**COLLEGE OF AGRICULTURE, FORESTRY, AND LIFE SCIENCES**

The College of Agriculture, Forestry, and Life Sciences (on the Web at virtual.clemson.edu/groups/CAFLS/) offers a broad range of academic degree programs providing a sound knowledge base and technical expertise in the basic and applied sciences including the life sciences. The Bachelor of Science degree is available in 16 academic programs; the Bachelor of Arts is offered in Biological Sciences.

Preprofessional Health Studies non-degree programs are offered in Premedicine, Prepharmacy, Prephysical Therapy, Prephysical Therapy, Speech-language Pathology, and Prevetinary Medicine. A bachelor's degree can be obtained by fulfilling additional requirements specified by the University.

The undergraduate academic programs include Agricultural Sciences with a Community and Economic Development Concentration; Agricultural Education; Agricultural Mechanization and Business; Animal and Veterinary Sciences with concentrations in Animal Agriculture, Equine Business, and Prevetinary and Science; Biochemistry; Biological Sciences; Biostatistics; Biotechnology; and Veterinary Medicine. A range of scholarships is available to students who excel in their academic performance. Information on scholarships and financial aid can be obtained from the Student Financial Office in Sikes Hall.

### AGRICULTURAL AND APPLIED ECONOMICS

#### Bachelor of Science

The Bachelor of Science in Agricultural and Applied Economics curriculum emphasizes a strong background in economics with applications to production agriculture, agribusiness, natural resources, and the environment. Courses are also included in basic agricultural and biological sciences, liberal arts, and business.

**Employment opportunities** and the agricultural and applied economics major is highly interdisciplinary and requires a strong background in economics, business, finance, marketing, and other related fields. Graduates have also begun businesses or returned to family-owned businesses. This major also provides an excellent background for professional or graduate study in several disciplines.

Students in the agricultural and applied economics curriculum take a basic set of courses during the freshman and sophomore years. During the junior and senior years, students concentrate in one of five emphasis areas: Agricultural Business, Agronomy, International Trade and Development, Production, and Real Estate. Students should select an emphasis area by the end of the sophomore year.

#### Freshman Year

<table>
<thead>
<tr>
<th>First Semester</th>
<th>15</th>
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<tbody>
<tr>
<td>1 - Elective</td>
<td>4</td>
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<tr>
<td>2 - CS 101 University Success Skills</td>
<td>3</td>
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<tr>
<td>3 - COMM 101 Intro. to Human Communication</td>
<td>3</td>
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<tr>
<td>4 - MATH 101 Intro. to Mathematical Analysis</td>
<td>3</td>
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<tr>
<td>5 - Natural Science Requirement</td>
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<tbody>
<tr>
<td>1 - Elective</td>
<td>4</td>
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<tr>
<td>2 - CS 102 Agricultural Economics</td>
<td>3</td>
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<tr>
<td>3 - CP 102 Intro. to Information Technology</td>
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<tr>
<td>4 - ENGL 103 A 101 University Success Skills</td>
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<tr>
<td>5 - EXST 122 Statistics in Everyday Life</td>
<td>3</td>
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<tr>
<td>6 - PHIL 103 Introduction to Ethics</td>
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#### Sophomore Year

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<tr>
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<tr>
<td>2 - C C 101 Financial Accounting Concepts</td>
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<tr>
<td>3 - AP EC 308 Quantitative A pplied Economics</td>
<td>3</td>
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<tr>
<td>4 - COMM 250 Public Speaking</td>
<td>3</td>
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<tr>
<td>5 - ECON 212 Principles of Macroeconomics</td>
<td>3</td>
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<tr>
<td>6 - Arts and Humanities (Literature) Requirement</td>
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<tr>
<td>2 - C C 102 Managerial Accounting Concepts</td>
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<tr>
<td>3 - AP EC 302 Economics of Farm Management</td>
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<tr>
<td>4 - EXST 301 Introductory Statistics</td>
<td>3</td>
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<tr>
<td>5 - SOC 201 Introduction to Sociology</td>
<td>3</td>
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<tr>
<td>6 - A griculture or Business Requirement</td>
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#### Junior Year

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<tr>
<th>First Semester</th>
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<tbody>
<tr>
<td>1 - Elective</td>
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<tr>
<td>2 - AP EC 309 of a agricultural M arketin g</td>
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<tr>
<td>3 - ECON (MGT) 306 Managerial Economics</td>
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<td>4 - ECON 314 Intermediate Macroeconomics</td>
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<td>5 - ENGL 304 Business Writing</td>
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<td>6 - ENGL 314 Technical Writing</td>
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<tr>
<td>7 - MGT 301 Principles of Management</td>
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<td>8 - MKT 301 Principles of Marketing</td>
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<table>
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<tr>
<th>Second Semester</th>
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<tbody>
<tr>
<td>1 - Elective</td>
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<tr>
<td>2 - AP EC 319 A griculture M anagement</td>
<td>3</td>
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<tr>
<td>3 - AP EC 421 Globalization</td>
<td>3</td>
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<tr>
<td>4 - AP EC 460 A griculture Finance</td>
<td>3</td>
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<tr>
<td>5 - C RIS 335 Leadership in Org. and Comm.</td>
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<tr>
<td>6 - COMM 350 Small Group and Team Comm.</td>
<td>3</td>
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<tr>
<td>7 - COMM 364 Organizational Comm.</td>
<td>3</td>
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<tr>
<td>8 - COMM 376 Negotiations Communication</td>
<td>3</td>
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<tr>
<td>9 - ECON 302 M oney and Banking</td>
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<tr>
<td>10 - ECON 315 Intermed. Macroeconomics</td>
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#### Senior Year

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<tbody>
<tr>
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<tr>
<td>2 - AP EC 402 Production Economics</td>
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<td>3 - AP EC 452 Agricultural Policy</td>
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<td>4 - CS 103 V (AP EC) 426 Syst. A nalysis</td>
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<tr>
<td>5 - EXST 462 Statistics Applied to Economics</td>
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<tr>
<td>6 - MGT 307 Personnel Management</td>
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<tr>
<td>3 - LAWS 312 Commercial Law</td>
<td>3</td>
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<tr>
<td>4 - LAWS 322 Legal Environment of Business</td>
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</table>

100 Total Semester Hours

*See General Education Requirements.

<table>
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<tr>
<th>COMMUNITY AND ECONOMIC DEVELOPMENT CONCENTRATION</th>
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</table>

The program in Community and Economic Development provides career opportunities for professional and graduate study in several disciplines. Community and Economic Development prepares students for employment in local, state, regional, federal, and international agencies; research and consulting firms; financial institutions; foundations; and agencies; public and private utilities; and organizations requiring entrepreneurial skills. This major provides an excellent background for professional and graduate study in several disciplines.

Agronomy and applied economics majors are offered in Premedicine, Prepharmacy, Preprofessional Health Studies, and Prevetinary Medicine. A range of scholarships is available to students who excel in their academic performance. Information on scholarships and financial aid can be obtained from the Student Financial Office in Sikes Hall.

### Scholarships

A range of scholarships is available to students who excel in their academic performance. Information on scholarships and financial aid can be obtained from specific departments in the College of from the Student Financial Office in Sikes Hall.

### Student Services

The college has a comprehensive Student Service Center offering a career library, company literature, career search technology, and video/audio resources.
### Freshman Year

**First Semester**
- CP SC 120 Intro. to Information Technology
- MTH SC 102 Intro. to Mathematical A nal ysis
- Arts and Humanities (Literature) Requirement
- Science and Tech. in Society Requirement
- Social Science Requirement

**Second Semester**
- ACCT 201 Financial Accounting Concepts
- ENGL 103 Accelerated Composition
- Natural Science Requirement
- Microeconomics Requirement
- Arts and Humanities (Non-Lit.) Requirement

### Sophomore Year

**First Semester**
- EX ST 301 Introductory Statistics
- Arts and Humanities (Literature) Requirement
- Microeconomics Requirement
- Oral Communication Requirement
- Elective

**Second Semester**
- C R D 357 Natural Resources Economics
- ECON 212 Principles of Microeconomics
- PO SC 302 State and Local Government
- Advanced Writing Requirement
- Behavioral Science Requirement

### Junior Year

**First Semester**
- C R D 335 Leadership in Org. and Commun.
- ECON (MGT) 306 Managerial Economics
- ECON 314 Intermediate Microeconomics
- Behavioral Science Requirement
- Emphasis A rea
- Marketing Requirement

**Second Semester**
- C R D 336 Community Development Methods
- Behavioral Science Requirement
- Emphasis A rea
- Planning Requirement

### Senior Year

**First Semester**
- C R D (A P EC) 411 Regional Impact Analysis
- EX ST 462 Statistics Applied to Economics
- R S (SOC) 459 The Community
- Behavioral Science Requirement
- Emphasis A rea

**Second Semester**
- C R D (A P EC) 412 Regional Economic Development Theory and Policy
- Behavioral Science Requirement
- Comm. and Econ. Dev. Practice Applications
- Emphasis A rea

120 Total Semester Hours

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### AGRICULTURAL EDUCATION

**Bachelor of Science**

Agricultural Education provides broad preparation in agricultural sciences and professional education, including communications and human relations skills. In addition to required courses, students may select a minor. (See page 55.)

The Bachelor’s degree prepares students for professional education positions in the mainstream of agriculture, including teaching, cooperative extension service, and government agricultural agencies. This degree also prepares students for other educational work such as agricultural missionary, public relations, and training officers in agricultural industry.

### Freshman Year

**First Semester**
- A G ED 102 A gric. Ed. Freshman Seminar
- A G ED 200 A gricultural A pplications of Educational Technology
- BIOL 103 General Biology I
- PHIL 102 Introduction to Logic
- Emphasis A rea
- Mathematics Requirement

16-17

**Second Semester**
- A G ED 100 Orientation and Field Experience
- A G ED 103 Multiculturalism in A gric. Ed.
- AV S 150 Introduction to A nimal Science
- AV S 151 Introduction to Animal Science Lab.
- BIOL 104 General Biology II
- ENGL 103 Accelerated Composition

15

### Sophomore Year

**First Semester**
- A G ED 201 Intro. to Agricultural Education
- A G ED 204 A pplicd A griculture Calculations
- A G ED 355 Team and Organizational Leadership in Food and Fiber Systems
- A P EC 202 A gricultural Economics
- CH 105 Beginning G en. and Organic Chem.

16

**Second Semester**
- A G ED 203 Teaching A griscience
- A G M 205 Principles of Fabrication
- HORT 212 Introduction to Turfgrass Culture
- HORT 213 Turfgrass Culture Lab.

17

### Junior Year

**First Semester**
- C SENV 202 Soils
- ED F 302 Educational Psychology
- HORT 303 Plant Materials

18

**Second Semester**
- A G ED 302 A gric. Education Junior Seminar
- COMM 150 Intro. to Human Comm. or
- COMM 250 Public Speaking
- HORT 305 Plant Propagation
- Advanced Writing Requirement
- Emphasis A rea

12

### Senior Year

**First Semester**
- A G ED 401 M ethods in A gricultural Ed.
- A G ED 404 Biotechnology in A gricultural Ed.
- Emphasis A rea

12

**Second Semester**
- A G ED 406 Directed Teaching
- Emphasis A rea

14

124-125 Total Semester Hours

### AGRICULTURAL MECHANIZATION AND BUSINESS

**Bachelor of Science**

The Agricultural Mechanization and Business major provides a program for students who desire training in areas relevant to dynamic agricultural enterprise. The program is organized with a strong emphasis on both business management and technical support of agriculture and agribusiness. To produce well-rounded individuals with good communication skills, the curriculum includes courses in the humanities, social sciences, English composition, and public speaking.

Graduates in Agricultural Mechanization and Business find meaningful and remunerative employment in a variety of situations directly and indirectly related to agricultural production, processing, marketing, and the many services connected therewith. Farming and technical sales in the agricultural, industrial, and heavy equipment industries are frequently chosen careers.

By completing this curriculum, graduates will have fulfilled the requirements for an Agricultural Business Management minor or other selected minor. Contact the Enrolled Student Services Office to have the minor recorded.
### College of Agriculture, Forestry, and Life Sciences

A additional information is available from the departmental offices or can be found on the Web at www.clemson.edu/agbioeng/agmech/index.htm.

#### Freshman Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
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</table>
| First Semester    | 1 - A G M 205 Principles of Fabrication  
                   | 2 - A P EC 202 A griicultural Economics  
                   | 3 - PHYS 200 Introductory Physics or  
                   | 4 - PHYS 207 General Physics I and  
                   | 5 - PHYS 209 General Physics I Lab.  
                   | 6 - A rts and Humanities (Literature) Requirement  
                   | 7 - Elective  |
| Second Semester   | 1 - A VS 221 Surveying  
                   | 2 - A G M 301 Soil and Water Conservation  
                   | 3 - A G M 460 Electrical Systems  
                   | 4 - A P EC 302 Economics of Farm Management  
                   | 5 - ENGL 304 Business Writing or  
                   | 6 - ENGL 314 Technical Writing  
                   | 7 - Minor Requirement  |

#### Sophomore Year

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                   | 2 - A P EC 202 A Briicultural Economics  
                   | 3 - PHYS 200 Introductory Physics or  
                   | 4 - PHYS 207 General Physics I and  
                   | 5 - PHYS 209 General Physics I Lab.  
                   | 6 - A rts and Humanities (Literature) Requirement  
                   | 7 - Elective  |
| Second Semester   | 1 - A VS 221 Surveying  
                   | 2 - A G M 301 Soil and Water Conservation  
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                   | 5 - ENGL 304 Business Writing or  
                   | 6 - ENGL 314 Technical Writing  
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                   | 5 - PHYS 209 General Physics I Lab.  
                   | 6 - A rts and Humanities (Literature) Requirement  
                   | 7 - Elective  |
| Second Semester   | 1 - A VS 221 Surveying  
                   | 2 - A G M 301 Soil and Water Conservation  
                   | 3 - A G M 460 Electrical Systems  
                   | 4 - A P EC 302 Economics of Farm Management  
                   | 5 - ENGL 304 Business Writing or  
                   | 6 - ENGL 314 Technical Writing  
                   | 7 - Minor Requirement  |
**EQUINE BUSINESS CONCENTRATION**

**Freshman Year**

**First Semester**
1. AVS 100 Orientation to AVS
2. AVS 150 Introduction to Animal Science
3. AVS 151 Intro. to Animal Science Lab.
4. BIOL 103 General Biology I or
5. BIOL 110 Principles of Biology I
6. CH 101 General Chemistry
7. Arts and Humanities (Non-Lit.) Requirement

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**Second Semester**
2. AVS 204 Horse Care Techniques
4. BIOL 104 General Biology II or
5. BIOL 111 Principles of Biology II
4. CH 102 General Chemistry
3. ENGL 103 Accelerated Composition
3. MTHSC 101 Intro. to Analysis
4. MTHSC 106 Calculus of One Variable

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**Sophomore Year**

**First Semester**
3. A CCT 201 Financial Accounting Concepts
3. AP EC 202 Agricultural Economics
4. AVS 312 Forages and Grazing Systems
3. Arts and Humanities (Literature) Requirement
2. AVS Techniques Requirement

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**Second Semester**
2. AVS 309 Principles of Equine Evaluation
2. AVS 310 Animal Health
2. AVS Techniques Requirement
5. Departmental Requirement
3. Social Science Requirement

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**Junior Year**

**First Semester**
2. AVS 205 Horsemanship I
4. AVS 301 Animal Nutrition
3. AVS 307 Principles of Animal Nutrition
3. AVS 470 Animal Genetics
3. Advanced Writing Requirement

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**Second Semester**
3. AVS 375 Animal Nutrition
3. AVS 410 Domestic Animal Behavior
3. AVS 453 Animal Reproduction
2. AVS Techniques Requirement
3. Departmental Requirement

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**Senior Year**

**First Semester**
2. AVS 385 Equine Behavior and Training
2. AVS 406 Seminars and Related Topics
4. AVS 416 Equine Exercise Physiology
3. AVS Experience-Based Activity
3. Departmental Requirement

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**Second Semester**
3. AVS 412 Advanced Equine Management
3. AVS 415 Contemporary Issues in Animal Science
4. AVS 417 Animal Agribusiness Development
3. Science and Technology in Society Requirement
3. Elective

17-17

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**Junior Year**

**First Semester**
4. AVS 301 Animal Nutrition
3. AVS 370 Principles of Animal Nutrition
3. BIOL CH 101 Molecualr Biochemistry or
3. BIOL CH 406 Physiological Chemistry
3. GEN 302 Molecular and General Genetics
1. GEN 303 Molecular and Gen. Genetics Lab.

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**Second Semester**
3. AVS 310 Animal Health
3. AVS 375 Applied Animal Nutrition
3. AVS 453 Animal Reproduction
4. MICRO 305 General Microbiology
3. Departmental Requirement

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**Senior Year**

**First Semester**
2. AVS 406 Seminars and Related Topics
3. Advanced Writing Requirement
3. AVS Experience-Based Activity
2. AVS Techniques Requirement
2. Departmental Requirement

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**Second Semester**
3. AVS 410 Domestic Animal Behavior
3. AVS 413 Animal Products
3. AVS 415 Contemporary Issues in Animal Science
3. Departmental Requirement
3. Social Science Requirement

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**Second Semester**
3. AVS 370 Principles of Animal Nutrition
3. AVS 310 Animal Health
3. AVS 316 Animal Reproduction
4. MICRO 305 General Microbiology
3. Departmental Requirement

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**Sophomore Year**

**First Semester**
3. AVS 150 Introduction to Animal Science
1. AVS 151 Intro. to Animal Science Lab.
4. BIOL 103 General Biology I or
5. BIOL 110 Principles of Biology I
4. CH 101 General Chemistry
3. Arts and Humanities (Literature) Requirement
2. AVS Techniques Requirement

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**Second Semester**
4. BIOL 104 General Biology II or
5. BIOL 111 Principles of Biology II
4. CH 102 General Chemistry
3. ENGL 103 Accelerated Composition
3. MTHSC 101 Intro. to Analysis
4. MTHSC 106 Calculus of One Variable

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**Junior Year**

**First Semester**
3. CH 223 Organic Chemistry I
1. CH 227 Organic Chemistry Lab.
3. PHYS 207 General Physics I or
3. PHYS 209 General Physics Lab.
3. Arts and Humanities (Literature) Requirement
2. AVS Techniques Requirement
3. Social Science Requirement

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**Second Semester**
3. CH 224 Organic Chemistry II
1. CH 228 Organic Chemistry Lab.
3. EX ST 301 Introductory Statistics
3. PHYS 208 General Physics II
1. PHYS 210 General Physics II Lab.
2. AVS Evaluation Requirement or
3. COMM 250 Public Speaking
2. AVS Techniques Requirement

15-16

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**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
- BIO CH 103 Careers in Biochem. and Genetics
- BIO I 100 Principles of Biology I
- CH 101 General Chemistry
- MTH SC 106 Calculus of One Variable I

### Second Semester
- BIO I 111 Principles of Biology II
- CH 102 General Chemistry
- ENGL 103 Accelerated Composition
- MTH SC 108 Calculus of One Variable II

## Sophomore Year

### First Semester
- CH 223 Organic Chemistry
- CH 227 Organic Chemistry Lab.¹
- GEN 302 Molecular and General Genetics
- GEN 303 Molecular and Gen. Genetics Lab.
- PHYS 122 Physics with Calculus I
- PHYS 124 Physics Lab. I
- 3-4: A advanced Mathematics Requirement²

### Second Semester
- BIO CH 301 Molecular Biochemistry
- CH 224 Organic Chemistry
- CH 228 Organic Chemistry Lab.¹
- COMM 150 Intro. to Human Comm. or
- COMM 250 Public Speaking
- PHYS 221 Physics with Calculus II
- PHYS 223 Physics Lab. II
- Arts and Humanities (Literature) Requirement³

## Junior Year

### First Semester
- BIO CH 431 Physical Approach to Biochem.
- BIO CH 433 General Biochemistry Lab. I
- CH 330 Introduction to Physical Chemistry³
- ENGL 314 Technical Writing
- Science Requirement⁴

### Second Semester
- BIO CH 432 Biochemistry of Metabolism
- BIO CH 434 General Biochemistry Lab. II
- BIO CH 436 Nucleic Acid and Protein Bioyn.
- PHIL 326 Science and Values
- Science Requirement⁵

## Senior Year

### First Semester
- BIO CH 491 Special Problems in Biochemistry⁶
- BIO CH (GEN) 493 Senior Seminar
- Social Science Requirement⁶
- Elective⁷

### Second Semester
- BIO CH 491 Special Problems in Biochemistry⁶
- BIO CH (GEN) 493 Senior Seminar
- Social Science Requirement⁶
- Elective⁷

## Freshman Year

### First Semester
- BIO I 100 Principles of Biology I
- CH 101 General Chemistry
- COMM 150 Intro. to Human Communication
- MTH SC 106 Calculus of One Variable I

### Second Semester
- BIO I 111 Principles of Biology II
- CH 102 General Chemistry
- ENGL 103 Accelerated Composition
- MTH SC 108 Calculus of One Variable II

## Sophomore Year

### First Semester
- CH 223 Organic Chemistry
- CH 227 Organic Chemistry Lab.¹
- GEN 302 Molecular and General Genetics
- GEN 303 Molecular and Gen. Genetics Lab.
- PHYS 122 Physics with Calculus I
- PHYS 124 Physics Lab. I
- 3-4: A advanced Mathematics Requirement²

### Second Semester
- BIO CH 301 Molecular Biochemistry
- CH 224 Organic Chemistry
- CH 228 Organic Chemistry Lab.¹
- COMM 150 Intro. to Human Comm. or
- COMM 250 Public Speaking
- PHYS 221 Physics with Calculus II
- PHYS 223 Physics Lab. II
- Arts and Humanities (Literature) Requirement³

## Junior Year

### First Semester
- BIO CH 431 Physical Approach to Biochem.
- BIO CH 433 General Biochemistry Lab. I
- CH 330 Introduction to Physical Chemistry³
- ENGL 314 Technical Writing
- Science Requirement⁴

### Second Semester
- BIO CH 432 Biochemistry of Metabolism
- BIO CH 434 General Biochemistry Lab. II
- BIO CH 436 Nucleic Acid and Protein Bioyn.
- PHIL 326 Science and Values
- Science Requirement⁵

## Senior Year

### First Semester
- BIO CH 491 Special Problems in Biochemistry⁶
- BIO CH (GEN) 493 Senior Seminar
- Social Science Requirement⁶
- Elective⁷

### Second Semester
- BIO CH 491 Special Problems in Biochemistry⁶
- BIO CH (GEN) 493 Senior Seminar
- Social Science Requirement⁶
- Elective⁷

## 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.

## Freshman Year

### First Semester
- BIO I 100 Principles of Biology I
- CH 101 General Chemistry
- COMM 150 Intro. to Human Communication
- MTH SC 106 Calculus of One Variable I

### Second Semester
- BIO I 111 Principles of Biology II
- CH 102 General Chemistry
- ENGL 103 Accelerated Composition
- MTH SC 108 Calculus of One Variable II

## Sophomore Year

### First Semester
- CH 223 Organic Chemistry
- CH 227 Organic Chemistry Lab.¹
- GEN 302 Molecular and General Genetics
- GEN 303 Molecular and Gen. Genetics Lab.
- PHYS 122 Physics with Calculus I
- PHYS 124 Physics Lab. I
- 3-4: A advanced Mathematics Requirement²

### Second Semester
- BIO CH 301 Molecular Biochemistry
- CH 224 Organic Chemistry
- CH 228 Organic Chemistry Lab.¹
- COMM 150 Intro. to Human Comm. or
- COMM 250 Public Speaking
- PHYS 221 Physics with Calculus II
- PHYS 223 Physics Lab. II
- Arts and Humanities (Literature) Requirement³

## Junior Year

### First Semester
- BIO CH 431 Physical Approach to Biochem.
- BIO CH 433 General Biochemistry Lab. I
- CH 330 Introduction to Physical Chemistry³
- ENGL 314 Technical Writing
- Science Requirement⁴

### Second Semester
- BIO CH 432 Biochemistry of Metabolism
- BIO CH 434 General Biochemistry Lab. II
- BIO CH 436 Nucleic Acid and Protein Bioyn.
- PHIL 326 Science and Values
- Science Requirement⁵

## Senior Year

### First Semester
- BIO CH 491 Special Problems in Biochemistry⁶
- BIO CH (GEN) 493 Senior Seminar
- Social Science Requirement⁶
- Elective⁷

### Second Semester
- BIO CH 491 Special Problems in Biochemistry⁶
- BIO CH (GEN) 493 Senior Seminar
- Social Science Requirement⁶
- Elective⁷

## 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.
Second Semester
12 - Major Requirement  
3 - Social Science Requirement  
3 - Biology of Plants Practicum  
15  
124 Total Semester Hours

The remaining courses may be selected from BIOCH 302, BIOCH 306, or any BIOCH, BOT, or ZOOL courses at the 300-level or higher.

**ENTOMOLOGY EMPHASIS AREA**

See Bachelor of Science curriculum for freshman year requirements.

**Sophomore Year**

First Semester
3 - CH 223 Organic Chemistry and  
1 - CH 227 Organic Chemistry Lab.  
4 - CH 201 Survey of Organic Chemistry  
3 - GEN 302 Molecular and General Genetics  
1 - GEN 303 Molecular and Gen. Genetics Lab.  
3 - Arts and Humanities (Literature) Requirement  
15  

Second Semester
3 - BIOCH 301 Molecular Biochemistry  
3 - BIOCH 302 Molecular Biochemistry Lab.  
3 - BIOCH 305 Essentials of Biochem.  
3 - BIOCH 304 Biology of Plants and  
3 - BIOCH 308 Biology of Plants Practicum  
3 - BIOCH 305 Biology of Angiosperms  
1 - BIOCH 309 Angiosperms Practicum  
3 - CH 224 Organic Chemistry  
3 - M ajor Requirement  
4 - M ajor Requirement  
15  

Junior Year

First Semester
3 - BIOCH 335 Evolutionary Biology  
3 - ENGL 314 Technical Writing  
3 - PHYS 207 General Physics I and  
1 - PHYS 209 General Physics I Lab.  
3 - PHYS 122 Physics with Calculus I and  
1 - PHYS 124 Physics Lab.  
4 - Entomology Requirement  
14  

Second Semester
3 - PHIL 324 Philosophy of Technology or  
3 - PHIL 326 Science and Values  
3 - PHYS 208 General Physics II  
1 - PHYS 210 General Physics II Lab.  
3 - PHYS 221 Physics with Calculus II and  
1 - PHYS 223 Physics Lab.  
3 - Entomology Requirement  
3 - M ajor Requirement  
3 - Social Science Requirement  
15  

Senior Year

First Semester
3 - BIOCH 461 Cell Biology  
2 - BIOCH 462 Cell Biology Lab.  
2 - BIOCH (MICRO) 493 Senior Seminar  
4 - Entomology Requirement  
3 - M ajor Requirement  
15  

Second Semester
3 - Entomology Requirement  
9 - M ajor Requirement  
3 - Social Science Requirement  
15  
124 Total Semester Hours

**TOXICOLOGY EMPHASIS AREA**

See Bachelor of Science curriculum for freshman year requirements.

**Sophomore Year**

First Semester
3 - CH 223 Organic Chemistry and  
1 - CH 227 Organic Chemistry Lab.  
4 - CH 201 Survey of Organic Chemistry  
3 - GEN 302 Molecular and General Genetics  
1 - GEN 303 Molecular and Gen. Genetics Lab.  
3 - Arts and Humanities (Literature) Requirement  
15  

Second Semester
3 - CH 223/227 and 228 are recommended.  
3 - CH 233/237 and 238 are recommended.  
3 - CH 243/247 and 248 are recommended.  
3 - CH 253/257 and 258 are recommended.  
3 - CH 263/267 and 268 are recommended.  
3 - CH 273/277 and 278 are recommended.  
3 - CH 283/287 and 288 are recommended.  
3 - CH 293/297 and 298 are recommended.  
3 - CH 303/307 and 308 are recommended.  
3 - CH 313/317 and 318 are recommended.  
3 - Social Science Requirement  
3 - Toxicology Requirement  
16  
124 Total Semester Hours

**Junior Year**

First Semester
3 - BIOCH 335 Evolutionary Biology  
3 - ENGL 314 Technical Writing  
3 - ENT (BIOSC, ENT) 430 Toxicology  
3 - PHYS 207 General Physics I and  
1 - PHYS 209 General Physics I Lab.  
3 - PHYS 221 Physics with Calculus II and  
1 - PHYS 223 Physics Lab.  
3 - M ajor Requirement  
3 - Social Science Requirement  
16  

Second Semester
3 - PHYS 208 General Physics II and  
1 - PHYS 210 General Physics II Lab.  
3 - PHYS 221 Physics with Calculus II and  
1 - PHYS 223 Physics Lab.  
1 - Arts and Humanities (Literature) Requirement  
4 - M ajor Requirement  
3 - Social Science Requirement  
14  

Senior Year

First Semester
3 - BIOCH 461 Cell Biology  
2 - BIOCH 462 Cell Biology Lab.  
2 - BIOCH (MICRO) 493 Senior Seminar  
3 - CH 313 Quantitative Analysis  
1 - CH 317 Quantitative Analysis Lab.  
3 - M ajor Requirement  
15  

Second Semester
3 - CH 413 Chemistry of Aqueous Systems or  
3 - ENT (BIOSC, ENT) 430 Chemical Sources and Fate in Environmental Systems  
3 - PHIL 324 Philosophy of Technology or  
3 - PHIL 326 Science and Values  
4 - M ajor Requirement  
3 - Social Science Requirement  
3 - Toxicology Requirement  
16  

**College of Agriculture, Forestry, and Life Sciences**

*Note: All courses with preparatory grade requirements must be completed with a minimum grade of C (2.0).*
**BIOLOGICAL SCIENCES**

**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**
- 5 - BIO L 110 Principles of Biology 1
- 1 - BIO SC 101 Frontiers in Biology I
- 4 - CH 101 General Chemistry
- 3 - COMM 150 Intro. to Human Communication
- 4 - MTH SC 106 Calculus of One Variable I

**Second Semester**
- 5 - BIO L 111 Principles of Biology II 1
- 1 - BIO SC 102 Frontiers in Biology II
- 4 - CH 102 General Chemistry
- 3 - ENGL 103 Accelerated Composition
- 3 - MTH SC 108 Calculus of One Variable I or 3 - MTH SC 301 Statistical Methods I

**Sophomore Year**

**First Semester**
- 4 - CH 201 Survey of Organic Chemistry
- 3 - GEN 302 Molecular and General Genetics
- 1 - GEN 303 Molecular and Gen. Genetics Lab.
- 1 - A nimal or Plant Diversity Requirement 2
- 4 - Foreign Language Requirement 3

**Second Semester**
- 3 - BIO CH 305 Essential Elements of Biochemistry
- 1 - BIO CH 306 Essential Elements of Biochem. Lab.
- 1 - A nimal or Plant Diversity Requirement 2
- 4 - Foreign Language Requirement 3
- 3 - Minor Requirement 4

**Junior Year**

**First Semester**
- 3 - BIO SC 335 Evolutionary Biology
- 3 - BIO SC 461 Cell Biology
- 3 - ENGL 314 Technical Writing
- 3 - Foreign Language Requirement 3
- 3 - Major Requirement 4 3

**Second Semester**
- 3 - PHIL 324 Philosophy of Technology or 3 - PHIL 326 Science and Values
- 3 - Foreign Language Requirement 3
- 3 - Major Requirement 4
- 6 - Minor Requirement 4

**Senior Year**

**First Semester**
- 2 - BIO SC (MICRO) 493 Senior Seminar
- 3 - PHYS 207 General Physics I
- 1 - PHYS 209 General Physics I Lab.
- 3 - Social Science Requirement 4
- 3 - Major Requirement 4
- 3 - Minor Requirement 4

**Second Semester**
- 3 - PHYS 208 General Physics II
- 1 - PHYS 210 General Physics II Lab.
- 3 - Arts and Humanities (Literature) Requirement 4
- 3 - Social Science Requirement 4
- 3 - Major Requirement 4
- 3 - Minor Requirement 4

125–126 Total Semester Hours

1BIO L 110 and 111 are strongly recommended; however, BIO L 103 may substitute for BIO L 110, and BIO L 104 may substitute for BIO L 111. The remaining 1–2 credits required must be completed for both Animal Diversity (BIOS SC 302/306 or BIOSC 303/307 and for Plant Diversity (BIOSC 304/308 or BIOSC 305/309).

2Four semesters (through 202) in the same modern foreign language are required.

3See page 55 for approved minors.

4See advisor. Select one lecture course from each of the following fields:
   - Ecology—BIOSC 441, 443, 446, 470
   - Physiology—BIOSC 401, 459, 475

5The remaining courses must be selected from MICRO 305 or other BIOSC, BOT, or ZOOL courses at the 300-level or higher.

6See General Education Requirements. T hree of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.

7See General Education Requirements.

**BIOSYSTEMS ENGINEERING**

**Bachelor of Science**

The Biosystems Engineering program is administered jointly with the College of Engineering and Science. See page 80 for the curriculum.

**ENVIRONMENTAL AND NATURAL RESOURCES**

**Bachelor of Science**

The Environmental and Natural Resources curriculum produces professionals who have a broad-based knowledge in natural resources and an ability to interact with other resource professionals to provide thoughtful solutions to environmental and natural resource problems. The world is blessed with an abundance of natural resources, but the problems associated with their conservation are immense. Protection of rare and endangered species, preventing and controlling invasions of exotics, protecting old growth forests, restoring degraded ecosystems, and balancing the resource demands of industry and the public are some of the environmental issues which are enmeshed in politicized environments.

Three concentrations are offered within the Environmental and Natural Resources major. The Conservation Biology Concentration is oriented toward students who desire a greater exposure to taxa, their habitats and their interrelationships. The Natural Resource and Economic Policy Concentration provides more in-depth study in economics and policy applications. The Natural Resources Management Concentration emphasizes both resource management and negotiation skills.

Graduates in Environmental and Natural Resources are well-prepared for further graduate studies in natural resources and related fields. Potential public sector employers of graduates include federal, state, and municipal resource management agencies, private industries impacting land and water resources, environmental management consulting firms, and various environmental advocacy groups.

**Freshman Year**

**First Semester**
- 4 - BIO L 103 General Biology I
- 4 - CH 105 Beginning Gen. and Organic Chem.
- 3 - EN R 101 Intro. to Env. and Natural Res. I
- 3 - MTH SC 102 Intro. to M athematical Analysis
- 3 - Elective

15

**Second Semester**
- 4 - BIO L 104 General Biology II
- 4 - CH 106 Beginning Gen. and Organic Chem.
- 3 - ENGL 103 Accelerated Composition
- 1 - F NR 102 FNR Freshman Portfolio
- 3 - Computer Science Requirement 2

15

1See students planning to take Organic Chemistry should substitute CH 101 and 102 and must satisfy the General Education Science and Technology in Society Requirement through another course.

2A G ED 200, CP SC 120, PRT M (FOR) 209, or other course approved by advisor

**CONSERVATION BIOLOGY CONCENTRATION**

**Sophomore Year**

**First Semester**
- 3 - AP EC 257 Nat. Res., Environment, and Econ.
- 4 - BIO SC 320 Field Botany or 2 - FOR 205 Dendrology and
- 3 - FOR 221 Forest Biology
- 3 - EX ST 301 Introductory Statistics
- 3 - Arts and Humanities (Literature) Requirement 1
- 3 - Oral Communication Requirement 1

16-17

**Second Semester**
- 4 - C SEN V 202 Soils
- 3 - GEN 300 Fundamental Genetics
- 3 - W F B (BIOS C) 313 Conservation Biology
- 3 - Physical Environment Requirement 2
- 3 - Taxonomy/Habitat Requirement 1

16

**Junior Year**

**First Semester**
- 3 - ENGL 314 Technical Writing
- 3 - Arts and Humanities (Non-Lit.) Requirement 1
- 3 - Ecology Requirement 4
- 3 - Physiology Requirement 4
- 3 - Taxonomy/Habitat Requirement 3

15

**Second Semester**
- 3 - BIO SC 335 Evolutionary Biology
- 3 - EN R 302 N atural Resources Measurements
- 3 - Natural Resource Economics Requirement 4
- 3 - Taxonomy/Habitat Requirement 3

15
Senior Year
First Semester
3 - E N R (BIOSC) 413 Restoration Ecology
3 - FOR (E N R) 434 GIS for Landscape Planning
3 - Conservation Policy/Law Requirement
3 - Internship or Directed Research
3 - Taxonomy/Habitat Requirement
15

Second Semester
3 - E N R 450 Conservation Issues
1 - FOR 496 Senior Portfolio or W F B 496 Senior Portfolio
3 - Social Science Requirement
6 - Taxonomy/Habitat Requirement
13

Junior Year
First Semester
3 - E N R 429 Environmental Law and Policy
3 - ECON 314 Intermediate Macroeconomics
3 - W F B (BIOSC) 313 Conservation Biology or W F B 498 Senior Portfolio
3 - Advanced Writing Requirement
3 - Applied Economics Requirement
15

Second Semester
3 - A P EC 457 Natural Resource Economic Theory and Policy
3 - ECON 319 Environmental Economics
3 - FOR (E N R) 434 GIS for Landscape Planning
3 - Ecology Requirement
3 - Minor Requirement
3 - Microeconomics Requirement
15

Second Semester
1 - FOR 498 Senior Portfolio
1 - W F B 496 Senior Portfolio
3 - Social Science Requirement
6 - Taxonomy/Habitat Requirement
13

Second Semester
3 - E N R 450 Conservation Issues
6 - Applied Economics Requirement
4 - Elective or Minor Requirement and 1 - Elective
16

121 Total Semester Hours

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

Geography Requirement
2

NATURAL RESOURCE AND ECONOMIC POLICY CONCENTRATION
Sophomore Year
First Semester
3 - A P EC 257 Nat. Res., Environment, and Econ.
3 - PO SC 101 American National Government
3 - PO SC 102 Intro to International Rel.
3 - Ecology Requirement or Minor Requirement
3 - Geology Requirement
3 - Oral Communication Requirement
15

Second Semester
3 - C R D (A P EC) 491 Internship, Agril business, and Community and Rural Development
3 - Minor Requirement
3 - EX ST 462 Statistics Applied to Economics
9 - A pplied Economics Requirement or 6 - A pplied Economics Requirement and 3 - Minor Requirement
15

Second Semester
1 - E N R 450 Conservation Issues
6 - A pplied Economics Requirement
4 - Elective or Minor Requirement and 1 - Elective
16

121 Total Semester Hours

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

Food Science
Bachelor of Science

Food Science majors apply principles of basic and applied sciences to the design, creation, manufacture, packaging, distribution, and utilization of safe, nutritious, and enjoyable foods and food products. The curriculum allows flexibility for concentrating in one of two areas.

In the Food Science and Technology Concentration, students may emphasize business, culinary science, or other areas of interest. The curriculum allows flexibility for concentrating in one of two areas.
### Freshman Year

#### First Semester
- 4 - BIO 103 General Biology I or
- 5 - BIO 110 Principles of Biology I
- 4 - CH 101 General Chemistry
- 3 - COMM 150 Intro. to Human Communication
- 1 - FD SC 102 Perspectives in Food and Nutrition Sciences
- 3 - MTHSC 106 Calculus of One Variable I

#### Second Semester
- 4 - BIO 104 General Biology II or
- 5 - BIO 111 Principles of Biology II
- 4 - CH 102 General Chemistry
- 3 - ENGL 103 A Accelerated Composition
- 2 - FD SC 102 Perspectives in Food and Nutrition Sciences
- 3 - PSYCH 201 Introduction to Psychology

#### Total Semester Hours: 15-17

### Sophomore Year

#### First Semester
- 3 - APEC 202 A Agricultural Economics or
- 3 - ECON 211 Principles of Microeconomics or
- 3 - ECON 212 Principles of Macroeconomics
- 4 - CH 201 Survey of Organic Chemistry or
- 3 - CH 223 Organic Chemistry and
- 1 - CH 227 Organic Chemistry Lab.
- 3 - PHYS 122 Physics with Calculus I and
- 1 - PHYS 124 Physics Lab. I or
- 4 - PHYS 200 Introductory Physics or
- 3 - PHYS 207 General Physics I and
- 1 - PHYS 209 General Physics I Lab.
- 3 - Arts and Humanities (Literature) Requirement ³
- 3 - Arts and Humanities (Non-Lit.) Requirement ³

#### Total Semester Hours: 16-17

### Junior Year

#### First Semester
- 1 - FD SC 421 Special Problems in Food Science
- 4 - MICRO 305 General M Microbiology
- 3 - NUTR 451 Human Nutrition
- 3 - Departmental Requirement ³
- 3 - Emphasis Area ³
- 3 - Elective

#### Second Semester
- 3 - ENGL 304 Business Writing or
- 3 - ENGL 314 Technical Writing
- 1 - FD SC 417 Seminar
- 1 - FD SC 421 Special Problems in Food Science
- 4 - MICRO 407 Food and Dairy Microbiology
- 6 - Emphasis Area ³

#### Total Semester Hours: 15

### Senior Year

#### First Semester
- 3 - FD SC 306 Food Service Operations
- 4 - FD SC 401 Food Chemistry I
- 3 - FD SC 404 Food Preservation and Processing
- 2 - FD SC 407 Quantity Food Production
- 1 - FD SC 418 Seminar
- 4 - NUTR 424 Medical Nutrition Therapy I

#### Second Semester
- 4 - FD SC 402 Food Chemistry II
- 3 - FD SC (PKGSC) 409 Total Quality Mgt. for the Food and Packaging Industries
- 2 - FD SC 491 Practicum
- 4 - NUTR 425 Medical Nutrition Therapy II
- 3 - NUTR 426 Community Nutrition

#### Total Semester Hours: 16

### Total Semester Hours: 123–126

³See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.

³AVS 304, 305, 323, 353, 354, 418, 430, or 431

³See advisor. Two credit hours of FD SC 421 are required in the emphasis area.

### FOREST RESOURCE MANAGEMENT

#### Bachelor of Science

The Forest Resource Management curriculum combines a broad education in the arts and sciences with applied forest sciences. This combination provides the necessary foundation for the scientific management of forest resources, products, and services.

Foresters are qualified for a broad spectrum of employment opportunities in the public and private sectors. They may be engaged as managers, administrators, or owners of forest lands or forest-based businesses; as technical specialists in the production of timber, useable water, wildlife, and aesthetic values; and in the recreational use of the forest; or as professionals in other areas where the conservation of natural resources is a concern. Foresters earning advanced degrees find employment in academic work and in research conducted by public and private agencies.

The curriculum, accredited by the Society of American Foresters, provides a strong program in the basic knowledge and skills required of a professional forester. Forest Resource Management majors will select a minor. (See page 55.) The curriculum also provides the necessary prerequisites for graduate study.
Freshman Year
First Semester
- BIOL 103 General Biology I
- CH 105 Beginning Gen. and Organic Chem.¹
- E N R 101 Intro. to Environ. and Natural Res.
- MTHSC 102 Intro. to Mathematical Analysis
- Elective
15

Second Semester
- BIOL 104 General Biology II
- CH 106 Gen. and Organic Chem.¹ or 2
- PHYS 200 Introductory Physics
- CP SC 120 Intro. to Information Technology
- ENGL 103 Accelerated Composition
- FOR 102 FNR Freshman Portfolio
15

Sophomore Year
First Semester
- CSENV 202 Soils
- EX ST 301 Introductory Statistics
- FOR 205 Dendrology
- FOR 221 Forestry Biology
- Arts and Humanities (Non-Lit.) Requirement²
15

Second Semester
- COMM 250 Public Speaking
- FOR 206 Forestry Ecology
- Economics Requirement³
- Social Science Requirement²
- Minor Requirement⁴
15

Forestry Summer Camp
- FOR 251 Forest Communities
- FOR 253 Forest Mensuration
- FOR 254 Forest Products
7

Junior Year
First Semester
- FOR 302 Forest Biometrics
- FOR 304 Forest Resource Economics
- FOR 308 Remote Sensing and GIS in Forestry
- FOR 413 Integrated Forest Pest Management
- Arts and Humanities (Non-Lit.) Requirement²
15

Second Semester
- ENGL 314 Technical Writing
- FOR 301 Introductory Statistics
- Economics Requirement³
- Social Science Requirement²
- Minor Requirement⁴
15

Senior Year
First Semester
- FNR 499 Natural Resources Seminar
- FOR 314 Harvesting and Forest Products
- FOR (ENR) 416 Forest Policy and Administration
- FOR 417 Forest Resource Management and Regulation
- Minor Requirement⁴
15

Second Semester
- BIOL 110 Principles of Biology I
- CH 101 General Chemistry
- GEN 103 Careers in Biochem. and Genetics
- MTHSC 106 Calculus of One Variable I
- 14

126 Total Semester Hours

¹CH 101 and 102 may be substituted; however, students selecting this option may be required to use elective hours to satisfy the General Education Science and Technology in Society Requirement.
²See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement. (Note: Social Science Requirement must be in an area other than economics.)
³A P EC 257, ECON 200, 211, or 212
⁴To be selected by the middle of the sophomore year

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) either in research, sales, or business operations. Combined with a law degree, a genetic bachelor of science is a good background for a career as a patent attorney.

Freshman Year
First Semester
- BIOL 110 Principles of Biology I
- CH 101 General Chemistry
- GEN 103 Careers in Biochem. and Genetics
- MTHSC 106 Calculus of One Variable I
- 14

Second Semester
- BIOL 111 Principles of Biology II
- CH 102 General Chemistry
- ENGL 103 Accelerated Composition
- MTHSC 108 Calculus of One Variable II
- 16

121 Total Semester Hours

¹Medical, veterinary, and graduate school requirements often include two semesters of physics with calculus and the physical laboratory. Students are encouraged to check requirements for admission to professional postgraduate programs.
²See General Education Requirements.
³BIOCH 423, 431, 432, BIOSC 335, 401, 432, 440, 459, 475, or MIRCO 416. Other courses must be approved by advisor.
⁴AVS 470, CSENV 405, ENT (BIOSC) 436, (GEN) 495, GEN (BIOSC) 405, (BIOSC, MIRCO) 416, HOT (BIOSC, GEN) 465, or MIRCO 415
²Two semesters of a foreign language are strongly recommended.
³To be taken over two semesters, preferably with the same faculty member
⁴See General Education Requirements. This course must also satisfy the Cross-Cultural Awareness Requirement.
HORTICULTURE
Bachelor of Science

Horticulture is the art, science, and business of food crops, ornamental plants, and turfgrasses and their production, utilization, and maintenance. A strong foundation in the basic sciences and humanities is built on courses in mathematics, chemistry, botany, physics, computer science, communications, economics, and humanities. Horticulture as a science depends on disciplines such as plant pathology, plant physiology, entomology, forestry, agronomy, soils, agricultural engineering, and agricultural economics. Business courses contribute to a well-rounded curriculum. A growing aspect of horticulture involves the management of enterprises, from production to distribution and marketing. Horticulture as an art involves the arrangement of plants in an aesthetically pleasing fashion.

Students begin professional development as undergraduates. An internship in a horticultural enterprise is required. Students considering graduate school are advised to take optional courses in the basic sciences as well as conduct an undergraduate research project. Those with strong interests in specific disciplines may complete special problems under the supervision of a faculty member.

Freshman Year
First Semester
1 - BIOSC 206 Plant Form and Function
3 - HORT 101 Horticulture
3 - MTHSC 102 Intro to Mathematical Analysis
6 - Social Science Requirement
15

Second Semester
3 - BIOSC 205 Plant Form and Function
1 - BIOSC 401 Plant Physiology Lab.
1 - HORT 409 Seminar
4 - Business Requirement
3 - Horticulture Specialization Requirement
3 - Laboratory Science Requirement
15

Sophomore Year
First Semester
3 - HORT 303 Plant Materials
3 - HORT 304 Annuals and Perennials
3 - HORT 305 Plant Propagation
3 - Laboratory Science Requirement
16

Second Semester
3 - HORT 306 Plant Propagation Techniques Lab.
3 - HORT 307 Advanced Internship
3 - Arts and Humanities (Literature) Requirement
15

Junior Year
First Semester
4 - CSEN V 202 Soils
3 - Advanced Writing Requirement
3 - Horticulture Specialization Requirement
3 - Spanish Language Requirement
13

Second Semester
3 - BIO 401 Plant Physiology
1 - BIO 402 Plant Physiology Lab.
1 - HORT 409 Seminar
4 - Business Requirement
3 - Horticulture Specialization Requirement
3 - Laboratory Science Requirement
15

Senior Year
First Semester
6 - Applied Science Requirement
3 - Business Requirement
6 - Horticulture Specialization Requirement
15

Second Semester
3 - Applied Science Requirement
6 - Horticulture Specialization Requirement
4 - Laboratory Science Requirement
1 - Elective
14

120 Total Semester Hours

M ICROBIOLOGY
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 effect 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. The microbiology curriculum with a Biomedicine Concentration is recommended for students planning graduate studies 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.

Freshman Year
First Semester
5 - BIOL 110 Principles of Biology I
4 - CH 101 General Chemistry
3 - COMM 150 Intro. to Human Communication
1 - MICRO 101 Microbes and Human Affairs
4 - MTHSC 106 Calculus of One Variable
17

Second Semester
5 - BIOL 111 Principles of Biology II
4 - CH 102 General Chemistry
3 - ENGL 103 A accelerated Composition
3 - Mathematics Requirement
15-16

Sophomore Year
First Semester
3 - CH 223 Organic Chemistry
1 - CH 227 Organic Chemistry Lab.
4 - MICRO 305 General Microbiology
3 - Arts and Humanities (Literature) Requirement
3 - Elective
14

Second Semester
3 - BIOCH 301 Molecular Biochemistry
3 - CH 228 Organic Chemistry Lab.
1 - CH 229 Organic Chemistry Lab.
3 - PHIL 324 Philosophy of Technology or
3 - PHIL 326 Science and Values
3 - Microbiology Requirement
3 - Social Science Requirement
16

Junior Year
First Semester
3 - CH 401 Microbial Diversity and Ecology
4 - PHYS 207 General Physics I and
1 - PHYS 209 General Physics I Lab. or
3 - PHYS 122 Physics with Calculus I and
1 - PHYS 124 Physics Lab. I
4 - Microbiology Requirement
15

Second Semester
3 - ENGL 314 Technical Writing
4 - MICRO 401 Microbial Diversity and Ecology
3 - PHYS 208 General Physics II and
1 - PHYS 210 General Physics II Lab. or
3 - PHYS 221 Physics with Calculus II and
1 - PHYS 223 Physics Lab. II
15
Senior Year
First Semester
3 - Social Science Requirement ¹
8 - Microbiology Requirement ²
4 - Elective ³
15

Second Semester
2 - BIOSC (MICRO) 493 Senior Seminar
4 - MICRO 411 Pathogenic Bacteriology
3 - Microbiology Requirement ²
6 - Elective ³
15

122-123 Total Semester Hours

¹BIOL 110 and 111 are strongly recommended; however, BIOL 103 may substitute for BIOL 110, and BIOL 104 may substitute for BIOL 111. The remaining 1-2 credits required must be satisfied by completing 1-2 extra credits from departmental course offerings at the 300-level or higher. See advisor.
²MT HSC 108, 301, or EX ST 301
³See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.
⁴Elective hours may be used toward satisfying the requirements of a minor.
⁵See advisor. Minimum of 18 credits is required. At least one course must be selected from each of the following fields: Biomedicine—BIOSC 425, 458/457, GEN 302/303, HLT H 380, MICRO 400, (AVS, BIOSC) 414, 417 Environmental—MICRO 403, 410 Food Safety, Industrial, and Technology—GEN (BIOSC, MICRO) 418, MICRO 407, 413, Virology—MICRO 416, 454

BIOMEDICINE CONCENTRATION

Freshman Year
First Semester
5 - BIOL 110 Principles of Biology ¹
4 - CH 101 General Chemistry
3 - COMM 150 Intro. to Human Communication
1 - MICRO 101 Microbes and Human Affairs
4 - MT HSC 106 Calculus of One Variable I
17

Second Semester
5 - BIOL 111 Principles of Biology II ¹ or
4 - BIOSC 315 Functional Human Anatomy
4 - CH 102 General Chemistry
3 - GEN 103 Molecular and General Genetics
3 - PHYS 122 Physics with Calculus I
15

122-124 Total Semester Hours

¹BIOL 110 and 111 are strongly recommended; however, BIOL 103 may substitute for BIOL 110, and BIOL 104 may substitute for BIOL 111. The remaining 1-2 credits required must be satisfied by completing 1-2 extra credits from departmental course offerings at the 300-level or higher. See advisor.
²MT HSC 108, 301, or EX ST 301
³See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.
⁴Elective hours may be used toward satisfying the requirements of a minor.
⁵See advisor. Minimum of 18 credits is required. At least one course must be selected from each of the following fields: Biomedicine—BIOSC 425, 458/457, GEN 302/303, HLT H 380, MICRO 400, (AVS, BIOSC) 414, 417 Environmental—MICRO 403, 410 Food Safety, Industrial, and Technology—GEN (BIOSC, MICRO) 418, MICRO 407, 413, Virology—MICRO 416, 454

Sophomore Year
First Semester
3 - CH 223 Organic Chemistry
1 - CH 227 Organic Chemistry Lab.
4 - MICRO 305 General Microbiology
3 - Arts and Humanities (Literature) Requirement ¹
3 - Elective
14

Second Semester
3 - BIOCH 301 Molecular Biochemistry
3 - CH 224 Organic Chemistry
1 - CH 228 Organic Chemistry Lab.
3 - PHYS 122 Physics with Calculus I
3 - BIOCH 302, 423, 422, BIOSC 425, 456, 457, HLT H 380, MICRO 400, or 491

Junior Year
First Semester
3 - GEN 302 Molecular and General Genetics
1 - GEN 303 Molecular and General Genetics Lab.
4 - MICRO 401 Microbial Diversity and Ecology
4 - MICRO (AVS, BIOSC) 414 Basic Immunology
3 - PHYS 207 General Physics I and
1 - PHYS 209 General Physics I Lab. or
3 - PHYS 122 Physics with Calculus I and
1 - PHYS 124 Physics Lab. I
16

Second Semester
3 - ENGL 314 Technical Writing
4 - MICRO 412 Bacterial Physiology
4 - MICRO 415 Microbial Genetics
3 - PHYS 208 General Physics II and
1 - PHYS 210 General Physics II Lab. or
3 - PHYS 211 Physics with Calculus II and
1 - PHYS 223 Physics Lab. II
15

Senior Year
First Semester
3 - BIOSC 461 Cell Biology
2 - BIOSC 462 Cell Biology Lab.
3 - MICRO 416 Introductory Virology
3 - Social Science Requirement ¹
4 - Elective
15

Second Semester
2 - BIOSC (MICRO) 493 Senior Seminar
3 - MICRO 411 Pathogenic Bacteriology
3 - MICRO 417 Molecular Mechanisms of Carcinogenesis and Aging
3 - Biomedicine Requirement ⁴
3 - Elective
15

122-124 Total Semester Hours

¹See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.
²MT HSC 108, 301, or EX ST 301
³See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.
⁴Elective hours may be used toward satisfying the requirements of a minor.
⁵See advisor. Minimum of 18 credits is required. At least one course must be selected from each of the following fields: Biomedicine—BIOSC 425, 458/457, GEN 302/303, HLT H 380, MICRO 400, (AVS, BIOSC) 414, 417 Environmental—MICRO 403, 410 Food Safety, Industrial, and Technology—GEN (BIOSC, MICRO) 418, MICRO 407, 413, Virology—MICRO 416, 454

PACKAGING SCIENCE
Bachelor of Science
The Bachelor of Science degree in Packaging Science prepares students for careers in industries producing and utilizing packages for all types of products. Packaging is an essential part of industrialized economies, protecting, preserving, and helping to market products. The field of packaging is highly competitive and highly innovative, requiring an ever-increasing number of professional positions.

Opportunities for employment include a wide variety of career paths such as marketing, sales, design, purchasing, quality assurance, and customer services. Most career opportunities are in positions requiring technical knowledge combined with marketing and management skills.

The core curriculum assures graduates of having the skills and knowledge required by most entry-level packaging positions. Emphasis area choices or approved minors allow students to select courses to improve career preparation for specific industry segments, including distribution and transportation, engineering technology, food and health care packaging, graphic communications, materials, business administration, entrepreneurship, environmental engineering, environmental science and policy, and management.

Students changing majors to Packaging Science must have at least a 2.0 cumulative grade-point ratio.

Freshman Year
First Semester
4 - BIOL 103 General Biology I
4 - CH 101 General Chemistry
4 - MT HSC 106 Calculus of One Variable I
1 - PKGSC 101 Packaging Orientation ¹
3 - Social Science Requirement ²
16

Second Semester
4 - BIOL 104 General Biology II
4 - CH 102 General Chemistry
3 - ENGL 103 A accelerated Composition
2 - PKGSC 102 Intro. to Packaging Science ²
3 - Departmental Requirement ²
1 - Elective ²
17

Sophomore Year
First Semester
4 - PKGSC 202 Packaging Materials and M anuf. ³
4 - PKGSC 202 Packaging Materials and Management ³

¹See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.
²See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.
³Elective hours may be used toward satisfying the requirements of a minor.
⁴See advisor. Minimum of 18 credits is required. At least one course must be selected from each of the following fields: Biomedicine—BIOSC 425, 458/457, GEN 302/303, HLT H 380, MICRO 400, (AVS, BIOSC) 414, 417 Environmental—MICRO 403, 410 Food Safety, Industrial, and Technology—GEN (BIOSC, MICRO) 418, MICRO 407, 413, Virology—MICRO 416, 454
Completion of an approved minor or emphasis area is required. At least one 15-week period (six months preferred) of Coopship, Environmental Engineering, Environmental Science and Policy, Management.

Students interested in minors or emphasis areas should take at least one 15-week period (six months preferred) of Cooperative Education is required.

Approved minors are Business Administration, Entrepreneurship, Environmental Engineering, Environmental Science and Policy, Management.

Students interested in minors or emphasis areas should take at least one 15-week period (six months preferred) of Cooperative Education is required.

Note: Please consult with your advisor as there are variations in courses required by the pharmacy schools.

For financial aid purposes, students in the Prepharmacy program are considered to be enrolled in a degree-seeking program.

**PREPHARMACY**

Prepharmacy is a two-year program requiring a minimum of 72 semester hours. Upon completion of the curriculum, students will be eligible to apply to a college of pharmacy, usually the Medical University of South Carolina or the University of South Carolina, and may be eligible to apply for the Bachelor of Science in Preprofessional Studies. The degree in Pharmacy is awarded by the institution attended. It is important for students to work closely with their advisor as there are variations in courses required by the pharmacy schools.

For financial aid purposes, students in the Prepharmacy program are considered to be enrolled in a degree-seeking program.
<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
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<tbody>
<tr>
<td>First Semester</td>
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<tr>
<td>4 - BIO 103 General Biology I</td>
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<td>4 - CH 101 General Chemistry</td>
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<td>3 - EX ST 301 Introductory Statistics</td>
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<td>3 - PSYCH 201 Introduction to Psychology</td>
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<td>3 - Arts and Humanities (Non-Lit.) Requirement¹</td>
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<td>Second Semester</td>
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<tr>
<td>4 - BIO 104 General Biology II</td>
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<td>4 - CH 102 General Chemistry</td>
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<td>3 - ENGL 103 Accelerated Composition</td>
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<td>3 - SOC 201 Introduction to Sociology</td>
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<td>3 - Mathematics Requirement²</td>
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<td>1 - Elective</td>
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<td>18</td>
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<td>Second Year</td>
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<td>First Semester</td>
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<td>4 - BIOSC 222 Human Anatomy and Phys. I</td>
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<td>3 - PHYS 207 General Physics I</td>
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<td>1 - PHYS 209 General Physics I Lab.</td>
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<td>3 - PSYCH 340 LifeSpan Developmental Psych.</td>
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<td>3 - Arts and Humanities (Literature) Requirement¹</td>
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<td>3 - Arts and Humanities Requirement¹</td>
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<td>Second Semester</td>
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<tr>
<td>4 - BIOSC 223 Human Anatomy and Phys. II</td>
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<td>3 - COMM 150 Intro. to Human Comm. or</td>
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<td>3 - COMM 250 Public Speaking</td>
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<td>3 - CP SC 120 Intro. to Information Technology</td>
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<td>3 - PHYS 208 General Physics II</td>
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<tr>
<td>1 - PHYS 210 General Physics II Lab.</td>
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<td>3 - Science and Tech. in Society Requirement¹</td>
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<td>Third Year¹</td>
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<td>90 Total Semester Hours</td>
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<td>3 - ENGL 103 Accelerated Composition</td>
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<td>3 - MTHSC 101 Essential Math for Informed Soc.</td>
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<td>3 - MTHSC 102 Intro. to Mathematical Analysis</td>
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<td>3 - COMM 250 Public Speaking</td>
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<td>3 - HORT 101 Horticulture</td>
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<td>4 - BIOL 103 General Biology I</td>
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<td>4 - HORT 101 Horticulture</td>
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<td>3 - MTHSC 102 Intro. to Mathematical Analysis</td>
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<td>6 - Social Science Requirement²</td>
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<td>Sophomore Year</td>
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<td>First Semester</td>
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<tr>
<td>4 - CH 101 General Chemistry³ or</td>
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<td>3 - HORT 212 Introduction to Turfgrass Culture</td>
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<td>1 - HORT 213 Turfgrass Culture Lab.</td>
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<td>3 - HORT 303 Plant Materials</td>
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<tr>
<td>3 - Oral Communication Requirement¹</td>
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<td>14</td>
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</tbody>
</table>
Second Semester
4 - CH 102 General Chemistry or
4 - CH 106 Beginning General and Organic Chemistry
3 - Arts and Humanities (Literature) Requirement¹
3 - Business Requirement³
3 - Social Science Requirement¹
13

Summer
3 - HORT 271 Internship⁶ or
3 - HORT 471 Advanced Internship⁶

Junior Year
First Semester
4 - C SEN V 202 Soils
3 - Applied Science Requirement¹
3 - Business Requirement³
3 - Spanish Requirement³
13

Second Semester
3 - BIO SC 401 Plant Physiology
1 - BIO SC 402 Plant Physiology Lab.
1 - HORT 409 Seminar
2 - HORT 420 Applied Turfgrass Physiology
3 - A Advanced Writing Requirement⁷
4 - Laboratory Science Requirement¹
14

Maymester
3 - PL PA (ENT) 406 Diseases and Insects of Turfgrasses

Senior Year
First Semester
3 - HORT 412 Advanced Turfgrass Management
6 - Horticulture Specialization Requirement³
4 - Laboratory Science Requirement¹
3 - Soils Requirement¹
16

Second Semester
3 - HORT (C SEN V) 433 Integrated Weed Management
for Agronomic and Horticultural Crops
3 - Applied Science Requirement¹
3 - Business Requirement³
3 - Horticulture Specialization Requirement³
3 - Soils Requirement¹
15

121 Total Semester Hours

²See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.
³Students not taking the CH 105/106 sequence must satisfy the General Education Science and Technology in Society Requirement by selecting a qualifying course from the Applied Science or Laboratory Science Requirement.
⁴See advisor. Select from department-approved list.
⁵Internship must be completed in one or two semesters. Internship may be done fall, spring, or summer after completing HORT 212/213. Prior approval is required for internships, and a 2.0 grade-point ratio is required for registration.
⁶Note: Turfgrass majors must make a C+ or better in all HORT-designated courses. Courses may be repeated as often as necessary to achieve the minimum grade.

WILDLIFE AND FISHERIES BIOLOGY

Bachelor of Science

Increased interest in conservation of natural resources and the environment and demand for seafood products have resulted in these areas becoming increasingly technical and requiring highly qualified wildlife and fisheries biologists. Greatest demands for graduates are in the areas of management, research, survey, and regulatory positions with state and federal agencies; industrial research and quality control laboratories; conservation, recreational, and other public service agencies; and private enterprises.

The Bachelor of Science degree program in Wildlife and Fisheries Biology provides a solid foundation for many careers in the sciences. The curriculum is strong in basic and applied sciences, communication skills, and the social sciences. In addition, three credit hours are available for field training with appropriate natural resource agencies. Students may satisfy coursework requirements for professional certification by the Wildlife Society and/or the American Fisheries Society.

Combined Bachelor of Science/Master of Science Degree Program

Under this plan, students may reduce the time necessary to earn both degrees by applying graduate credits to both undergraduate and graduate program requirements.

Students are encouraged to obtain the specific requirements for the dual degree from the Department of Forestry and Natural Resources as early as possible in their undergraduate program as a number of required courses have prerequisites not normally taken by Wildlife and Fisheries Biology majors. Enrollment guidelines and procedures can be found under Academic Regulations in this catalog.

Freshman Year
First Semester
4 - BIO L 103 General Biology I
4 - CH 105 Beginning General and Organic Chemistry³
1 - E N R 101 Intro. to ENR I
3 - M TH SC 102 Intro. to Mathematical Analysis
3 - Elective
15

Second Semester
4 - BIO L 104 General Biology II
4 - CH 106 Beginning General and Organic Chemistry³ or
4 - PHYS 200 Introductory Physics²
3 - CP SC 120 Intro. to Information Technology
3 - EN GL 103 A Celerated Composition
1 - F N R 102 FN R Freshman Portfolio
15

Sophomore Year
First Semester
4 - C SEN V 202 Soils
2 - FOR 205 Dendrology
3 - FOR 221 Forest Biology
3 - W F B 300 Wildlife Biology Lab.
1 - W F B 301 Wildlife Biology Lab.
3 - Arts and Humanities (Non-Lit.) Requirement²
3 - Social Science Requirement²
16

Second Semester
3 - BIO SC 303 Vertebrate Biology
3 - COMM 250 Public Speaking
3 - W F B 350 Principles of Fish and Wildlife Biology
3 - Arts and Humanities (Non-Lit.) Requirement²
3 - Social Science Requirement²
15

Junior Year
First Semester
3 - A P EC 257 Nat. Res., Environment, and Econ.
4 - BIO SC 300 Field Botany
3 - EN GL 314 Technical Writing
3 - GEN 300 Fundamental Genetics
3 - W F B 462 Wetland Wildlife Biology
16

Second Semester
3 - E N R 302 Natural Resources Measurements
3 - EX ST 301 Introductory Statistics
3 - W F B (BIO SC) 313 Conservation Biology
3 - W F B 410 Wildlife Management Techniques
3 - A approved Requirement³
15

Senior Year
First Semester
4 - AVS 301 A Nat. and Phys. of Domestic Animals
3 - W F B 412 Wildlife Management
3 - A approved Requirement³
3 - Ecology Requirement³
3 - Policy and Law Requirement³
16

Second Semester
1 - F N R 499 Natural Resources Seminar
3 - W F B 416 Fishery Biology
3 - W F B 440 On-Game Wildlife Management
1 - W F B 498 Senior Portfolio
6 - A approved Requirement³
14

122 Total Semester Hours

⁴Students planning to take organic chemistry should substitute CH 101 and 102.
⁵See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement; and, if CH 105 is not selected, three credits must also satisfy the Science and Technology in Society Requirement. (Note: Social Science Requirement must be in an area other than economics.)
⁶Select from department-approved list.
²BIO SC 441, 443, 446, or FOR 315
MINORS

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

Accounting
Agricultural Extension Education
Aerospace Studies
African American Studies
Agricultural Business Management
Agricultural Mechanization and Business
American Sign Language Studies
Agricultural and Veterinary Sciences
Anthropology
Athletic Leadership
Biochemistry
Bioengineering
Biological Sciences
Business Administration
Chemistry
Cluster
Communication Studies
Communications
Community Recreation Management
Computer Science
Crop and Soil Environmental Science
East Asian Studies
Economics
Education
English
Entomology
Entrepreneurship
Environmental Engineering
Environmental Science and Policy
Equine Business— not open to Agricultural Sciences majors
Film Studies
Financial Management
Fine Arts
Food Science
Forest Products
Forest Resource Management
Geography
Geology
Global Politics
Great Works
Health Science

History
Horticulture— not open to Turfgrass majors
Human Resource Management
Legal Studies
Management
Mathematical Sciences
Microbiology
Military Leadership
Modern Languages
Music
Natural Resource Economics
Nonprofit Leadership
Operations Management
Packaging Science
Park and Protected Area Management
Philosophy
Physics
Plant Pathology
Political Science
Poultry Science— not open to Agricultural Sciences majors
Psychology
Public Policy
Religion
Russian Area Studies
Science and Technology in Society
Screenwriting
Sociology
Spanish-American Area Studies
Sport Management
Textiles
Theatre
Therapeutic Recreation
Travel and Tourism
Turfgrass— not open to Horticulture majors
Urban Forestry
Wildlife and Fisheries Biology
Women's Studies
Writing

See pages 36-39 for details.