**Sophomore Year**

**First Semester**
- 3 - BIOL 1030 General Biology I
- 1 - BIOL 1050 General Biology Lab. I
- 3 - ENSP 2000 Intro. to Environmental Science
- 3 - GEOL 2050 Mineralogy and Intro. Petrology
- 1 - GEOL 2070 Mineral. and Intro. Petrology Lab.
- 1 - GEOL 2910 Introduction to Research I
- 3 - Arts and Humanities (Literature) Requirement¹

**Second Semester**
- 3 - BIOL 1040 General Biology II
- 1 - BIOL 1060 General Biology Lab. II
- 3 - CH 2100 Survey of Organic Chemistry or
- 3 - CH 2230 Organic Chemistry
- 4 - GEOL 2020 Earth History
- 1 - GEOL 2920 Introduction to Research II
- 3 - PHYS 1220 Physics with Calculus I

**Junior Year**

**First Semester**
- 3 - GEOL 3000 Environmental Geology
- 4 - GEOL 3020 Structural Geology
- 2 - GEOL 3910 Research Methods I
- 4 - GEOL 4150 Analysis of Geological Processes²
- 13

**Second Semester**
- 3 - GEOL 3180 Introduction to Geochemistry
- 2 - GEOL 3920 Research Methods II
- 3 - GEOL 4210 GIS Applications in Geology
- 3 - MATH 3020 Statistics for Science and Engr. or
- 3 - STAT 2300 Statistical Methods I
- 4 - Environmental Science Requirement¹
- 15

**Summer**
- 6 - Field Experience⁴

**Senior Year**

**First Semester**
- 3 - ENSP 3000 Studies in Environmental Science
- 3 - GEOL (CE) 4820 Groundwater and Contaminant Transport
- 3 - GEOL 4910 Research Synthesis I
- 3 - Social Science Requirement¹
- 12

**Second Semester**
- 3 - GEOL 4920 Research Synthesis II
- 10 - Environmental Science Requirement¹
- 13

**Second Semester**
- 3 - EES 4010 Environmental Engineering
- 4 - GEOL 4050 Surficial Geology
- 3 - GEOL 4090 Research and Exploration Geophysics
- 3 - GEOL 4920 Research Synthesis II
- 14

**Total Semester Hours**
- 121

¹See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.

²MATH 2060 may be substituted.

³Total of 14 credit hours selected from department-approved list. No more than eight hours below the 3000-level. Courses cannot be used to satisfy any other requirement.

⁴GEOL 4750 or a combination of GEOL 2750 plus a three credit hour field course in geology, ecology or other approved discipline. Students desiring to become registered professional geologists should take a sixcredit hour summer field camp in geology/hydrogeology.

**HYDROGEOLOGY CONCENTRATION**

**Freshman Year**

**First Semester**
- 4 - CH 1010 General Chemistry
- 3 - ENGL 1010 Accelerated Composition
- 3 - GEOL 1010 Physical Geology
- 1 - GEOL 1030 Physical Geology Lab.
- 4 - MATH 1060 Calculus of One Variable I
- 15

**Second Semester**
- 4 - CH 1020 General Chemistry
- 3 - GEOL 1120 Earth Resources
- 4 - MATH 1080 Calculus of One Variable II
- 3 - Arts and Humanities (Non-Lit.) Requirement¹
- 3 - Social Science Requirement¹

**Sophomore Year**

**First Semester**
- 3 - GEOL 2050 Mineralogy and Intro. Petrology
- 1 - GEOL 2070 Mineral. and Intro. Petrology Lab.
- 1 - GEOL 2910 Introduction to Research I
- 3 - PHYS 1220 Physics with Calculus I
- 1 - PHYS 1240 Physics Lab I
- 3 - Arts and Humanities (Literature) Requirement¹
- 3 - Hydrogeology Requirement²
- 15

**Second Semester**
- 4 - GEOL 2020 Earth History
- 1 - GEOL 2920 Introduction to Research II
- 3 - MATH 3020 Statistics for Science and Engr. or
- 3 - STAT 2300 Statistical Methods I
- 3 - PHYS 2210 Physics with Calculus II
- 3 - Social Science Requirement¹
- 3 - Hydrogeology Requirement²
- 17

**Junior Year**

**First Semester**
- 3 - GEOL 3000 Environmental Geology
- 4 - GEOL 3020 Structural Geology
- 2 - GEOL 3910 Research Methods I
- 4 - GEOL 4150 Analysis of Geological Processes³
- 13

**Second Semester**
- 4 - GEOL 4050 Surficial Geology
- 3 - GEOL (CE) 4820 Groundwater and Contaminant Transport
- 3 - GEOL 4910 Research Synthesis I
- 3 - Social Science Requirement¹

**Senior Year**

**First Semester**
- 3 - GEOL 4050 Surficial Geology
- 3 - ENGS 4010 Environmental Engineering
- 4 - GEOL 4050 Surficial Geology
- 3 - GEOL 4090 Research and Exploration Geophysics
- 3 - GEOL 4920 Research Synthesis II
- 14

**Total Semester Hours**
- 121

²See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.

³Total of 12 credit hours selected from department-approved list. Courses may not be used to satisfy any other requirement.

⁴MATH 2060 may be substituted.

**MATHEMATICAL SCIENCES**

The Mathematical Sciences curriculum is designed to be versatile. Students gain a broad knowledge of mathematical concepts and methods that are applicable in sciences, engineering, business, industry, and other professions requiring a strong mathematical background. In addition to the basic courses that provide necessary mathematical skills, the curriculum allows students to select an emphasis area or concentration, providing an introduction to a specific area where mathematics is used. These are Abstract Mathematics, Actuarial Science/Financial Mathematics, Applied and Computational Mathematics, Biology, Computer Science, Operations Research/Management Science, and Statistics.

In addition to the overall goal of preparing students to cope with a variety of mathematical problems, the curriculum seeks to provide an adequate background for students who plan to pursue graduate study or positions in business, industry, or government. Students selecting the Biology Concentration will have the necessary preparation for entering medical school. More information about the degree program can be found at www.clemson.edu/ces/departments/math.

All mathematical sciences majors are required to complete a capstone experience that provides an opportunity to pursue research, independent study, or an approved internship under the direction of a faculty member, or the opportunity to study mathematical models in some area of the mathematical sciences. The capstone experience requires a written report (thesis, computer code, project description, intern experience, etc.) and an oral or poster presentation by each student.

**Combined Bachelor’s/Master’s Plan**

Under this plan, students may reduce the time necessary to earn both degrees by applying up to 12 graduate credits to both undergraduate and graduate program requirements. Students are encouraged to obtain the specific requirements for pursuing the combined degree from the Department of Mathematical Sciences www.clemson.edu/ces/departments/math as early as possible in their undergraduate program. Enrollment guidelines and procedures can be found under Academic Regulations in this catalog.
Bachelor of Science

Freshman Year
First Semester
1. MATH 2500 Intro. to Mathematical Sciences
2. PHYS 1220 Physics with Calculus I
3. MATH 1080 Calculus of One Variable II
4. PHYS 2070 General Physics I
5. MATH 2060 Calculus of Several Variables
6. MATH 3100 Linear Algebra
7. ENGL 1030 Accelerated Composition
8. EDUC 1010 Introduction to Education
9. MATH 3190 Introduction to Proof
10. Natural Science Requirement
11. Social Science Requirement
12. Total Semester Hours: 16

Second Semester
1. MATH 4920 Professional Development
2. MATH 4120 Introduction to Modern Algebra
3. STAT 4202 Statistical Computing
4. MATH 4530 Advanced Calculus I
5. MATH 4340 Advanced Engineering Math.
6. Applied and Computational Mathematics
7. Arts and Humanities (Literature) Requirement
8. Social Science Requirement
9. Total Semester Hours: 15

Sophomore Year
First Semester
1. MATH 4500 Advanced Calculus II
2. MATH 4410 Intro. to Stochastic Models
3. MATH 4310 Theory of Interest
4. MATH 4020 Statistical Theory and Meth. II
5. MATH 4120 Systems Modeling
6. Operations Research/Management Science
7. Arts and Humanities (Literature) Requirement
8. Social Science Requirement
9. Total Semester Hours: 15

Second Semester
1. MATH 4910 Advanced Calculus I
2. MATH 4140 Numerical Analysis II
3. MATH 4320 Financial Mathematics
4. MATH 4010 Mathematical Sciences
5. Arts and Humanities (Literature) Requirement
6. Social Science Requirement
7. Total Semester Hours: 15

Junior Year
First Semester
1. MATH 4000 Theory of Probability
2. MATH 4400 Linear Programming
3. MATH 4530 Advanced Calculus I
4. Adv. Writing Requirement
5. Technical Requirement
6. Total Semester Hours: 16

Second Semester
1. MATH 4120 Introduction to Modern Algebra
2. MATH 4540 Advanced Calculus II
3. Emphasis Area Requirement
4. Technical Requirement
5. Elective
6. Total Semester Hours: 15

Senior Year
First Semester
1. Capstone Experience
2. Emphasis Area Requirement
3. Oral Communication Requirement
4. Science and Tech. in Society Requirement
5. Total Semester Hours: 15

Second Semester
1. MATH 4920 Professional Development
2. Capstone Experience
3. Emphasis Area Requirement
4. Mathematical Sciences Requirement
5. Elective
6. Total Semester Hours: 15

122 Total Semester Hours
### Senior Year

**First Semester**
- MATH 4000 Theory of Probability
- MATH 4530 Advanced Calculus I
- Animal or Plant Diversity Requirement
- Capstone Experience
- Social Science Requirement

15 Total Semester Hours

### Second Semester
- MATH 4120 Introduction to Modern Algebra
- MATH 4540 Advanced Calculus II
- Biological Sciences Requirement
- Capstone Experience
- Social Science Requirement

13 Total Semester Hours

### Junior Year

**First Semester**
- MATH 3190 Introduction to Proof
- Advanced Writing Requirement
- Math Science Requirement
- Natural Science Requirement
- Elective

16 Total Semester Hours

**Second Semester**
- MATH 3190 Introduction to Proof
- Advanced Writing Requirement
- Math Science Requirement
- Natural Science Requirement
- Elective

16 Total Semester Hours

### Senior Year

**First Semester**
- MATH 4530 Advanced Calculus I
- Arts and Humanities Requirement or Education Requirement
- Capstone Experience
- Minor Requirement or Second Major Requirement
- Math Science Requirement

15 Total Semester Hours

**Second Semester**
- MATH 4920 Professional Development or EDF 4250 Instructional Tech. Strategies
- Capstone Experience
- Minor Requirement or Second Major Requirement
- Math Science Requirement

15 Total Semester Hours

**Sophomore Year**

**First Semester**
- MATH 2060 Calculus of Several Variables
- MATH 2500 Intro. to Mathematical Sciences
- Arts and Humanities (Literature) Requirement
- Cross-Cultural Awareness Requirement

14 Total Semester Hours

**Second Semester**
- MATH 2080 Intro. to Ordinary Diff. Equations
- MATH 3020 Statistics for Science and Engr.
- MATH 3110 Linear Algebra
- Arts and Humanities (Non-Lit.) Requirement
- Minor Requirement or Second Major Requirement
- Second Major Requirement

16 Total Semester Hours

**Notes:**
1. For graduation, a candidate for the BA degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point average in all required MATH courses.
2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next MATH course.
3. Students who change majors to Mathematical Sciences must have achieved the Minimum Cumulative Grade-Point Average (MCGPA) by Total Credit Hour Level as defined in the Academic Regulations section of the Undergraduate Announcements and must have received a grade of C or better in all MATH courses taken.

### PHYSICS

**Bachelor of Science**

Physics, the most fundamental of the natural sciences, forms the basis of study upon which the other branches of science are founded. Physics is concerned with the fundamental behavior of matter and energy. Classical physics encompasses the fields of mechanics, heat and thermodynamics, electricity and magnetism, acoustics and optics. Modern physics is concerned with the study of atoms and molecules, atomic nuclei, elementary particles and the properties of liquids, crystalline solids, and other materials, as well as the areas of relativity, cosmology, and the large-scale structure of the universe.

The undergraduate Physics curricula provide students with a strong background in the classical areas of physics, as well as an introduction to the more important aspects of modern physics. The BS curriculum is directed toward preparing students for graduate study ultimately leading to the PhD degree or toward research and development work in industrial or governmental laboratories. It also provides a good background for graduate study or industrial work in many areas or engineering physics and applied science.

**Freshman Year**

**First Semester**
- CH 1010 General Chemistry
- ENGL 1030 Accelerated Composition
- MATH 1060 Calculus of One Variable I
- PHYS 1210 Physics with Calculus I
- PHYS 1240 Physics Lab I

15 Total Semester Hours

**Second Semester**
- CH 1010 General Chemistry
- MATH 1060 Calculus of One Variable II
- PHYS 2210 Physics with Calculus II
- PHYS 2230 Physics Lab. II
- Arts and Humanities (Non-Lit.) Requirement

15 Total Semester Hours

**Sophomore Year**

**First Semester**
- MATH 2060 Calculus of Several Variables
- PHYS 2220 Physics with Calculus III
- PHYS 3000 Introduction to Research
- PHYS 3250 Experimental Physics I
- Foreign Language Requirement

16 Total Semester Hours

**Notes:**
1. May be satisfied by (1) completion of six credits of MATH 4820; (2) completion of six credits of MATH 4910 or an approved substitution; (3) completion of three credits of MATH 4500 and three credits of an additional course approved by advisor; or (4) EDSC 4460 for students seeking a double major in Secondary Education—Mathematics.
2. See page 113 for approved minors.
3. Select from EDSC 2260, ENGL 3040, 3120, 3140 or 3150; or the cluster of AS 3090, 3100, 4090 and 4100; or the cluster of courses ML 3010, 3020, 4010, and 4020.
4. Any 4000-level MATH or STAT course approved by advisor.
5. May be satisfied by (1) completion of six credits of MATH 4820; (2) completion of six credits of MATH 4910 or an approved substitution; or (3) completion of three credits of MATH 4500 and three credits of an additional course approved by advisor.
6. May be satisfied by (1) completion of six credits of MATH 4820; (2) completion of six credits of MATH 4910 or an approved substitution; or (3) completion of three credits of MATH 4500 and three credits of an additional course approved by advisor.
7. Since General Education Requirements. ECON 2000 or 2110 is recommended.
8. See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.
9. Select from ENGL 3040, 3120, 3140 or 3150; or the cluster of courses ML 3010, 3020, 4010, and 4020.
10. See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.
11. Select from ENGL 3040, 3120, 3140, or 3150; or the cluster of courses ML 3010, 3020, 4010, and 4020.
12. See General Education Requirements.
13. May be satisfied by (1) completion of six credits of MATH 4820; (2) completion of six credits of MATH 4910 or an approved substitution; or (3) completion of three credits of MATH 4500 and three credits of an additional course approved by advisor.
14. May be satisfied by (1) completion of six credits of MATH 4820; (2) completion of six credits of MATH 4910 or an approved substitution; or (3) completion of three credits of MATH 4500 and three credits of an additional course approved by advisor.