BIOCHEMISTRY

Bachelor of Science

Biochemistry is the study of the molecular basis of life. To comprehend current biochemical information and make future contributions to our molecular understanding of life processes, students must obtain a broad background in biology and a firm foundation in chemistry, mathematics, and physics. This is the basis of the biochemistry curriculum.

The program provides an excellent educational background for professional school (medicine, dentistry, or veterinary medicine) and graduate school in biochemistry, molecular biology, or another biological science discipline. Graduates will find employment opportunities in the research and service programs of universities, medical schools, hospitals, research institutes, and industrial and government laboratories.

Freshman Year

First Semester
1. BCHM 1030 Careers in Biochem. and Genetics
2. MATH 1060 Calculus of One Variable I
3. CH 1010 General Chemistry
4. BIOL 1100 Principles of Biology I
5. PHIL 1010 Ethics

Second Semester
1. MATH 2060 or STAT 2300
2. PHYS 1220 Physics with Calculus I
3. CH 1220 Organic Chemistry
4. ENGL 1010 Frontiers in Biology I
5. BIOL 1110 Principles of Biology II

Sophomore Year

First Semester
1. CH 2230 Organic Chemistry
2. PHYS 1240 Physics with Calculus II
3. GEN 3020 Molecular and General Genetics
4. BCHM 3050 Essential Elements of Biochem.
5. BIOL 1100 Principles of Biology I

Second Semester
1. BCHM 3010 Molecular Biochemistry
2. CH 2240 Organic Chemistry
3. COMP 1500 Intro. to Human Comm. or COMP 2500 Public Speaking
4. PHYS 2210 Physics with Calculus II
5. PHYS 2230 Physics Lab. II
6. Arts and Humanities (Literature) Requirement

Junior Year

First Semester
1. BCHM 4310 Physical Approach to Biochem.
2. BCHM 4330 Physical Approach to Biochem. Lab
3. CH 3300 Introduction to Physical Chemistry
4. Science Requirement
5. Social Science Requirement
6. Elective

Second Semester
1. BCHM 4320 Biochemistry of Metabolism
2. BCHM 4340 Biochemistry of Metabolism Lab
3. BCHM 4360 Molecular Biol.; Genes to Proteins
4. PHIL 3260 Science and Values
5. Social Science Requirement

Senior Year

First Semester
1. BIOL 4610 Cell Biology
2. GEN (BCHM) 4400 Bioinformatics
3. Science Requirement
4. Elective

Second Semester
1. BCHM 4930 Senior Seminar
2. Science Requirement
3. Elective

120–121 Total Semester Hours

Notes:
1. A student is allowed to enroll in science and mathematics courses only when all prerequisites have been passed with a grade of C or higher.
2. A minimum grade of C is required in all science and mathematics courses. No student may exceed a maximum of two attempts, excluding a W, to complete successfully any science or mathematics course.

BIOLOGICAL SCIENCES

Biology encompasses the broad spectrum of the modern life sciences, including the study of all aspects of life from the structure and function of the whole organism down to the subcellular levels and up through the interactions of organisms to the integrated existence of life on the entire planet. Descriptive, structural, functional, and evolutionary questions are explored through the hierarchy of the organization of life. Applications of current advances to the health and well-being of man and society, to nature and the continuation of earth as a balanced ecosystem, and to an appreciation of the place of natural science in our cultural heritage receive emphasis. Majors in Biological Sciences receive classroom, laboratory, and field training in biology with an emphasis on chemistry, mathematics, and physics as necessary tools.

Bachelor of Arts

The Bachelor of Arts in Biological Sciences provides a strong foundation in biology and is ideal for students desiring a liberal education emphasizing an interdisciplinary approach to a thorough understanding of the life sciences.

Freshman Year

First Semester
1. BIOL 1010 Frontiers in Biology I
2. BIOL 1100 Principles of Biology I
3. PHYS 1010 General Chemistry
4. MATH 1060 Calculus of One Variable I
5. Oral Communications Requirement

Second Semester
1. BIOL 1110 Principles of Biology II
2. PHYS 1020 General Chemistry
3. ENGL 1030 Composition and Rhetoric
4. Mathematical Sciences Requirement

Sophomore Year

First Semester
1. CH 2230 Organic Chemistry
2. GEN 3020 Fundamental Genetics
3. Arts and Humanities (Literature) Requirement
4. Modern Language Requirement

Second Semester
1. BCHM 3050 Essential Elements of Bioch.
2. BIOL 2270 Organic Chemistry Lab.
3. GEN 3000 Fundamental Genetics
4. Modern Language Requirement
5. Major Requirement
6. Organismal Diversity Requirement

Junior Year

First Semester
1. BIOL 3350 Evolutionary Biology
2. BIOL 4610 Cell Biology
3. BIOL 4620 Cell Biology Laboratory
4. ENGL 3150 Scientific Writing and Comm.
5. Modern Language Requirement
6. Minor Requirement
Second Semester
3 - Arts and Humanities (Non-Lit.) Requirement
3 - Modern Language Requirement
3 - Ecology Requirement
6 - Minor Requirement

Senior Year
First Semester
2 - BIOL 4930 Senior Seminar or
2 - MICR 4930 Senior Seminar
3 - PHYS 2070 General Physics I
3 - PHYS 2090 General Physics I Lab.
3 - Functional Biology Requirement
3 - Social Science Requirement

Second Semester
3 - PHYS 2080 General Physics II
1 - PHYS 2100 General Physics II Lab.
6 - Minor Requirement
3 - Elective

121 Total Semester Hours

Double Major in Biological Sciences/Science Teaching—Biological Sciences
The Bachelor of Arts Degree in Biological Sciences and Science Teaching—Biological Sciences prepares students for teaching biology on the secondary school level and for graduate studies in any of the life science areas. See page 104 for the curriculum.

Note: To receive a double major in Biological Sciences and Science Teaching—Biological Sciences, the student must complete a change-of-program form to declare both majors.

PREREHABILITATION SCIENCES EMPHASIS AREA

Freshman Year
First Semester
1 - BIOL 1010 Frontiers in Biology I
3 - BIOL 1030 General Biology I
1 - BIOL 1050 General Biology Lab. I
4 - CH 1010 General Chemistry
4 - MATH 1060 Calculus of One Variable I
3 - Oral Communication Requirement

Second Semester
3 - BIOL 1040 General Biology II
1 - BIOL 1060 General Biology Lab. II
4 - CH 1020 General Chemistry
3 - ENGL 1030 Composition and Rhetoric
3 - Statistics Requirement

Sophomore Year
First Semester
3 - CH 2230 Survey of Organic Chemistry
1 - CH 2270 Survey of Organic Chemistry Lab.
4 - GEN 3000 Fundamental Genetics
4 - Modern Language Requirement
4 - Organismal Diversity Requirement

Second Semester
3 - BCHM 3050 Essential Elements of Bioch.
3 - PSYC 2010 Introduction to Psychology
3 - Arts and Humanities (Literature) Requirement
4 - Modern Language Requirement
3 - Social Science Requirement

Junior Year
First Semester
4 - BIOL 3150 Functional Human Anatomy
3 - BIOL 3330 Evolutionary Biology
3 - BIOL 4630 Cell Biology
2 - BIOL 4620 Cell Biology Laboratory
3 - Modern Language Requirement

Second Semester
4 - BIOL 3160 Human Physiology
3 - Arts and Humanities (Non-Lit.) Requirement
3 - Modern Language Requirement
6 - Minor Requirement

Senior Year
First Semester
2 - BIOL 4930 Senior Seminar or
2 - MICR 4930 Senior Seminar
3 - ENGL 3150 Scientific Writing and Comm.
3 - PHYS 2070 General Physics I
1 - PHYS 2090 General Physics I Lab.
3 - Ecology Requirement
3 - Minor Requirement

Second Semester
3 - PHYS 2080 General Physics II
1 - PHYS 2100 General Physics II Lab.
6 - Minor Requirement
5 - Elective

122 Total Semester Hours

BIOLOGICAL SCIENCES

Bachelor of Science
The Bachelor of Science in Biological Sciences curriculum prepares students for graduate study in any of the life science areas (such as agricultural sciences, biochemistry, botany, cell and molecular biology, conservation, ecology and environmental science, entomology, forestry, genetics, industrial and regulatory biology, microbiology, morphology, physiology, wildlife biology, and zoology) for the health professions (medicine, dentistry, etc.), veterinary medicine; and for science teaching.
**Freshman Year**

**First Semester**
- BIOL 1010 Frontiers in Biology I
- BIOL 1100 Principles of Biology I
- CH 1010 General Chemistry
- MATH 1060 Calculus of One Variable I
- Oral Communications Requirement

**Second Semester**
- BIOL 1110 Principles of Biology II
- CH 1020 General Chemistry
- ENGL 1030 Composition and Rhetoric
- Mathematical Sciences Requirement

**Sophomore Year**

**First Semester**
- CH 2230 Organic Chemistry 1,2
- CH 2270 Organic Chemistry Lab. 1,2
- GEN 3000 Fundamental Genetics
- Arts and Humanities (Non-Lit.) Requirement 2
- Organismal Diversity Requirement
- Elective

**Second Semester**
- BCHM 3050 Essential Elements of Bioch. 8
- Major Requirement 9
- Social Science Requirement 10
- Elective

**Junior Year**

**First Semester**
- BIOL 3350 Evolutionary Biology
- BIOL 4610 Cell Biology
- BIOL 4620 Cell Biology Lab.
- PHYS 2070 General Physics I
- PHYS 2090 General Physics I Lab.
- Ecology Requirement

**Second Semester**
- ENGL 3150 Scientific Writing and Comm. 11
- PHYS 2080 General Physics II
- PHYS 2100 General Physics II Lab.
- Arts and Humanities (Non-Lit.) Requirement
- Functional Biology Requirement
- Major Requirement

**Senior Year**

**First Semester**
- BIOL 4930 Senior Seminar or MICR 4930 Senior Seminar
- Elective

**Second Semester**
- Elective

**121 Total Semester Hours**

**Senior Year**

**First Semester**
- BIOL 1010 Frontiers in Biology I
- BIOL 1030 General Biology II
- BIOL 1050 General Biology Lab. I
- CH 1010 General Chemistry
- MATH 1060 Calculus of One Variable I

**Second Semester**
- BIOL 1060 General Biology II
- BIOL 1060 General Biology Lab. II
- CH 1020 General Chemistry
- ENGL 1030 Composition and Rhetoric
- Mathematical Sciences Requirement

**Sophomore Year**

**First Semester**
- CH 2230 Organic Chemistry
- CH 2270 Organic Chemistry Lab.
- ENT (BIOL) 3010 Insect Biology and Diversity
- Elective

**Second Semester**
- Elective

**121 Total Semester Hours**

**PREPHARMACY EMPHASIS AREA**

**Freshman Year**

**First Semester**
- BIOL 1010 Frontiers in Biology I
- BIOL 1030 General Biology II
- BIOL 1050 General Biology Lab. I
- CH 1010 General Chemistry
- MATH 1060 Calculus of One Variable I
- Oral Communications Requirement

**Second Semester**
- BIOL 1060 General Biology II
- BIOL 1060 General Biology Lab. II
- CH 1020 General Chemistry
- ENGL 1030 Composition and Rhetoric
- Mathematical Sciences Requirement

**Sophomore Year**

**First Semester**
- CH 2230 Organic Chemistry
- CH 2270 Organic Chemistry Lab.
- GEN 3000 Fundamental Genetics
- Arts and Humanities (Literature) Requirement
- Organismal Diversity Requirement
- Elective

1 BIOL 1100 and 1110 are strongly recommended; however, BIOL 1030/1050 may substitute for BIOL 1100, and BIOL 1040/1060 may substitute for BIOL 1110. The remaining 1-2 credits required must be satisfied by completing 1-2 extra credits.

2 See General Education Requirements.

3 MATH 1080, STAT 2300, or other approved coursework. See advisor. Medical/dental schools have different mathematics requirements. The Medical Colleges Admissions Test (MCAT) includes questions on statistics.

4 Most professional health sciences schools require the second semester of organic chemistry with laboratory, CH 2240/2280.

5 CH 2010 and CH 2020 may substitute.

6 At least one lecture and associated laboratory selected from BIOL 3010, 3020/3060, 3030/3070, 3040/3080, 3200, 4060/4070, 4250/4260.

7 BCHM 3010 may be substituted.

8 Twenty-one credit hours from 3000-level or higher BIOL or MICR courses (except MICR 3000) or from CH 2240/2280, including at least three laboratory courses. Any combination of BIOL or MICR 3940, 4910, 4920, 4940, and 4950 may not exceed eight credits.

9 See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and the Science and Technology in Society Requirements. The Medical Colleges Admissions Test (MCAT) includes questions on psychology and sociology.

10 PHYS 1220/1240 may be substituted.

11 At least one course selected from BIOL 4100, 4410, 4420, 4430, 4460, 4700, MICR 4030, or 4050.

12 ENGL 3140 may be substituted.

13 PHYS 2210/2230 may be substituted.

14 At least one course selected from BIOL 4010, 4080, 4200, 4400, 4590, 4750, 4800, 4830, 4840, or MICR 4140.

ENTOMOLOGY EMPHASIS AREA

See Bachelor of Science curriculum for freshman year requirements.

Sophomore Year

**First Semester**
- CH 2230 Organic Chemistry
- CH 2270 Organic Chemistry Lab.
- ENT (BIOL) 3010 Insect Biology and Diversity
- Elective

**Second Semester**
- Elective

**Junior Year**

**First Semester**
- BIOL 3350 Evolutionary Biology
- BIOL 4610 Cell Biology
- BIOL 4620 Cell Biology Lab.
- PHYS 2070 General Physics I
- PHYS 2090 General Physics I Lab.
- Ecology Requirement

**Second Semester**
- ENGL 3150 Scientific Writing and Comm.
- PHYS 2080 General Physics II
- PHYS 2100 General Physics II Lab.
- Arts and Humanities (Non-Lit.) Requirement
- Functional Biology Requirement
- Major Requirement

**Senior Year**

**First Semester**
- BIOL 4930 Senior Seminar or MICR 4930 Senior Seminar
- Elective

**Second Semester**
- Elective

**121 Total Semester Hours**

1 Most professional health sciences schools require two semesters of organic chemistry with laboratory, CH 2240/2280.

2 CH 2010 and CH 2020 may be substituted.

3 See General Education Requirements.

4 BCHM 3010 may be substituted.

5 Seven credit hours must be selected from BIOL or MICR courses at the 3000-level or above (except MICR 3000) or CH 2240/2280.

6 See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and the Science and Technology in Society Requirements.

7 PHYS 1220/1240 may be substituted.

8 At least one course selected from BIOL 4100, 4410, 4420, 4430, 4460, 4700, MICR 4030, or 4050.

9 ENGL 3140 may be substituted.

10 PHYS 2210/2230 may be substituted.

11 At least one course selected from BIOL 3610, 4010, 4080, 4200, 4400, 4590, 4750, 4800, 4830, 4840, or MICR 4140.

PREPHARMACY EMPHASIS AREA

**Freshman Year**

**First Semester**
- BIOL 1010 Frontiers in Biology I
- BIOL 1050 General Biology Lab. I
- CH 1010 General Chemistry
- MATH 1060 Calculus of One Variable I
- Oral Communications Requirement

**Second Semester**
- BIOL 1060 General Biology II
- BIOL 1060 General Biology Lab. II
- CH 1020 General Chemistry
- ENGL 1030 Composition and Rhetoric
- Mathematical Sciences Requirement

**Junior Year**

**First Semester**
- BIOL 4610 Cell Biology
- BIOL 4620 Cell Biology Laboratory
- PHYS 2070 General Physics I
- PHYS 2090 General Physics I Lab.
- Ecology Requirement
- Entomology Requirement

**Second Semester**
- ENGL 3150 Scientific Writing and Comm.
- PHYS 2080 General Physics II
- PHYS 2100 General Physics II Lab.
- Arts and Humanities (Non-Lit.) Requirement
- Functional Biology Requirement

**Senior Year**

**First Semester**
- BIOL 4930 Senior Seminar or MICR 4930 Senior Seminar
- Elective

**Second Semester**
- Elective

**121 Total Semester Hours**

**1** BIOL 1100 and 1110 are strongly recommended; however, BIOL 1030/1050 may substitute for BIOL 1100, and BIOL 1040/1060 may substitute for BIOL 1110. The remaining 1-2 credits required must be satisfied by completing 1-2 extra credits.
TOXICOLOGY EMPHASIS AREA
See Bachelor of Science curriculum for freshman year requirements.

Sophomore Year
First Semester
3 - BIOL 2110 Introduction to Toxicology
3 - CH 2230 Organic Chemistry1,2
1 - CH 2270 Organic Chemistry Lab.1,2
3 - GEN 3000 Fundamental Genetics3
3 - Social Science Requirement4
3 - Elective

Second Semester
3 - BCHM 3050 Essential Elements of Bioch.5
3 - BIOL 3350 Evolutionary Biology
4 - Major Requirement10
4 - Organismal Diversity Requirement2
3 - Elective

Junior Year
First Semester
3 - BIOL 4610 Cell Biology
2 - BIOL 4620 Cell Biology Laboratory
3 - PHYS 2070 General Physics I
1 - PHYS 2090 General Physics I Lab.7
3 - PSYC 2010 Introduction to Psychology

Second Semester
3 - BCHM 3050 Essential Elements of Bioch.5
3 - BIOL 3350 Evolutionary Biology
2 - MICR 4930 Senior Seminar
2 - BIOL 4930 Senior Seminar

Senior Year
First Semester
2 - BIOL 4930 Senior Seminar or
2 - MICR 4930 Senior Seminar
3 - Ecology Requirement9
3 - Major Requirement13
5 - Elective

Second Semester
4 - MICR 3050 General Microbiology
3 - Major Requirement13
6 - Elective

121 Total Semester Hours

1Pharmacy programs require BIOL 1030/1050 and 1040/1060 or equivalent, however, BIOL 1100 and 1110 may substitute. The additional 1-2 credit hours will be subtracted from Major Requirement credits.
2See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness Requirement and the Science and Technology in Society Requirement.
3MATH 1080, STAT 2300, or other approved coursework. See advisor. Professional schools have different mathematics requirements.
4GEN 3020 may be substituted.
5At least one lecture and associated laboratory selected from BIOL 3010, 3020/3060, 3030/3070, 3040/3080, 3200, 4060/4070, 4250/4260.
6At least one course selected from BIOL 4100, 4410, 4420, 4430, 4460, 4520, MICR 4010, or 4030.
7ENGL 3400 may be substituted.
8At least one course selected from BIOL 4100, 4410, 4420, 4430, 4460, 4520, MICR 4010, or 4030.
9Six credit hours must be selected from BIOL or MICR courses at the 3000 level or above (except MICR 3000).

Combined Bachelor of Science in Biological Sciences/Master of Science in Bioengineering
Under this plan, students may reduce the time necessary to earn both degrees by applying graduate credits to both undergraduate and graduate program requirements. See Academic Regulations in this catalog for enrollment guidelines and procedures. Students are encouraged to obtain the specific requirements for the dual degree from the Department of Biological Sciences or Bioengineering as early as possible in their undergraduate program as a number of required courses have prerequisites not normally taken by Biological Sciences majors.

CHEMISTRY
Bachelor of Arts
Freshman Year
First Semester
4 - CH 1010 General Chemistry
4 - MATH 1060 Calculus of One Variable I
6 - Arts and Humanities Requirement1 or
6 - Social Science Requirement1
1 - Elective

Second Semester
4 - CH 1020 General Chemistry
1 - Elective

Sophomore Year
First Semester
2 - BIOL 4930 Senior Seminar or
2 - MICR 4930 Senior Seminar
3 - CH 3130 Quantitative Analysis
2 - CH 3710 Quantitative Analysis Lab.
3 - Social Science Requirement4
5 - Elective

Second Semester
3 - CH 4130 Chemistry of Aqueous Systems or
3 - ETOX 4210 Chemical Sources and Fate in Environmental Systems
3 - Arts and Humanities (Non-Lit.) Requirement4
3 - Toxicology Requirement8
3 - Elective

121 Total Semester Hours

1Most professional health sciences programs require the second semester of organic chemistry with laboratory, CH 2240/2280.
2PHY 1220/1230 may be substituted.
3PHY 2210/2230 may be substituted.
4See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and the Science and Technology in Society Requirements.
5BCHM 3010 may be substituted.
CHEMISTRY
Bachelor of Science
Chemistry, an experimental discipline based on observation guided by molecular theory, is of fundamental importance in much of modern science and technology. Its molecular concepts form the basis for ideas about complex material behavior. Due to the fundamental nature and extensive application of chemistry, an unusually large variety of challenging opportunities to contribute in the science-oriented community are open to students whose education is built around the principles of this discipline.

The Chemistry curriculum, through the career requirement options and the large number of electives, provides students the opportunity to select a coherent program of study beyond the basic courses. Career requirement options are provided for students anticipating graduate study in chemistry or related fields; employment following the BS degree in laboratory, production, technical sales, or management positions; professional studies (e.g., medicine); chemical physics; geochemistry; and employment in fields requiring extensive preparation in courses other than sciences (e.g., patent law and technical writing). Significant features of the curriculum are the student's extensive participation in experimental work and the opportunity to take part in a research investigation during the junior and senior years.

Freshman Year
First Semester
3 - CH 3130 Quantitative Analysis
1 - CH 3170 Quantitative Analysis Lab.
3 - CH 3310 Physical Chemistry
3 - Arts and Humanities Requirement or Social Science Requirement
3 - Minor Requirement
3 - Modern Language Requirement

Second Semester
3 - CH 3320 Physical Chemistry
3 - ENGL 3140 Technical Writing
3 - Arts and Humanities (Literature) Requirement
3 - Minor Requirement
3 - Modern Language Requirement

Senior Year
First Semester
3 - Arts and Humanities Requirement or Social Science Requirement
3 - Chemistry Requirement
3 - Minor Requirement
6 - Elective

Second Semester
3 - CH 3400 Organic Chemistry
3 - CH 3320 Physical Chemistry
3 - Arts and Humanities Requirement or Social Science Requirement
3 - Chemistry Requirement
6 - Minor Requirement
5 - Modern Language Requirement

121 Total Semester Hours

CHEMISTRY
Bachelor of Science
CHEMISTRY
First Semester
3 - CH 3130 Quantitative Analysis
3 - CH 3170 Quantitative Analysis Lab.
3 - CH 3310 Physical Chemistry
3 - Arts and Humanities Requirement or Social Science Requirement
3 - Minor Requirement
3 - Modern Language Requirement

Second Semester
3 - CH 3320 Physical Chemistry
3 - ENGL 3140 Technical Writing
3 - Arts and Humanities (Literature) Requirement
3 - Minor Requirement
3 - Modern Language Requirement

Senior Year
First Semester
4 - CH 1010 General Chemistry
4 - MATH 1060 Calculus of One Variable I
3 - Arts and Humanities Requirement or Social Science Requirement
4 - Technical Requirement

Second Semester
4 - CH 1020 General Chemistry
3 - ENGL 1030 Composition and Rhetoric
4 - MATH 1080 Calculus of One Variable II
3 - PHYS 1220 Physics with Calculus I
1 - PHYS 1240 Physics Laboratory I

Sophomore Year
First Semester
3 - CH 2230 Organic Chemistry
1 - CH 2270 Organic Chemistry Lab.
4 - MATH 2060 Calculus of Several Variables
3 - PHYS 2210 Physics with Calculus II
1 - PHYS 2230 Physics Lab. II
3 - Arts and Humanities Requirement or Social Science Requirement

Second Semester
3 - CH 2230 Organic Chemistry
3 - CH 2050 Introduction to Inorganic Chemistry
3 - CH 2240 Organic Chemistry
1 - CH 2280 Organic Chemistry Lab.
4 - MATH 2060 Calculus of Several Variables
3 - PHYS 2210 Physics with Calculus II
1 - PHYS 2230 Physics Lab. II
3 - Arts and Humanities Requirement or Social Science Requirement

Junior Year
First Semester
3 - CH 3130 Quantitative Analysis
2 - CH 3150 Quantitative Analysis Lab.
3 - CH 3310 Physical Chemistry
1 - CH 3390 Physical Chemistry Lab.
1 - CH 3410 Introduction to Research
3 - Inorganic Chemistry Requirement
3 - Elective

Second Semester
3 - CH 3320 Physical Chemistry
1 - CH 3400 Physical Chemistry Lab.
3 - CH 3600 Chemical Biology
3 - CH 4110 Instrumental Analysis
2 - CH 4120 Instrumental Analysis Lab.
3 - Elective

Senior Year
First Semester
3 - CH 4430 Research Problems
3 - Arts and Humanities Requirement or Social Science Requirement
3 - Chemistry Requirement
6 - Elective

Second Semester
2 - CH 4030 Advanced Synthetic Techniques
3 - CH 4440 Research Problems
3 - CH 4500 Chemistry Capstone
3 - Chemistry Requirement
3 - Elective

121 Total Semester Hours

GENETICS
Bachelor of Science
Genetics is the study of heredity. Genetics research takes many forms, from the study of heredity at the level of individual molecules to study at the level of cells and chromosomes, individuals, or populations. To comprehend current genetic information and to make future contributions to our molecular understanding of life processes, students must obtain a broad background in biology and a firm foundation in chemistry and mathematics. This is the basis of the genetics curriculum.

A degree in Genetics is a strong preparation for many careers. The degree provides an excellent foundation for medical, veterinary, or pharmacy school, as well as graduate research in any discipline related to biology, including bioinformatics, forensic technology, and genetic counseling. Because of the increasing emphasis on genetics in everyday life, a Bachelor of Science in Genetics can also be a direct path to a career in the emerging biotechnology industries (pharmaceuticals, agricultural technologies, biomimetic minerals) in research, sales, or business operations. Combined with a law degree, a genetics bachelor of science is a good background for a career as a patent attorney.

Freshman Year
First Semester
5 - BIOL 1100 Principles of Biology I
4 - CH 1010 General Chemistry
1 - GEN 1030 Careers in Biochem. and Genetics
4 - MATH 1060 Calculus of One Variable I

Second Semester
5 - BIOL 1100 Principles of Biology II
4 - MATH 1080 Calculus of Several Variables
1 - PHYS 1230 Physics Laboratory I
4 - MATH 1060 Calculus of One Variable II
3 - PHYS 1240 Physics Laboratory II
3 - Arts and Humanities Requirement

Junior Year
First Semester
3 - BIOL 2020 Genetics
3 - BIOL 2030 Molecular Biology
3 - BIOL 2100 Cell Biology
3 - BIOL 2200 Evolutionary Biology
3 - BIOL 2300 Microbiology
3 - BIOL 2400 Genetics
3 - BIOL 2500 Molecular and Cell Biology
3 - BIOL 2600 Biochemistry
3 - BIOL 2700 Biostatistics
3 - BIOL 2800 Bioinformatics
3 - BIOL 2900 Marine Biology
3 - BIOL 3000 Comparative Biology
3 - BIOL 3100 Neurobiology
3 - BIOL 3200 Immunology
3 - BIOL 3300 Virology
3 - BIOL 3400 Pathology
3 - BIOL 3500 Environmental Science
3 - BIOL 3600 Biotechnology
3 - BIOL 3700 Biostatistics
3 - BIOL 3800 Marine Biology
3 - BIOL 3900 Neurobiology
3 - BIOL 4000 Immunology
3 - BIOL 4100 Pathology
3 - BIOL 4200 Biostatistics
3 - BIOL 4300 Marine Biology
3 - BIOL 4400 Neurobiology
3 - BIOL 4500 Immunology
3 - BIOL 4600 Pathology
3 - BIOL 4700 Biostatistics
3 - BIOL 4800 Marine Biology
3 - BIOL 4900 Neurobiology
3 - BIOL 5000 Immunology
3 - BIOL 5100 Pathology
3 - BIOL 5200 Biostatistics
3 - BIOL 5300 Marine Biology
3 - BIOL 5400 Neurobiology
3 - BIOL 5500 Immunology
3 - BIOL 5600 Pathology
3 - BIOL 5700 Biostatistics
3 - BIOL 5800 Marine Biology
3 - BIOL 5900 Neurobiology
3 - BIOL 6000 Immunology
3 - BIOL 6100 Pathology
3 - BIOL 6200 Biostatistics
3 - BIOL 6300 Marine Biology
3 - BIOL 6400 Neurobiology
3 - BIOL 6500 Immunology
3 - BIOL 6600 Pathology
3 - BIOL 6700 Biostatistics
3 - BIOL 6800 Marine Biology
3 - BIOL 6900 Neurobiology
3 - BIOL 7000 Immunology
3 - BIOL 7100 Pathology
3 - BIOL 7200 Biostatistics
3 - BIOL 7300 Marine Biology
3 - BIOL 7400 Neurobiology
3 - BIOL 7500 Immunology
3 - BIOL 7600 Pathology
3 - BIOL 7700 Biostatistics
3 - BIOL 7800 Marine Biology
3 - BIOL 7900 Neurobiology
3 - BIOL 8000 Immunology
3 - BIOL 8100 Pathology
3 - BIOL 8200 Biostatistics
3 - BIOL 8300 Marine Biology
3 - BIOL 8400 Neurobiology
3 - BIOL 8500 Immunology
3 - BIOL 8600 Pathology
3 - BIOL 8700 Biostatistics
3 - BIOL 8800 Marine Biology
3 - BIOL 8900 Neurobiology
3 - BIOL 9000 Immunology
3 - BIOL 9100 Pathology
3 - BIOL 9200 Biostatistics
3 - BIOL 9300 Marine Biology
3 - BIOL 9400 Neurobiology
3 - BIOL 9500 Immunology
3 - BIOL 9600 Pathology
3 - BIOL 9700 Biostatistics
3 - BIOL 9800 Marine Biology
3 - BIOL 9900 Neurobiology
3 - BIOL 1000 Principles of Biology I
4 - CH 1010 General Chemistry
1 - GEN 1030 Careers in Biochem. and Genetics
4 - MATH 1060 Calculus of One Variable I

Second Semester
5 - BIOL 1100 Principles of Biology II
4 - MATH 1080 Calculus of Several Variables
1 - PHYS 1230 Physics Laboratory I
4 - MATH 1060 Calculus of One Variable II
3 - PHYS 1240 Physics Laboratory II
3 - Arts and Humanities Requirement

Senior Year
First Semester
3 - CH 4430 Research Problems
3 - Arts and Humanities Requirement or Social Science Requirement
3 - Chemistry Requirement
6 - Elective

Second Semester
2 - CH 4030 Advanced Synthetic Techniques
3 - CH 4440 Research Problems
3 - CH 4500 Chemistry Capstone
3 - Chemistry Requirement
3 - Elective

121 Total Semester Hours

See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.

Genetics can also be a direct path to a career in the emerging biotechnology industries (pharmaceuticals, agricultural technologies, biomimetic minerals) in research, sales, or business operations. Combined with a law degree, a genetics bachelor of science is a good background for a career as a patent attorney.
Second Semester
3 - BIOL 1110 Principles of Biology II
4 - CH 1020 General Chemistry
3 - ENGL 1030 Composition and Rhetoric
4 - MATH 1080 Calculus of One Variable II

16

Sophomore Year
First Semester
3 - CH 2270 Organic Chemistry Lab.
1 - COMM 1500 Intro. to Human Comm.
3 - COMM 2500 Public Speaking
3 - GEN 3020 Molecular and General Genetics
3 - PHYS 1220 Physics with Calculus I
1 - PHYS 1240 Physics Lab.
1
14

Second Semester
3 - BCHM 3010 Molecular Biochemistry
3 - CH 2240 Organic Chemistry
1 - CH 2280 Organic Chemistry Lab.
2 - GEN 3040 Molecular Biology Lab.
3 - STAT 2300 Statistical Methods I
3 - Arts and Humanities (Literature) Requirement
3 - Social Science Requirement
18

Junior Year
First Semester
3 - GEN 4200 Molecular Genetics and Gene Regulation Lab.
3 - GEN (BCHM) 4400 Bioinformatics
3 - Science Requirement
3 - Social Science Requirement
14

Second Semester
3 - BIOL 4610 Cell Biology
3 - GEN 4100 Population and Quantitative Gen.
2 - GEN 4110 Population and Quantitative Gen. Lab.
3 - PHIL 3260 Science and Values
3 - Genetics Requirement
3 - Elective
17

Senior Year
First Semester
3 - GEN 4500 Comparative Genetics
3 - Genetics Requirement
3 - Science Requirement
6 - Elective
15

Second Semester
2 - GEN 4930 Senior Seminar
3 - Genetics Requirement
3 - Science Requirement
6 - Elective
14

122 Total Semester Hours

Medical, veterinary, and graduate school requirements often include two semesters of physics with calculus and the physics laboratory. Students are encouraged to check requirements for admission to professional postgraduate programs.

See General Education Requirements. Three of the Social Science Requirement credit hours must also satisfy the Cross-Cultural Awareness Requirement. BIOL 2220, 2230, PHYS 2090, 2100, 2210, 2230, or any courses at 3000 level or above in BCHM, BIOE, BIOL, CH, GEN, MATH, MICR, PHYS, and STAT. Other courses must be approved by advisor. A maximum of nine credit hours from undergraduate research courses (4930, creative inquiry or similar courses) may be used towards the combined science and genetics requirements.

AVS 4700, BCHM 4110, 4120, 4130, 4340, 4360, 4430, 4910, BIOL 3350, 4400, 4500, (PLPA 4540, 4560, 4570, GEN 4700, 4910, MICR 3050, 4150, 4170, PES 4050).

Two semesters of a modern language are strongly recommended. See Modern Languages Requirement at Clemson University statement on page 27.

Notes:
1. A student is allowed to enroll in science and mathematics courses only when all prerequisites have been passed with a grade of C or better.
2. A minimum grade of C is required in all science and mathematics courses. No student may exceed a maximum of two attempts, excluding a W, to complete successfully any science or mathematics course.

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 electing 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, internship 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 Mathemati-
Second Semester
1. MATH 4920 Professional Development or
2. EDSC 3260 Practicum in Secondary Math.
3. Capstone Experience
4. Math Science Requirement
5. Minor Requirement or
6. Second Major Requirement
7. Elective
8. 15-17

Junior Year
First Semester
1. MATH 4000 Theory of Probability
2. MATH 4400 Linear Programming
3. MATH 4530 Advanced Calculus I
4. Advanced Writing Requirement
5. Technical Requirement
6. 15

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. 15

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

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

Second Semester
1. MATH 2080 Intro. to Ordinary Diff. Equations
2. MATH 3020 Statistics for Science and Engr.
3. MATH 3110 Linear Algebra
4. Arts and Humanities (Literature) Requirement
5. Natural Science Requirement
6. 17

Biology Concentration

Freshman Year
First Semester
1. MATH 1060 Calculus of One Variable I
2. Arts and Humanities (Non-Lit.) Requirement
3. Modern Language Requirement
4. Social Science Requirement
5. 16

Second Semester
1. ENGL 1030 Composition and Rhetoric
2. MATH 1080 Calculus of One Variable II
3. ENGL 2220 Physics with Calculus I
4. MATH 2060 Calculus of Several Variables
5. CPSC 1010, 1110, or 2200
6. 15

Freshman Year
First Semester
1. BIOL 1100 Principles of Biology I
2. MATH 1060 Calculus of One Variable I
3. Modern Language Requirement
4. Social Science Requirement
5. 15
Second Semester
5 - BIOL 1110 Principles of Biology II
3 - ENGL 1030 Composition and Rhetoric
4 - MATH 1080 Calculus of One Variable II
3 - Computer Science Requirement1
15

Sophomore Year
First Semester
4 - CH 1010 General Chemistry
4 - MATH 2060 Calculus of Several Variables
1 - MATH 2500 Intro. to Mathematical Sciences
3 - PHYS 2070 General Physics I
1 - PHYS 2090 General Physics I Lab.
3 - Arts and Humanities (Non-Lit.) Requirement4
16
Second Semester
4 - CH 1020 General Chemistry
4 - MATH 2080 Intro. to Ordinary Diff. Equations
3 - MATH 3110 Linear Algebra
3 - PHYS 2080 General Physics II
1 - PHYS 2100 General Physics II Lab.
15

Junior Year
First Semester
3 - CH 2230 Organic Chemistry
1 - CH 2270 Organic Chemistry Lab.
3 - MATH 3190 Introduction to Proof
3 - MATH 3600 Intermediate Math. Computing
3 - Advanced Writing Requirement3
3 - Arts and Humanities (Literature) Requirement4
16
Second Semester
3 - CH 2240 Organic Chemistry
1 - CH 2280 Organic Chemistry Lab.
3 - MATH 3020 Statistics for Science and Engr.
3 - MATH 4400 Linear Programming
3 - Mathematical Sciences Requirement6
3 - Oral Communication Requirement1
16

Senior Year
First Semester
3 - MATH 4000 Theory of Probability
3 - MATH 4530 Advanced Calculus I
3 - Animal or Plant Diversity Requirement8
3 - Capstone Experience2
3 - Social Science Requirement4
15
Second Semester
3 - MATH 4120 Introduction to Modern Algebra
3 - MATH 4540 Advanced Calculus II
1 - MATH 4920 Professional Development
3 - Biological Sciences Requirement13
3 - Capstone Experience2
13
121 Total Semester Hours

1Three credits in any modern language numbered 1020 or above.
2See Modern Languages Requirement at Clemson University statement on page 27.
3See General Education Requirements. ENCOM 2000 or 2110 is recommended.
4CPSC 1010, 1110, or 2200
5See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.
6Select from ENGL 3040, 3120, 3140 or 3150, or the cluster of courses AS 3090, 3100, 4090 and 4100; or the cluster of courses ML 3010, 3020, 4010, and 4020.
7Any 4000 level MATH or STAT course approved by advisor.
8See General Education Requirements.
9BIOL 3020, 3030, 3040, or 3050
10May 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 approved by advisor selected from MATH 4030, 4060, 4070, 4080, 4100, 4190, 4310, 4340, 4350, 4410, 4420, 4600, 4820, 4910.
10BCHM 3010, GEN 3020/3030, MICR 3050, or any 3000–4000 level BIOL course

Notes:
1. For graduation, a candidate for the BS degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point average in all required MATH courses.
2. Students who change majors to Mathematical Sciences must have achieved the Minimum Cumulative Grade-Point Average (MC GPA) 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.

Microbiology
Bachelor of Science
Microbiology deals with the study of bacteria, viruses, yeasts, filamentous fungi, protozoa, and unicellular algae. Microbiologists seek to describe these organisms in terms of their structures, functions, and processes of reproduction, growth, and death at both the cellular and molecular levels. They are also concerned with their ecology, particularly in regard to their pathological effects on man, and with their economic importance.

The Microbiology major provides a thorough training in the basic microbiological skills. Further, students receive instruction in mathematics, physics, chemistry, and biochemistry, all essential to the training of a modern microbiologist. Students can prepare for a variety of careers through a wide choice of electives. Microbiology graduates may enter graduate school in microbiology, biochemistry, bioengineering, or related disciplines; they may enter medical or dental schools or pursue careers in one of the many industries or public service departments dependent upon microbiology. Some of these are the fermentation and drug industries, medical and public health microbiology, various food industries, and agriculture.

Microbiology majors planning to apply for admission to a medical or dental school should inform their advisors immediately upon entering the program.

Sophomore Year
First Semester
3 - CH 2230 Organic Chemistry
1 - CH 2270 Organic Chemistry Lab.
3 - MATH 1060 Calculus of One Variable I
3 - BIOL 1010 Frontiers in Biology I
1 - PHYS 2090 General Physics I Lab.
1 - BIOL 1010 Frontiers in Biology I
5, 9 - Elective
16
Second Semester
3 - MATH 3600 Intermediate Math. Computing
3 - CH 2240 Organic Chemistry
First Semester
3 - MATH 1080 Calculus of One Variable II
3 - ENGL 1030 Composition and Rhetoric
5 - BIOL 1110 Principles of Biology II
3 - MATH 1010 General Chemistry
4 - CH 1020 General Chemistry
3 - ENGL 1030 Composition and Rhetoric
3 - Mathematical Sciences Requirement1
15
3 - Elective. See General Education Requirements.
14
Second Semester
3 - BCHM 3050 Essential Elements of Biochem6
2 - BIOL 4340 Biol. Chemistry Lab. Techniques
3 - CH 2240 Organic Chemistry
1 - CH 2280 Organic Chemistry Lab.
4 - MICR 3050 General Microbiology
3 - Arts and Humanities (Non-Lit.) Requirement4
16
Junior Year
First Semester
3 - MICR 4010 Microbial Diversity and Ecology
3 - PHYS 2070 General Physics I
1 - PHYS 2090 General Physics I Lab.1
6 - Microbiology Requirement6
3 - Elective1
16
Second Semester
3 - MICR 4100 Microbial Diversity and Ecology
2 - MICR 4500 Advanced Micro Lab I
3 - Microbiology Requirement6
3 - Social Science Requirement4
3 - Elective1
14
Senior Year
First Semester
3 - BIOL 4610 Cell Biology
3 - MICR 4150 Microbial Genetics
2 - MICR 4500 Advanced Micro Lab II
3 - Virology Requirement10
3 - Elective1
14
Second Semester
2 - BIOL 4930 Senior Seminar or 2 - MICR 4930 Senior Seminar
2 - MICR 4520 Advanced Micro Lab III
3 - Microbiology Requirement8
9 - Elective1
16
124 Total Semester Hours

1BIOL 1100 and 1110 are strongly recommended; however, BIOL 1030/1050 may substitute for BIOL 1100, and BIOL 1040/1060 may substitute for BIOL 1110. The remaining 1-2 credits required must be satisfied by completing 1-2 extra credits.
2See General Education Requirements.
3MATH 1080 or STAT 2300 or other approved coursework. See advisor. Medical and dental schools have different mathematics requirements. The Medical Colleges Admissions Test (MCAT) includes questions on statistics.
4See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements. The Medical Colleges Admissions Test (MCAT) includes questions on psychology and sociology.
5Elective hours may be used toward satisfying the requirements of a minor.
6BCHM 3010 may be substituted.
BIOMEDICINE

CONCENTRATION

The Microbiology curriculum with a Biomedicine Concentration is recommended for students planning postgraduate programs. It is especially suited for students interested in the study of infectious disease.

Freshman Year

First Semester
1 - BIOL 1010 Frontiers in Biology I
5 - BIOL 1100 Principles of Biology I
4 - CH 1010 General Chemistry
MATH 1090 Calculus of One Variable I
3 - Oral Communication Requirement 2
17

Second Semester
5 - BIOL 1110 Principles of Biology II
4 - CH 1020 General Chemistry
3 - ENGL 1030 Composition and Rhetoric
3 - Mathematical Sciences Requirement 3
15

Sophomore Year

First Semester
3 - CH 2230 Organic Chemistry
1 - CH 2270 Organic Chemistry Lab.
3 - ENGL 3150 Scientific Writing and Comm.
3 - Arts and Humanities (Literature) Requirement 2
3 - Social Science Requirement 4
3 - Elective 4
16

Second Semester
3 - BCHM 3050 Essential Elements of Biochem 6
3 - CH 2240 Organic Chemistry
1 - CH 2280 Organic Chemistry Lab.
3 - GEN 3000 Fundamental Genetics 2
4 - MIRC 3050 General Microbiology
3 - Arts and Humanities (Non-Lit.) Requirement 4
17

Junior Year

First Semester
3 - BIOL 4610 Cell Biology
2 - BIOL 4620 Cell Biology Lab.
3 - MIRC 4010 Microbial Diversity and Ecology
3 - PHYS 2070 General Physics I
1 - PHYS 2090 General Physics I Lab. 8
3 - Biomedicine Requirement 8
15

Second Semester
3 - MICR 4120 Bacterial Physiology
2 - MICR 4500 Advanced Micro Lab I
3 - PHYS 2080 General Physics II 9
1 - PHYS 2100 General Physics II Lab. 10
3 - Social Science Requirement 1
3 - Elective 4
15

Senior Year

First Semester
3 - MICR 4140 Basic Immunology
3 - MICR 4150 Microbial Genetics
3 - MICR 4160 Introductory Virology
3 - MICR 4510 Advanced Micro Lab II
3 - Biomedicine Requirement 8
14

Second Semester
2 - BIOL 4930 Senior Seminar or
2 - MICR 4930 Senior Seminar
3 - MICR 4110 Pathogenic Bacteriology
3 - MICR 4170 Cancer and Aging
2 - MICR 4520 Advanced Micro Lab III
3 - Biomedicine Requirement 8
3 - Elective 4
16

125 Total Semester Hours

PHYSICS

PHYSICS

Bachelor of Arts

The Bachelor of Arts in Physics program is ideal for students interested in acquiring a broad-based liberal education that includes a strong and solid understanding of either science or a broad exposure to engineering with a strong physics foundation.

Double Major in Physics/Science Teaching—Physics

The Bachelor of Arts Degree in Physics and Science Teaching—Physics prepares students for teaching physics on the secondary school level and for graduate studies in physics. See page 106 for the curriculum.

Note: To receive a double major in Physics and Science Teaching—Physics, the student must complete a change-of-program form to declare both majors.

Freshman Year

First Semester
4 - CH 1010 General Chemistry
3 - ENGL 1030 Composition and Rhetoric
4 - MATH 1060 Calculus of One Variable I
3 - PHYS 1220/1240 Calculus with Calculus I
1 - PHYS 1240 Physics Lab. I
17

Second Semester
4 - CH 1020 General Chemistry
4 - MATH 1080 Calculus of One Variable II
3 - PHYS 2210 Physics with Calculus II
1 - PHYS 2230 Physics Lab. II
3 - Arts and Humanities (Non-Lit.) Requirement 4
15

Sophomore Year

First Semester
4 - MATH 2060 Calculus of Several Variables
3 - PHYS 2220 Physics with Calculus III
2 - PHYS 3000 Introduction to Research
3 - PHYS 3250 Experimental Physics I
4 - Modern Language Requirement 4
16

Second Semester
4 - MATH 2080 Intro. to Ordinary Diff. Equations
3 - PHYS 3110 Intro. to Math. of Theoretical Phys.
4 - Modern Language Requirement 4
3 - Oral Communication Requirement 4
14

Junior Year

First Semester
3 - PHYS 3150 Intro. to Computational Physics
3 - PHYS 3210 Mechanics I
3 - Modern Language Requirement 4
3 - Minor Requirement 4
3 - Physics Writing Requirement 4
15

Second Semester
3 - PHYS 3220 Mechanics II
3 - PHYS 4650 Thermodynamics and Statistical Mechanics
3 - Modern Language Requirement 4
3 - Minor Requirement 4
3 - Social Science Requirement 4
15
### Bachelor of Science

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 in any area of engineering and applied science.

#### Freshman Year

**First Semester**
- 4 - CH 1010 General Chemistry
- 3 - ENGL 1020 Composition and Rhetoric
- 4 - MATH 1010 Calculus of One Variable I
- 3 - PHYS 1220 Physics with Calculus I
- 1 - PHYS 1240 Physics Lab I

15

**Second Semester**
- 4 - CH 1020 General Chemistry
- 4 - MATH 1020 Calculus of One Variable II
- 3 - PHYS 2210 Physics with Calculus II
- 1 - PHYS 2230 Physics Lab II
- 3 - Arts and Humanities (Non-Lit.) Requirement

15

**Total Semester Hours**: 30

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### Sophomore Year

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

16

**Second Semester**
- 4 - MATH 2080 Intro. to Ordinary Diff. Equations
- 3 - PHYS 3110 Intro. to Meth. of Theoretical Phys.
- 3 - PHYS 3260 Experimental Physics II
- 4 - Modern Language Requirement

14

### Junior Year

**First Semester**
- 3 - PHYS 3120 Methods to Theoretical Physics II
- 3 - PHYS 3130 Intro. to Computational Physics
- 3 - PHYS 3210 Mechanics I
- 3 - Emphasis Area Requirement
- 3 - Oral Communication Requirement

15

**Second Semester**
- 3 - HIST 1720 The West and the World I or
- 3 - HIST 1730 The West and the World II
- 3 - Arts and Humanities (Literature) Requirement
- 3 - Minor Requirement
- 3 - Physics Requirement
- 3 - Elective

15

**Total Semester Hours**: 30

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### Senior Year

**First Semester**
- 3 - PHYS 4010 Senior Thesis
- 3 - PHYS 4410 Electromagnetics I
- 3 - PHYS 4550 Quantum Physics I
- 3 - Arts and Humanities (Literature) Requirement
- 3 - Emphasis Area Requirement

15

**Second Semester**
- 3 - HIST 1720 The West and the World I or
- 3 - HIST 1730 The West and the World II
- 3 - PHYS 4420 Electromagnetics II
- 3 - PHYS 4560 Quantum Physics II
- 3 - Emphasis Area Requirement
- 3 - Social Science Requirement

15

**Total Semester Hours**: 30

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Students must complete through 2020 in a modern language. See Modern Languages Requirement at Clemson University statement on page 27.

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### BIOPHYSICS CONCENTRATION

The Biophysics Concentration offers an excellent preparation for medical school or graduate work in biological sciences. It includes the flexibility of selecting courses in chemistry, biological sciences, physics, and mathematics. This concentration also provides the necessary background for employment in industry, manufacturing, and instrumentation for clinical or molecular biology applications.

#### Freshman Year

**First Semester**
- 4 - CH 1010 General Chemistry
- 3 - ENGL 1020 Composition and Rhetoric
- 4 - MATH 1060 Calculus of One Variable I
- 3 - PHYS 1220 Physics with Calculus I
- 1 - PHYS 1240 Physics Lab I

15

**Second Semester**
- 4 - CH 1020 General Chemistry
- 4 - MATH 1080 Calculus of One Variable II
- 3 - PHYS 2210 Physics with Calculus II
- 1 - PHYS 2230 Physics Lab II
- 3 - Arts and Humanities (Non-Lit.) Requirement

15

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### Sophomore Year

**First Semester**
- 5 - BIOL 1100 Principles of Biology
- 4 - MATH 2060 Calculus of Several Variables
- 3 - PHYS 2220 Physics with Calculus III
- 2 - PHYS 3000 Introduction to Research
- 3 - PHYS 3250 Experimental Physics I

17

**Second Semester**
- 4 - MATH 2080 Intro. to Ordinary Diff. Equations
- 3 - PHYS 3110 Intro. to Meth. of Theoretical Phys.
- 3 - PHYS 3260 Experimental Physics II
- 3 - Science Requirement
- 4 - Biophysics Requirement

14

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### Junior Year

**First Semester**
- 3 - PHYS 3120 Methods to Theoretical Physics II
- 3 - PHYS 3130 Intro. to Computational Physics
- 3 - PHYS 3210 Mechanics I
- 3 - Biophysics Requirement
- 4 - Modern Language Requirement

16

**Second Semester**
- 3 - PHYS 3220 Mechanics II
- 3 - PHYS 4650 Thermodynamics and Statistical Mechanics
- 3 - Biophysics Requirement
- 4 - Modern Language Requirement
- 3 - Oral Communication Requirement

16

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### Senior Year

**First Semester**
- 3 - PHYS 3210 Thermodynamics and Statistical Mechanics
- 3 - PHYS 3250 Experimental Physics
- 3 - Oral Communication Requirement

15
Senior Year
First Semester
3 - PHYS 4410 Electromagnetics I
3 - PHYS 4550 Quantum Physics I
3 - Arts and Humanities (Literature) Requirement
3 - Biophysics Requirement
3 - Physics Writing Requirement

Second Semester
3 - HIST 1720 The West and the World I or
3 - HIST 1730 The West and the World II
3 - PHYS 4420 Electromagnetics II
3 - PHYS 4560 Quantum Physics II
3 - Biophysics Requirement
3 - Social Science Requirement

Second Semester
135

Second Semester
15

Sophomore Year
First Semester
4 - MATH 2060 Calculus of Several Variables
3 - PHYS 2220 Physics with Calculus III
2 - PHYS 3000 Introduction to Research
3 - PHYS 3250 Experimental Physics I
3 - Emphasis Area Requirement

Second Semester
4 - MATH 2080 Intro, to Ordinary Diff. Equations
3 - PHYS 3110 Intro. to Meth. of Theoretical Phys.
3 - PHYS 3260 Experimental Physics II
3 - Emphasis Area Requirement
3 - Physics Writing Requirement

Junior Year
First Semester
3 - PHYS 3150 Intro. to Computational Physics
3 - PHYS 3210 Mechanics I
3 - Emphasis Area Requirement
4 - Modern Language Requirement
3 - Oral Communication Requirement

Second Semester
3 - PHYS 3220 Mechanics II
3 - PHYS 4650 Thermodynamics and Statistical Mechanics
3 - Emphasis Area Requirement
4 - Modern Language Requirement
3 - Science Requirement

Senior Year
First Semester
3 - PHYS 4010 Senior Thesis
3 - PHYS 4410 Electromagnetics I
3 - PHYS 4550 Quantum Physics I
3 - Arts and Humanities (Literature) Requirement
3 - Emphasis Area Requirement

Second Semester
3 - HIST 1720 The West and the World I or
3 - HIST 1730 The West and the World II
6 - Emphasis Area Requirement
3 - Social Science Requirement

Other introductory courses, such as CPSC 1010 or 1020, may be chosen with departmental approval.

See General Education Requirements. Three of these credit hours must also satisfy the Science and Technology in Society Requirement.

See advisor. Twenty-one credit hours, with at least nine at the 3000-4000 level, are required. Courses and emphasis area must be approved by the department. Note: Requirements for a minor may be satisfied with these courses. Emphasis area and courses of study must be approved by the end of sophomore year.

Students must complete through 2020 in a modern language. See Modern Languages Requirement at Clemson University statement on page 27.

Any 2000-4000 level science course in ASTR, BIOL, CH, ENSF, GEOL, PHYS, or STS. Other science courses require departmental approval.

Students may select an approved synthesis or capstone course or directed research in their emphasis area. Students in the honors program must complete a senior thesis in physics.

Combined Bachelor’s/Master’s Plan
Under this plan, students may reduce the time necessary to earn both degrees by applying graduate credits to both undergraduate and graduate program requirements. Both BS/MS (Master of Science) and BS/MAT (Master of Arts in Teaching) plans are available. Students are encouraged to obtain the specific requirements for pursuing the combined degree from the Department of Physics and Astronomy (www.physics.clemson.edu) as early as possible in their undergraduate program. Enrollment guidelines and procedures can be found under Academic Regulations in this catalog.

PREPROFESSIONAL STUDIES—PREPHARMACY

Non-degree
The Prepharmacy program requires 90 credits of general education requirements and typical prerequisites for PharmD programs. Upon completion of the necessary prerequisites, students will be eligible to apply to a school of pharmacy, typically at the conclusion of their second year at Clemson. Students who complete the 90-credit program at Clemson and a full year of coursework at an accredited school of pharmacy are eligible to apply for the Bachelor of Science in Preprofessional Studies for an August graduation at the earliest. The degree in Pharmacy is not awarded by Clemson. It is important for students to work closely with their advisor, as there are variations in courses required by pharmacy schools. For financial aid purposes, students in the Prepharmacy program are considered to be enrolled in a degree-seeking program.

Alternatively, students may also choose to enroll in a content-specific major while accommodating the prerequisite coursework of their particular pharmacy schools of interest. In this case, students would apply to a school of pharmacy at the conclusion of their third year at Clemson. Pharmacy schools typically specify only a few required courses to allow latitude for developing individualized undergraduate programs of study. Interested students are encouraged to consult with Health Professions advising, as well as the individual schools to which they hope to apply in order to identify the appropriate coursework. These schools are not as concerned about a student’s major as they are about academic performance in whichever curriculum.
the students chooses. Performance becomes critical as competition increases for the limited number of places available in pharmacy schools.

**First Year**

**First Semester**
- 3 - BIOL 1030 General Biology I
- 1 - BIOL 1050 General Biology Lab. I
- 4 - CH 1010 General Chemistry
- 4 - MATH 1060 Calculus of One Variable I
- 3 - PSYC 2010 Introduction to Psychology
- 15

**Second Semester**
- 3 - BIOL 1040 General Biology II
- 1 - BIOL 1060 General Biology Lab. II
- 4 - CH 1020 General Chemistry
- 3 - ENGL 1030 Composition and Rhetoric
- 3 - STAT 2300 Statistical Methods I
- 3 - Economics Requirement
- 17

**Second Year**

**First Semester**
- 4 - BIOL 2220 Human Anatomy and Phys. I
- 3 - CH 2230 Organic Chemistry
- 1 - CH 2270 Organic Chemistry Lab.
- 3 - PHYS 2070 General Physics I
- 1 - PHYS 2090 General Physics I Lab.
- 3 - Arts and Humanities (Non-Lit.) Requirement
- 15

**Second Semester**
- 4 - BIOL 2230 Human Anatomy and Phys. II
- 3 - CH 2240 Organic Chemistry
- 1 - CH 2280 Organic Chemistry Lab.
- 3 - COMM 1500 Intro. to Human Comm. or
  - 3 - COMM 2500 Public Speaking or
  - 3 - HON 2230 Studies in Communications
- 3 - PHYS 2080 General Physics II
- 1 - PHYS 2100 General Physics II Lab.
- 15

**Third Year**

**First Semester**
- 4 - MICR 3050 General Microbiology
- 3 - Arts and Humanities (Literature) Requirement
- 3 - Science and Tech. in Society Requirement
- 6 - Elective
- 16

**Second Semester**
- 12 - Elective
- 12

90 Total Semester Hours

1Pharmacy programs require BIOL 1030/1050 and BIOL 1040/1060. However, BIOL 1100 and 1110 may be substituted. The additional 1-2 credits will be subtracted from elective credits.

2ECON 2000, 2110, or 2120

3BIOL 3150 and 3160 may be substituted

4See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.

5Students planning to receive the Bachelor of Science in Pre-professional Studies degree are required to complete a year at an accredited pharmacy school.
MINORS

Following are minors acceptable for students in the College of Science. Students cannot major and minor in the same field or acquire a minor that is not allowed by the degree program.

Accounting
Adult/Extension Education
Aerospace Studies
Agricultural Business Management
Agricultural Mechanization and Business
American Sign Language Studies
Animal and Veterinary Sciences
Anthropology
Architecture
Art
Athletic Leadership
Biochemistry
Biological Sciences
Brand Communications
British and Irish Studies
Business Administration
Chemistry
Chinese Studies
Cluster
Communication Studies
Computer Science
Creative Writing
Crop and Soil Environmental Science
Digital Production Arts
East Asian Studies
Economics
English
Entomology
Entrepreneurship
Environmental Science and Policy
Equine Industry
Film Studies
Financial Management
Food Science
Forest Products
Forest Resource Management
French Studies
Gender, Sexuality and Women’s Studies
Genetics
Geography
Geology
German Studies
Global Politics
Great Works
History
Horticulture

Human Resource Management
International Engineering and Science
Italian Studies
Japanese Studies
Legal Studies
Management
Management Information Systems
Mathematical Sciences
Microbiology
Middle Eastern Studies
Military Leadership
Music
Natural Resource Economics
Nonprofit Leadership
Nuclear Engineering and Radiological Sciences
Packaging Science
Pan African Studies
Park and Protected Area Management
Philosophy
Physics
Plant Pathology
Political and Legal Theory
Political Science
Precision Agriculture
Psychology
Public Policy
Race, Ethnicity and Migration
Recreational Therapy
Religious Studies
Russian Area Studies
Science and Technology in Society
Screenwriting
Sociology
Spanish Studies
Spanish-American Area Studies
Sustainability
Theatre
Travel and Tourism
Turfgrass
Urban Forestry
Wildlife and Fisheries Biology
Women’s Leadership
Writing
Youth Development Studies

See Minors section for details.