II
- MATH 233 Calculus of Functions of Several Variables H 4

One or two semesters of physics chosen from the following options: 4-8

PHYS 104 General Physics I
& PHYS 105 and General Physics II

PHYS 114 General Physics I: For Students of the Life Sciences

PHYS 116 Mechanics
& PHYS 117 and Electromagnetism and Optics H

At least four courses in the Division of Natural Sciences and Mathematics (beyond the General Education (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) requirements), but not in mathematics. STOR 555 can be counted for this requirement.

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.

2 With at least three from MATH 528, MATH 529, MATH 564, MATH 566, MATH 661, MATH 668, sequence MATH 383L + MATH 528L + MATH 529L.

Mathematics (beyond the General Education (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) requirements), but not in mathematics.

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.

2 With at least three from MATH 528, MATH 529, MATH 564, MATH 566, MATH 661, MATH 668, sequence MATH 383L + MATH 528L + MATH 529L.

Students must complete either the B.S. or B.S.-Applied Option for a B.S. degree with a major in mathematics. All Foundations, Approaches, and Connections requirements of the General Education curriculum apply to students in both options.

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.

- Title
- Hours
- MATH 521 Advanced Calculus I H 3
- MATH 522 Advanced Calculus II H 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 Biology**

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 101</td>
<td>Principles of Biology $^H$</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 101</td>
<td>General Descriptive Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 102</td>
<td>General Descriptive Chemistry II</td>
<td></td>
</tr>
<tr>
<td>BIOL 201</td>
<td>Ecology and Evolution $^H$</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 202</td>
<td>Molecular Biology and Genetics $^H$</td>
<td></td>
</tr>
<tr>
<td>BIOL 206</td>
<td>Cellular and Developmental Biology $^H$</td>
<td></td>
</tr>
<tr>
<td>BIOL 454</td>
<td>Evolutionary Genetics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL 526</td>
<td>Computational Genetics $^H$</td>
<td></td>
</tr>
<tr>
<td>BIOL 551</td>
<td>Comparative Biomechanics</td>
<td></td>
</tr>
<tr>
<td>BIOL 553</td>
<td>Mathematical and Computational Models in Biology</td>
<td></td>
</tr>
<tr>
<td>MATH 521</td>
<td>Advanced Calculus I $^H$</td>
<td>3</td>
</tr>
<tr>
<td>One of:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MATH 522</td>
<td>Advanced Calculus II $^H$</td>
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<tr>
<td>MATH 523</td>
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<td>MATH 528</td>
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<td>MATH 566</td>
<td>Introduction to Numerical Analysis</td>
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</tr>
<tr>
<td>One of:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MATH 534</td>
<td>Elements of Modern Algebra</td>
<td></td>
</tr>
<tr>
<td>MATH 548</td>
<td>Combinatorial Mathematics</td>
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<tr>
<td>MATH 578</td>
<td>Algebraic Structures</td>
<td></td>
</tr>
<tr>
<td>MATH 547</td>
<td>Linear Algebra for Applications</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 577</td>
<td>Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>Three or more mathematics courses numbered above 500. Consider especially MATH 524, MATH 529, MATH 535, and MATH 564</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

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

**Special Opportunities 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.

**Honors in Mathematics**

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

Promising students are encouraged to work toward a bachelor’s degree with honors in mathematics. This program consists of six or more courses approved by the departmental honors advisor and satisfactory completion of an honors project completed over the two semesters of the senior year. 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 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. UNC–BEST students meet all the degree requirements for their mathematics major and complete a teaching methods class (MATH 410). Students also fulfill teaching licensure coursework requirements (see list below) as well as many General Education and elective requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 410</td>
<td>Teaching and Learning Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>EDUC 689</td>
<td>Foundations of Special Education (may substitute EDUC 516)</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 532</td>
<td>Introduction to Development and Learning (may substitute EDUC 403)</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 615</td>
<td>Schools and Community Collaboration (may substitute EDUC 533)</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 593</td>
<td>Internship/Student Teaching</td>
<td>12</td>
</tr>
<tr>
<td>EDUC 601</td>
<td>Education Workshops</td>
<td>1</td>
</tr>
</tbody>
</table>

For more details on admission requirements and application processes, visit the School of Education Web site (http://soe.unc.edu/academics/uncbest).