# COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

## UNDERGRADUATE PROGRAMS



In the College of Agriculture and Natural Resources, business, education, science and technology are used to solve problems related to environmental protection; food and fiber production; and animal and plant health. Comprising nearly 25% of the nation's workforce, agriculture and natural resources provide career opportunities in research, industry, education and government.

The curricula provide a flexible program of study designed to educate students on the rapid changes and improvements in agriculture and natural resources. Frequent consultation with faculty advisors helps students progress toward achieving their educational goals. College faculty encourage and support students to pursue Degrees with Distinction, to take courses in the University Honors Program, and to participate in the Science and Engineering Scholars summer research program.

Undergraduate majors are offered in agriculture and natural resources, agricultural education, animal science, engineering technology, entomology, environmental soil science, food and agribusiness management, food science and technology, landscape horticulture, natural resource management, plant protection, plant science, resource economics, statistics, and wildlife conservation.

### TAKING COURSES PASS/FAIL

Courses that a student chooses to take under the pass/fail option cannot be used to complete major or group requirements in the College of Agriculture and Natural Resources. Pass/fail option courses can be counted only as free electives.

### DEAN'S SCHOLAR PROGRAM

The Dean's Scholar Program serves students whose clearly defined educational goals cannot be effectively achieved by pursuing the standard curricula for all existing majors, minors, and interdepartmental majors sponsored by the University. Driven by an overarching passion or curiosity that transcends typical disciplinary bounds and curricula, a Dean's Scholar's intellectual interests may lead to broad interdisciplinary explorations of an issue or to more intense, in-depth studies in a single field at a level akin to graduate work. In consultation with faculty advisors and the Assistant Dean of their college, Dean's Scholars design an imaginative and rigorous individual plan of study to meet the total credit hours required for graduation. Dean's Scholars in Agriculture and Natural Resources may qualify for Honors Degrees. Contact the Assistant Dean in the college or go to www.udel.edu/deansscholar/ for more information and the application.

### BACHELOR OF SCIENCE

Core Curriculum

For all majors **except Engineering Technology**, the following core curriculum must be met in addition to the Major and Concentration requirements listed in the following pages. Exceptions or additions to the core curriculum for a specific major are noted in the departmental sections. In most cases, a course can be used to fulfill both a Major and a College requirement; however, students should verify this with their advisors. If a course is used to fulfill two requirements, credits are counted only once toward the total credits for graduation.

**UNIVERSITY REQUIREMENTS**

ENGL 110 Critical Reading and Writing (minimum grade of C-) . . . . . 3

First Year Experience (see page 68) . . . . . 0-4

Discovery Learning Experience (see page 68) . . . . . 3

Multi-cultural Course (see pages 69-71) . . . . . 3

**COLLEGE BREADTH REQUIREMENTS**

Agricultural and Biological Sciences . . . . . 9
Minimum of one course in three of the following areas, outside the student's major: AGED, AGRI, ANFS, BISC, EGTE, ENWC, PLSC, STAT, and FREC (except FREC 135).

Literature and Arts . . . . . 6
Minimum of six credits from ART, ARTH, COMM, ENGL (not ENGL 110,) MUSC, THEA, any foreign language, or courses cross-listed with these courses.

Social Sciences and Humanities . . . . . 9
Minimum of one course in three of the following areas: ANTH, BAMS, CRJU, ECON, EDUC, GEOG, HIST, PHIL, POSC, PSYC, SOCI, WOMS, or courses cross listed with these courses.

Physical Science . . . . . 8
Minimum of 8 credits from CHEM, GEOL, PHYS, or SCEN. See major for specific requirement.

## AGRICULTURE AND NATURAL RESOURCES

Telephone: (302) 831-2508
E-mail: kra@udel.edu
http://ag.udel.edu

For the undergraduate with broad interests, the major in agriculture and natural resources is offered. The program is administered through the Office of the Academic Programs in the College of Agriculture and Natural Resources.

### DEGREE: BACHELOR OF SCIENCE
### MAJOR: AGRICULTURE AND NATURAL RESOURCES

CURRICULUM CREDITS
See page 73 for University and College Requirements

**MAJOR REQUIREMENTS**

***Mathematics and Computer Science***
Mathematics course (MATH 115 or higher) . . . . . 3
Computer Science course (FREC 135 or equivalent) . . . . . 3

***Physical Sciences*** . . . . . 8
Minimum of eight credits selected from one of the following two-course sequences:
CHEM 101/102 or 103/104
PHYS 201/202 or 207/208
SCEN 101/102

***Communications (cannot be double counted to fulfill another requirement)***
A minimum of one course in written communications chosen from the following: . . . . . 3
ENGL 301 Expository Writing
ENGL 302 Advanced Composition
ENGL 312 Written Communications in Business
ENGL 410 Technical Writing

A minimum of one course in oral communications chosen from the following: . . . . . 3
AGRI 212 Oral Communication in Agriculture and Natural Resources
COMM 212 Oral Communication in Business
COMM 255 Fundamentals of Communication
COMM 350 Public Speaking

***Within the college*** . . . . . 30
Thirty additional credits from any of the following areas (fifteen credits of the 30 must be at the 300 level or higher).
Food and Resource Economics, Bioresources Engineering, Agricultural Education, Animal and Food Sciences, Entomology and Wildlife Ecology, Statistics, Agriculture, or Plant and Soil Sciences. (A maximum of twelve credits of Special Problem/Independent Study/Field Experience may be counted toward the degree, with a maximum of six credits in any one area.)

**ELECTIVES**
After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only four credits total of HESC 120 activity or performing Music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## AGRICULTURAL EDUCATION

Telephone: (302) 831-4232
E-mail: pbarber@udel.edu
http://ag.udel.edu

This program offers a Bachelor of Science degree that prepares the individual for teacher certification in agricultural and natural resources education. It provides students with an opportunity to gain broad understanding and professional preparation in animal science, plant and soil sciences, food science, engineering technology, entomology and wildlife conservation, resource economics, agribusiness and natural resource management. Students develop and practice their leadership skills through participation in FFA activities and other student organizations. Additionally, it provides pedagogical skills in a pragmatic hands-on program that uses an investigative, scientific, design-and-construct, and problem-solving approach to teaching. The curriculum is designed to allow students to teach in classroom and laboratory settings using modern technology and techniques.

### DEGREE: BACHELOR OF SCIENCE
### MAJOR: AGRICULTURAL EDUCATION

CURRICULUM CREDITS

See page 73 for University and College Requirements

**MAJOR REQUIREMENTS**
Communications (AGRI 212 or COMM 212) . . . . . 3
Mathematics (MATH 115 or higher) . . . . . 3

***Physical Sciences*** . . . . . 8
Minimum of eight credits selected from one of the following two-course sequences:
CHEM 101/102 or 103/104
PHYS 201/202 or 207/208

***Professional Studies***

| | | |
|---|---|---|
| AGED 180 | Introduction to Agricultural Education | 3 |
| AGED 280 | FFA and Supervised Agricultural Experiences | 3 |
| AGED 448 | Student Teaching Seminar | 3 |
| AGED 480 | Career & Technical Education Materials & Approaches I | 3 |
| AGED 481 | Career & Technical Education Materials & Approaches II | 3 |
| EDUC 413 | Adolescent Development & Educational Psychology | 4 |
| EDUC 414 | Teaching Exceptional Adolescents | 3 |
| EDUC 419 | Diversity in Secondary Education **(fulfills the University multicultural requirement)** | 3 |
| EDUC 400 | Student Teaching | 9 |
| EDUC 420 | Reading in the Content Area | 1 |

***Technical Agriculture*** . . . . . 30
Thirty credits of agriculture and natural resources courses from at least three departments in the college are required. Three credits must be FREC 135. A minimum overall GPA of 2.75 is required in these courses. Students are to meet with their Agricultural Education advisor before selecting these courses.

A maximum of three credits of independent study in Food and Resource Economics and a maximum of six credits in all areas, including Food and Resource Economics, may be counted toward the degree.

The Agricultural Education program requires a 2.5 minimum overall GPA and passing scores on the Praxis I test for all three subtests (reading, passing score=175; writing, passing score=173; and mathematics, passing score=174) prior to enrollment in AGED 480 and AGED 481, and proof of having taken the Praxis II test in the appropriate academic content area. A copy of the official score report must be submitted to the Delaware Center for Teacher Education, 200 Academy Street, during enrollment in EDUC 400 Student Teaching or no later than November 1 for January graduates and May 1 for June or summer graduates. An institutional recommendation for certification will not be issued until the candidate has presented the official score report. The teacher education program advisor should be consulted for other policies concerning qualifications for student teaching. A minimum GPA of 2.5 is required in all AGED and EDUC courses.

**ELECTIVES**
After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only four credits of activity-type Physical Education or performing Music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## ANIMAL AND FOOD SCIENCES

Telephone: (302) 831-2524
http://ag.udel.edu
Faculty Listing: http://ag.udel.edu/anfs/faculty/facultyStaff.htm

The Department of Animal and Food Sciences offers undergraduate programs leading to the Bachelor of Science degrees in: 1) Animal and Food Sciences, 2) Pre-veterinary Medicine and Animal Biosciences and 3) Food Science. The department also offers minor programs in a) Animal Science and b) Food Science. An Honors Degree option is offered for all majors in the department.

The Animal and Food Sciences major encompasses a wide range of disciplines in which the principles of biology, chemistry and biochemistry are applied to animal agriculture and food systems. Instruction is offered in animal nutrition, food science and its interactions with animal agriculture, physiology, genetics, and reproduction; in animal health and molecular biology; and in dairy, livestock and poultry management.

The Pre-veterinary and Animal Biosciences major is designed to meet not only the department, college, and University requirements for the BS degree, but also the admission requirements for many U.S. veterinary schools. It is also designed to prepare students to pursue graduate degrees in areas related to animal agriculture and biological sciences through course work and laboratory experiences.

The Food Science major is designed to provide students with a broad understanding and professional preparation in the areas of food processing, preservation, evaluation, packaging, and distribution. Upon graduation, job opportunities include positions within the food and allied industries, government, and independent research institutions. The role of the food scientist in such positions may involve product and process development, food safety engineering, quality control and analysis, technical service and sales, with opportunities in regulatory agencies, education, and basic research. This major places emphasis on the biological, chemical and physical sciences, preparing a student for research opportunities within the Food Science disciplines. Additional recommended electives can provide a student with the course work to pursue a food processing engineering emphasis.

Students are encouraged to participate in a broad realm of animal and food science projects in the department through undergraduate research opportunities.

### DEGREE: BACHELOR OF SCIENCE
### MAJOR: ANIMAL AND FOOD SCIENCES

CURRICULUM CREDITS

See page 73 for University and College Requirements

***Math and Science Requirements***

| | | |
|---|---|---|
| MATH 221 | Calculus I | 3 |
| BISC 207/208 | Introductory Biology I and II | 8 |
| CHEM 101/102 or CHEM 103/104 | General Chemistry I and II. | 8 |
| CHEM 213 | Elementary Organic Chemistry | 4 |
| CHEM 214/216 | Elementary Biochemistry w/lab | 4 |
| BISC 306 | General Physiology | 3 |

***Major Requirements***
**A minimum grade of C- is required for all ANFS credits used to satisfy the major requirements.**

| | | |
|---|---|---|
| ANFS 101 | Introduction to Animal Science | 3 |
| ANFS 102 | Food for Thought | 3 |
| ANFS 111 | Animal Science Laboratory | 1 |
| ANFS 140 | Functional Anatomy | 4 |
| ANFS 230 | Foodborne Diseases (or ANFS 332 Animal Diseases) | 3 |
| ANFS 251 | Animal Nutrition. | 3 |
| ANFS 252 | Animal Nutrition Laboratory | 1 |
| ANFS 265 | Sophomore Seminar | 1 |
| ANFS 300 | Principles of Animal and Plant Genetics | 3 |
| ANFS 305 | Food Science (or ANFS 315 Food Safety) | 3 |

One of the following 4-credit capstone/production courses :

| | |
|---|---|
| ANFS 404 | Dairy Production |
| ANFS 411 | Food Science Capstone |
| ANFS 417 | Beef Cattle and Sheep Production |
| ANFS 418 | Swine Production |
| ANFS 421 | Poultry Production |
| ANFS 420 | Equine Reproductive Management |

Two courses from the following:

| | | |
|---|---|---|
| ANFS 409 | Food Processing | 3 |
| ANFS 419 | Topics in International Animal Agriculture | 3-4 |
| ANFS 424 | Non Ruminant Nutrition | 3 |
| ANFS 435 | Animal Virology | 3 |
| ANFS 436 | Immunology of Domestic Animals | 3 |
| ANFS 439 | Food Microbiology | 3 |
| ANFS 441 | Reproductive Physiology of Domestic | 3 |
| ANFS 442 | Lactational Physiology | 3 |
| ANFS 445 | Comparative Physiology of Domestic Animals | 3 |
| ANFS 449 | Food Biotechnology | 4 |
| ANFS 454 | Ruminant Nutrition | 3 |
| ANFS 366/466 | Independent Study | 3 (max) |
| ANFS 468 | Research | 3 (max) |
| ANFS 470 | Principles of Molecular Genetics | 3 |

**ELECTIVES**
Variable to complete a total of 124 credits
After required courses are completed, sufficient credits must be taken to meet the minimum requirements for the degree. Only 4 credits of HESC 120 or 4 credits of performing Music credit may be counted toward the degree. ANFS 399 may be taken P/F for a maximum of 2 credits toward the degree. No more than 5 credits of ANFS X66 may be counted towards the degree.

Students should consult with their advisor regarding the choice of elective credits. Students wishing to concentrate their efforts in the areas of Production Systems, Equine and Companion Animals, Food Safety, or Biotechnology are strongly encouraged to consider the recommended course selections provided by the department.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

### DEGREE: BACHELOR OF SCIENCE
### MAJOR: PRE-VETERINARY MEDICINE AND ANIMAL BIOSCIENCES

CURRICULUM CREDITS

See page 73 for University and College Requirements

***Math Science Requirements***

| | | |
|---|---|---|
| BISC 207/208 | Introductory Biology I and II | 8 |
| BISC 300 | Introduction to Microbiology | 4 |
| CHEM 103/104 | General Chemistry | 8 |
| CHEM 321/322 | Organic Chemistry | 8 |
| CHEM 527 | Biochemistry (or CHEM 214) | 3 |
| PHYS 201/202 | General Physics I and II | 8 |
| MATH 221 | Calculus I | 3 |
| FREC 408 Research Methods (or STAT 200) | | 3 |

***Major Requirements***
**A minimum grade of C- is required for all ANFS credits used to satisfy the major requirements**

| | | |
|---|---|---|
| ANFS 101 | Introduction to Animal Science | 3 |
| ANFS 102 | Food for Thought | 3 |
| ANFS 111 | Animal Science Laboratory | 1 |
| ANFS 140 | Functional Anatomy | 4 |
| ANFS 251 | Animal Nutrition. | 3 |
| ANFS 252 | Animal Nutrition Laboratory | 1 |
| ANFS 265 | Sophomore Seminar | 1 |
| ANFS 300 | Principles of Animal and Plant Genetics | 3 |
| ANFS 310 | Animal Genetics Laboratory | 1 |
| ANFS 332 | Introduction to Animal Diseases | 3 |
| ANFS 445 | Comparative Physiology of Domestic Animals | 3 |
| ANFS ___ | Animal Science elective | 2 |

One of the following capstone/production courses: . . . . . 4
ANFS 404 Dairy Production
ANFS 411 Food Science Capstone
ANFS 417 Beef Cattle and Sheep Production
ANFS 418 Swine Production
ANFS 420 Equine Reproductive Management
ANFS 421 Poultry Production

Second Writing Requirement (with a minimum grade of C-) . . . . . 3**
A second writing course involving significant writing experience. The course must be taken after completion of 60 credit hours. Approved courses are designated each semester. (**These credits can be used to satisfy credit requirements in the breadth requirements for Literature and Arts)

**ELECTIVES**
After required courses are completed, sufficient credits must be taken to meet the minimum requirements for the degree. Only 4 credits of HESC 120 or 4 credits of performing Music credit may be counted toward the degree. ANFS 399 may be taken P/F for a maximum of 2 credits toward the degree. No more than 5 credits of ANFS X66 may be counted towards the degree.

***Recommended Electives***:
Students should seek advice from their academic advisor when choosing electives.

ANFS 436 Immunology of Domestic Animals
ANFS 261 Principles of Companion Animal Nutrition
ANFS 424 Non Ruminant Nutrition
ANFS 435 Introduction to Animal Virology
ANFS 442 Lactational Physiology
ANFS 454 Ruminant Nutrition
COMM 212
or AGRI 212 Oral Communication
ENWC 419 Medical Veterinary Entomology
ENGL 312 Written Communications in Business
FREC 201 Records and Account

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## HONORS BACHELOR OF SCIENCE: ANIMAL AND FOOD SCIENCES or PRE-VETERINARY MEDICINE AND ANIMAL BIOSCIENCES

The recipient of this degree must complete:
1. All requirements for the Bachelor of Science: Animal and Food Sciences or Pre-veterinary Medicine and Animal Biosciences.
2. All the University requirements for the Honors degree (see page 52). Courses with the ANFS prefix taken at the 600-level or higher are considered to be Honors courses in the major. One 3-or 4-credit course in PLSC, ENWC, or BISC will, if taken as Honors, count toward the 12 Honors credits required in the major or in collateral disciplines.

## MINOR IN ANIMAL SCIENCE

**A minimum grade of C- is required for all ANFS credits used to satisfy the minor requirements**
The minor in animal science requires 19 credits in animal science including: ANFS 101, 111, 140, 251, 252, one course from ANFS 404, 417, 418, 420 and 421; and one course from ANFS 332, 441, 436 and 454.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: FOOD SCIENCE

CURRICULUM CREDITS

See page 73 for University and College Requirements

***Math Science Requirements***

BISC 207/208 Introductory Biology I and II . . . . . 8
BISC 300 Introduction to Microbiology . . . . . 4
CHEM 103/104 General Chemistry . . . . . 8
CHEM 220 Quantitative Analysis I . . . . . 3
CHEM 221 Quantitative Analysis Laboratory . . . . . 1
CHEM 321/322 Organic Chemistry . . . . . 8
CHEM 214 Elementary Biochemistry . . . . . 3
CHEM 418 Introductory Physical Chemistry . . . . . 3
PHYS 201/202 General Physics I and II . . . . . 8
MATH 221/222 Calculus I and II . . . . . 6
NDTD 200 Nutrition Concepts . . . . . 3
FREC 408
Research Methods (or STAT 200). . . . . 3

***Major Requirements***
**A minimum grade of C- is required for all ANFS credits used to satisfy the major requirements.**
ANFS 102 Food for Thought . . . . . 3
ANFS 111 Animal Science Laboratory . . . . . 1
ANFS 230 Foodborne Diseases . . . . . 3
ANFS XXX Seminar: Food Science . . . . . 1
ANFS 305 Food Science . . . . . 3
ANFS 328 Food Chemistry . . . . . 4
ANFS 329 Food Analysis . . . . . 4
ANFS 409 Food Processing . . . . . 4
ANFS 411 Food Science Capstone . . . . . 4
ANFS 439 Food Microbiology . . . . . 4
ANFS 443 Food Engineering . . . . . 4
ANFS 449 Food Biotechnology . . . . . 4

Second Writing Requirement (with a minimum grade of C-) . . . . . 3**
A second writing course involving significant writing experience. The course must be taken after completion of 60 credit hours. Approved courses are designated each semester. (**These credits can be used to satisfy credit requirements in the breadth requirements for Literature and Arts)

**ELECTIVES - Variable to complete a total of 124 credits**
After required courses are completed, sufficient credits must be taken to meet the minimum credits requirements for the degree. Only 4 credits of HESC 120 or four credits of performing Music credits may be counted toward the degree. ANFS 399 may be taken P/F for a maximum of 2 credits toward the degree. No more than 5 credits of ANFS X66 may be counted towards the degree.

Students should seek advice from their academic advisors when choosing electives.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## HONORS BACHELOR OF SCIENCE: FOOD SCIENCE

The recipient of this degree must complete:
1. All requirements for the Bachelor of Science: Food Science.
2. All the University requirements for the Honors degree (see page 52). Courses in Food Science taken at the 600-level or higher are considered to be Honors courses in the major. One 3-or 4-credit required course in a related technical area will, if taken as Honors, count toward the total of Honors credits required in the major or in collateral disciplines..

## MINOR IN FOOD SCIENCE

The minor in food science requires 15 credits, and a C- grade or higher is required in all ANFS courses. Course selection depends on completion of prerequisites and other science and math preparation. Successful completion of MATH 221/222 Calculus I and II (6 credits) is required prior to taking food science courses for the minor; however, pre-requisites may be waived with permission of instructor.

ANFS 305 Food Science. . . . . 3

Select any 3 courses from: . . . . . 12
ANFS 328 Food Chemistry, ANFS 329 Food Analysis, ANFS 409 Food Processing, ANFS 411 Food Science Capstone, ANFS 443 Food Engineering, ANFS 449 Food Biotechnology, ANFS 639 Food Microbiology

Prerequisites may be waived. Permission of instructor to register is based on individual student academic record and major. See a food science faculty member for advisement.

**CREDITS TO TOTAL A MINIMUM OF. . . . . 15**

## BIORESOURCES ENGINEERING

Telephone: (302)831-2468
http://ag.udel.edu
Faculty Listing: http://ag.udel.edu/breg/faculty/facultyStaff.htm

The Bioresources Engineering Department offers an undergraduate major in Engineering Technology that is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC of ABET).

### ENGINEERING TECHNOLOGY

Engineering technology is part of the broad discipline of engineering, in which knowledge of the mathematical and natural sciences is applied in utilization of materials and forces. Engineering technology requires the application of scientific and engineering knowledge combined with technical skills in support of engineering activities. The curriculum prepares the engineering technologist to make independent judgments and to design and manage systems and components to achieve conceptual goals with consideration of their effectiveness, safety and cost. Close liaison is maintained between the educational programs and employers to give graduates the greatest opportunity for career development.

Within the major in engineering technology, two optional concentrations are available. The applied electronics and controls concentration includes coursework in digital systems, instrumentation, controls, PLC's, and courses that focus on communication and networks, or manufacturing. The construction technology and technical management concentration provides courses in soil mechanics, storm water management, wood and steel and concrete and masonry as well as courses in project management and economic analysis. Both concentrations allow the student to focus their studies with more in-depth courses in areas of their interest.

Students who choose the engineering technology major may take all the necessary courses at the University of Delaware or they may transfer appropriate course work from other accredited institutions. Students who wish to have prior course work considered must contact an advisor in the department for a degree analysis.

Computer use for problem solving is important throughout the engineering technology curriculum. Students are urged to have their own computer with spreadsheet and word processing software, and should be able to connect to the University computer network.

### DEGREE: BACHELOR OF SCIENCE
### MAJOR: ENGINEERING TECHNOLOGY

CURRICULUM CREDITS

**UNIVERSITY REQUIREMENTS**
ENGL 110 Critical Reading and Writing . . . . . 3

First Year Experience (see page 68) . . . . . 0-4

Discovery Learning Experience (see page 68) . . . . . 3

Three credits in an approved course or courses stressing multi-cultural, ethnic, and/or gender-related course content (see pages 69-71). 3

**MAJOR REQUIREMENTS**
EGTE 165 New Student Seminar . . . . . 0

***Communications***
A second writing course selected from: . . . . . 3
ENGL 301 Expository Writing
ENGL 302 Advanced Composition
ENGL 307 News Writing and Editing
ENGL 312 Written Communications in Business
ENGL 410 Technical Writing

An oral communications course selected from: . . . . . 3
AGRI 212 Oral Communications in Agriculture and Natural Resources
COMM 212 Oral Communication in Business
COMM 255 Fundamentals of Communication
COMM 350 Public Speaking

***Social Sciences and Humanities***
ECON 151 Introduction to Microeconomics . . . . . 3
ECON 152 Introduction to Macroeconomics . . . . . 3
Six additional credits to be selected from . . . . . 6
Anthropology, Art, Art History, Black American Studies, Criminal Justice, Economics, Education, English, Foreign Language, Geography, History, Music, Philosophy, Political Science, Psychology, Sociology, Theatre, Women's Studies, or courses cross-listed in these departments.

***Basic Sciences and Mathematics***
Biology/Life Science course . . . . . 3 or 4
CHEM 103/104 General Chemistry . . . . . 8
PHYS 201/202 Introductory Physics I and II
or
PHYS 207/208 Fundamentals of Physics I and II (recommended). . . . . 8
MATH 117 Precalculus for Scientists and Engineers . . . . . 4
MATH 221/222 Calculus I and II (with permission of advisor)
or
MATH 241/242 Calculus A and B . . . . . 6 or 8

Additional MATH course to bring total MATH credits at 201 level and above to 12 credits. . . . . 4 or 6

***Technical Skills***
EGTE 115 Introduction to Computer Based Problem Solving. . . . . 4
EGTE 209 Technical and Computer Aided Drafting. . . . . 3

Technical Skills elective . . . . . 3

***Technical Sciences***
EGTE 215 Applied Fluid Mechanics . . . . . 4
EGTE 231 Fundamentals of Statics and Strength of Materials . . . . . 4
EGTE 244 Electricity for Engineering Technology . . . . . 4
EGTE 311 Fundamentals of Thermodynamics . . . . . 3

***Technical Specialization***
25 to 31 credits of EGTE or engineering courses at the 300 or 400 level from a departmental approved list, including a 3 credit capstone experience selected from EGTE 450, EGTE 451, EGTE 466 or UNIV 401/402. At least 15 credits must be EGTE courses. A minor in a technical or business subject area is strongly encouraged. With a minor, the requirements for a technical specialization are a minimum of 25 credits . . . . . 31 to 25

***Technical Support***
9 to 15 credits of course work selected to support the student's career objectives. Subject to approval of the faculty. . . . . 9 to 15

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

Students must earn at least a C- in all prerequisite courses to qualify for admission to the next course. Enrollment in EGTE 300 and 400 level courses is limited to majors with Junior or Senior standing, or by permission of the instructor.

To graduate with a major in engineering technology, a student must attain at least a 2.0 average in ETGE courses. This requirement is in addition to the University requirement of an overall 2.0 grade point average. A student must complete a minimum of 48 semester hours in technical sciences, technical skills and technical specialization.

### DEGREE: BACHELOR OF SCIENCE
### MAJOR: ENGINEERING TECHNOLOGY
### CONCENTRATION: APPLIED ELECTRONICS AND CONTROLS

CURRICULUM CREDITS

**UNIVERSITY REQUIREMENTS**
ENGL 110 Critical Reading and Writing . . . . . 3

First Year Experience (see page 68) . . . . . 0-4

Discovery Learning Experience (see page 68) . . . . . 3

Three credits in an approved course or courses stressing multi-cultural, ethnic, and/or gender-related course content (see pages 69-71). 3

**MAJOR REQUIREMENTS**
EGTE 165 New Student Seminar . . . . . 0

***Communications***
A second writing course selected from: . . . . . 3
ENGL 301 Expository Writing
ENGL 302 Advanced Composition
ENGL 307 News Writing and Editing
ENGL 312 Written Communications in Business
ENGL 410 Technical Writing

An oral communications course selected from: . . . . . 3
AGRI 212 Oral Communications in Agriculture and Natural Resources
COMM 212 Oral Communication in Business
COMM 255 Fundamentals of Communication
COMM 350 Public Speaking

***Social Sciences and Humanities***
ECON 151 Introduction to Microeconomics . . . . . 3
ECON 152 Introduction to Macroeconomics . . . . . 3

Six additional credits from . . . . . 6
Anthropology, Art, Art History, Black American Studies, Criminal Justice, Economics, Education, English, Foreign Language, Geography, History, Music, Philosophy, Political Science, Psychology, Sociology, Theatre, Women's Studies, or courses cross-listed in these departments.

***Basic Sciences and Mathematics***
Biology/Life Science course . . . . . 3 or 4
CHEM 103/104 General Chemistry . . . . . 8
PHYS 201/202 Introductory Physics I and II
or
PHYS 207/208 Fundamentals of Physics I and II (recommended) . . . . . 8
MATH 117 Precalculus for Scientists and Engineers . . . . . 4
MATH 221/222 Calculus I and II (with permission of advisor)
or
MATH 241/242 Calculus A and B . . . . . 6 or 8

Additional MATH credits to bring total MATH credits at 201 level and above to 12 credits . . . . . 4 or 6

***Technical Skills***
EGTE 115 Introduction to Computer Based Problem Solving . . . . . 4
MEEG 202 Computer-Aided Engineering Design . . . . . 3

***Technical Sciences***
EGTE 215 Applied Fluid Mechanics . . . . . 4
EGTE 231 Fundamentals of Statics and Strength of Materials . . . . . 4
EGTE 244 Electricity for Engineering Technology . . . . . 4
EGTE 311 Fundamentals of Thermodynamics . . . . . 3

***Technical Specialization***
CPEG 202 Introduction to Digital Systems . . . . . 4
EGTE 245 Analog Electronics . . . . . 3
EGTE 443 Instrumentation . . . . . 3
EGTE 444 PLC Applications . . . . . 3
EGTE 449 Applied Controls . . . . . 3

Technical Specialization electives including a 3 credit capstone experience selected from EGTE 450, EGTE 451, EGTE 466 or UNIV 401/402, with a focus in an area such as computer architecture, communication and networks, or manufacturing, subject to approval by the student's faculty advisor. A University minor may also be selected as the focus . . . . . 16

***Technical Support***
An additional computer programming language . . . . . 3

Approved Technical Support Electives . . . . . 8

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

Students must earn at least a C- in all prerequisite courses to qualify for admission to the next course. Enrollment in EGTE 300 and 400 level courses is limited to majors with Junior or Senior standing, or permission of the instructor.

To graduate with a major in engineering technology, a student must attain at least a 2.0 average in ETGE courses. This requirement is in addition to the University requirement of an overall 2.0 grade point average. A student must complete a minimum of 48 semester hours in technical sciences, technical skills and technical specialization.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: ENGINEERING TECHNOLOGY
## CONCENTRATION: CONSTRUCTION TECHNOLOGY AND TECHNICAL MANAGEMENT

CURRICULUM CREDITS

**UNIVERSITY REQUIREMENTS**
ENGL 110 Critical Reading and Writing . . . . . 3

First Year Experience (see page 68) . . . . . 0-4
Discovery Learning Experience (see page 68) . . . . . 3

Three credits in an approved course or courses stressing multi-cultural, ethnic, and/or gender-related course content (see pages 69-71). 3

**MAJOR REQUIREMENTS**
EGTE 165 New Student Seminar . . . . . 0

***Communications***
A second writing course selected from: . . . . . 3
ENGL 301 Expository Writing
ENGL 302 Advanced Composition
ENGL 307 News Writing and Editing
ENGL 312 Written Communications in Business
ENGL 410 Technical Writing

An oral communications course selected from: . . . . . 3
AGRI 212 Oral Communications in Agriculture and Natural Resources
COMM 212 Oral Communication in Business
COMM 255 Fundamentals of Communication
COMM 350 Public Speaking

***Social Sciences and Humanities***
ECON 151 Introduction to Microeconomics . . . . . 3
ECON 152 Introduction to Macroeconomics . . . . . 3

Six additional credits from . . . . . 6
Anthropology, Art, Art History, Black American Studies, Criminal Justice, Economics, Education, English, Foreign Language, Geography, History, Music, Philosophy, Political Science, Psychology, Sociology, Theatre, Women's Studies, or courses cross-listed in these departments.

***Basic Sciences and Mathematics***
Biology/Life Science course . . . . . 3 or 4

CHEM 103/104 General Chemistry . . . . . 8
PHYS 201/202 Introductory Physics I and II
or
PHYS 207/208 Fundamentals of Physics I and II (recommended) . . . . . 8
MATH 117 Precalculus for Scientists and Engineers . . . . . 4
MATH 221/222 Calculus I and II (with permission of advisor)
or
MATH 241/242 Calculus A and B . . . . . 6 or 8

Additional MATH credits to bring total MATH credits at 201 level and above to 12 credits . . . . . 4 or 6

***Technical Skills***
EGTE 113 Introduction to Surveying . . . . . 2
EGTE 115 Introduction to Computer Based Problem Solving . . . . . 4
EGTE 209 Technical and Computer-Aided Drafting . . . . . 3
EGTE 223 Surveying . . . . . 3

***Technical Sciences***
EGTE 215 Applied Fluid Mechanics . . . . . 4
EGTE 231 Fundamentals of Statics and Strength of Materials . . . . . 4
EGTE 244 Electricity for Engineering Technology . . . . . 4
EGTE 311 Fundamentals of Thermodynamics . . . . . 3

***Technical Specialization***
EGTE 312 Fundamentals of Soil Mechanics . . . . . 3
EGTE 321 Storm Water Management . . . . . 4
EGTE 416 Project Economic Analysis . . . . . 3
EGTE 417 Project Management . . . . . 3
EGTE 454 Wood and Steel Structures . . . . . 3
EGTE 455 Concrete and Masonry Structures . . . . . 3
Approved Technical Specialization electives . . . . . 12
Technical Specialization electives will include a 3 credit capstone experience selected from EGTE 450, EGTE 451, EGTE 466 or UNIV 401/402.

***Technical Support***
ACCT 207 or FREC 201 . . . . . 3

Technical Support electives appropriate to the student's professional goals, subject to approval by the student's faculty advisor . . . . . 5

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

Students must earn at least a C- in all prerequisite courses to qualify for admission to the next course. Enrollment in EGTE 300 and 400 level courses is limited to majors with Junior or Senior standing, or permission of the instructor.

To graduate with a major in engineering technology, a student must attain at least an overall 2.0 average in ETGE courses. This requirement is in addition to the University requirement of an overall 2.0 grade point average. A student must complete a minimum of 48 semester hours in technical sciences, technical skills and technical specialization.

## MINOR IN ENGINEERING TECHNOLOGY

A minor in engineering technology may be earned by a student in any University bachelor degree program through successful completion of a minimum of 20 credits in engineering technology courses in accordance with the requirements listed here. Before taking each engineering technology course, the student must satisfy required prerequisites for the course. A grade point average of at least 2.0 is required in the 20 credits of engineering technology courses for the minor.

The required engineering technology courses are:
EGTE 115 Introduction to Computer Based Problem Solving . . . . . 4

One course from the following list:
EGTE 215 Applied Fluid Mechanics . . . . . 4
EGTE 231 Fundamentals of Statics and Strength of Materials . . . . . 4
EGTE 244 Electricity for Engineering Technology . . . . . 4

Furthermore, additional courses must be completed so that EGTE credits total 20, of which at least 6 credits must be at the 300-level or above. All engineering technology courses shall be selected with the approval of an advisor in the Department of Bioresources Engineering to meet each student's objectives. For students interested in environmental issues, courses could include: EGTE 103, 113, 215, and 328; for those interested in electronics: EGTE 244, 245, 443, 444, and 449. For students interested in construction technology, courses could include: EGTE 113, 223, 312, 416, 454, 455 and 456. Courses can also be chosen to give the student's minor an emphasis in other areas such as manufacturing or management.

## ENTOMOLOGY AND WILDLIFE ECOLOGY

Telephone: (302) 831-2526
E-mail: jlbowman@udel.edu
http://ag.udel.edu
Faculty Listing: http://ag.udel.edu/enwc/faculty/facultyStaff.htm

Entomology emphasizes the structure, physiology, behavior, development, ecology, classification, and management of insects. Wildlife ecology broadly includes the biology and ecology of all species and their conservation. Wildlife conservation is the broad effort to perpetuate free-living, breeding populations of species in their native habitats. The department views all non-domesticated species as wildlife.

The Department offers two undergraduate majors. Students can focus their biological interest on insects in the Entomology major. This program requires basic sciences as well as specialty courses on insects. Flexibility in course selection permits students to emphasize pest management or insect biology. The Wildlife Conservation major is for students with interests in the biological aspects of environmental science, e.g., conservation, wildlife biology, or ecology. It requires basic sciences, specialty courses in vertebrates, insects, plants, and conservation and other supporting areas. The curriculum's flexibility accommodates career goals ranging from research to nature education, conservation advocacy and wildlife management. Meeting the requirements for the Wildlife Conservation major should provide the student with the minimum educational requirements for certification as an Associate Wildlife Biologist by The Wildlife Society, a professional society. An Honors Degree option is offered for both majors. The department also offers minors in both Entomology and Wildlife Conservation and co-offers Natural Resource Management and Plant Protection as interdisciplinary majors. (See pages 80, 83 and 84 for details.)

The faculty advisor and student jointly plan the course program according to the student's interests and career objective. Course selection should be made in consultation with the academic advisor during the registration period of each term.

University of Delaware students in other majors who wish to transfer to or add entomology or wildlife conservation majors must have a UD grade point average of at least 2.25. In addition, completion of the major must be the stated intention of the student and a realistic possibility before the student's intended graduation date. Students with a GPA below 2.25 are invited to contact the department for advisement on course selection appropriate to the desired major while improving their GPA.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: ENTOMOLOGY

CURRICULUM CREDITS

See page 73 for University and College requirements.

### MAJOR REQUIREMENTS

**A minimum grade of C- is required for all ENWC credits used to satisfy departmental requirements.**

***Professional Studies***
FREC 135 (or equivalent) Intro to Data Analysis . . . . . 3
MATH 115 Pre-Calculus or higher level . . . . . 3
BISC 207 Introductory Biology I . . . . . 4
BISC 208 Introductory Biology II . . . . . 4
BISC 302 General Ecology . . . . . 3
CHEM 101/102
or
CHEM 103/104 General Chemistry . . . . . 8
ENWC 165 New Student Seminar . . . . . 1
ENWC 205 Elements of Entomology . . . . . 3
ENWC 215 Entomology Laboratory . . . . . 2
ENWC 300 Principles of Animal and Plant Genetics . . . . . 3
ENWC 405 Insect Structure and Function . . . . . 4
ENWC 406 Insect Identification-Taxonomy . . . . . 3
ENWC 408 Field Taxonomy . . . . . 3
ENWC 465 Senior Capstone Experience . . . . . 1

ENWC courses (may include 3 credits maximum of Independent Study, Research, and must include one regularly scheduled course with content focused on insects; Field Experience.) . . . . . 6
Nine credits from any of the following: . . . . . 9
Any BISC XXX course or courses at or above 300-level (except BISC 302 and 321)
PLSC 151 Introduction to Crop Science
PLSC 201 Botany II
PLSC 204 Introduction to Soil Science
PLSC 211 Herbaceous Landscape Plants
PLSC 212 Woody Landscape Plants
PLSC 303 Introductory Plant Pathology
PLSC 404 Plant Taxonomy

### ELECTIVES
Beyond required courses, sufficient credits must be taken to meet the minimum credits required for the degree. Organic chemistry, biochemistry, statistics, physics, and additional writing courses are strongly recommended. Only two credits of HESC activity or performing music may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: WILDLIFE CONSERVATION

CURRICULUM CREDITS

See page 73 for University and College requirements.

### MAJOR REQUIREMENTS
**A minimum grade of C- is required for all ENWC credits used to satisfy departmental requirements.**

***Professional Studies***

FREC 135 (or equivalent) Intro to Data Analysis . . . 3
MATH 115, 221, or 241 . . . 3-4
BISC 207/208 Introductory Biology I and II . . . 8
BISC 302 General Ecology . . . 3
CHEM 101/102 General Chemistry
or
CHEM 103/104 General Chemistry . . . 8
ENWC 165 New Student Seminar . . . 1
ENWC 201 Wildlife Conservation and Ecology . . . 3
ENWC 205 Elements of Entomology . . . 3

ENWC 300 Principles of Animal and Plant Genetics . . . 3
or
BISC 403 Genetics and Evolutionary Biology . . . 3
ENWC 325 Wildlife Management . . . 3
ENWC 406 Insect Identification–Taxonomy . . . 3
ENWC 415 Wildlife Research Techniques . . . 3
ENWC 418 Ornithology . . . 3
ENWC 425 Mammalogy . . . 3
ENWC 465 Senior Capstone Experience . . . 1
ENWC credit (may include UNIV 400 or any ENWC course 200-level or above (except X66 and x68) . . . 3
ECON 151 Introduction to Microeconomics: Prices and Markets . . . 3
or
FREC 150 Economics of Agriculture and Natural Resources . . . 3
FREC 408 Research Methods I . . . 3
or
STAT 200 Basic Statistical Practice . . . 3
PLSC 101 Botany I . . . 4
PLSC 204 Introduction to Soil Science . . . 3
PLSC 212 Woody Landscape Plants . . . 4
or
PLSC 344 Forest Ecology (same as ENWC 344) . . . 2
or
PLSC 404 Plant Taxonomy . . . 3

***GROUP I:*** 10 credits from the following . . . 10
ANSC 140 Functional Anatomy of Domestic Animals
BISC 300 Introduction to Microbiology
BISC 305 Cell Physiology
BISC 306 General Physiology
BISC 442 Vertebrate Morphology
BISC 480 Vertebrate Natural History
BISC 495 Evolution
BISC 637 Population Ecology
ENWC 310 Animal and Plant Genetics Laboratory
ENWC 408 Insect Field Taxonomy
ENWC 424 Herpetology
ENWC 444 Conservation of Tropical Biodiversity
ENWC 452 Conservation of African Wildlife
MAST 627 Marine Biology
MAST 629 Ichthyology

***GROUP II:*** 9 credits from the following: . . . 9
AGRI 212 Oral Communication in Agriculture and Natural Resources
COMM 212 Oral Communication in Business
COMM 350 Public Speaking
ENGL 301 Expository Writing
ENGL 307 News Writing and Editing
ENGL 309 Feature and Magazine Writing
ENGL 312 Written Communications in Business
ENGL 410 Technical Writing
THEA 204 Introduction to Voice and Speech
UNIV 402 Senior Thesis (requires completed thesis)

***GROUP III:*** 6 credits from the following: . . . 6
ENWC 413 Human Dimensions in Wildlife Conservation
ENWC 450 Debates in Conservation Biology
ENWC 453 Community-based Conservation
FREC 444 Economics of Environmental Management
FREC 450 Topics in Environmental Law
GEOG 236 Conservation: Global Issues
PHIL 448 Environmental Ethics
POSC 350 Politics and the Environment

### ELECTIVES
Beyond required courses, sufficient credits must be taken to meet the minimum credits required for the degree. Calculus, organic chemistry, biochemistry, geographic information systems, and physics are strongly recommended. Only two credits of HESC 120 activity or performing music may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . 124**

## HONORS BACHELOR OF SCIENCE: ENTOMOLOGY OR WILDLIFE CONSERVATION

The recipient of this degree must complete:
1. All requirements for the Bachelor of Science: Entomology or Wildlife Conservation.
2. All of the University's requirements for the Honors Baccalaureate degree (see page 52). Courses with the ENWC prefix taken at the 600-level or higher may be counted as Honors courses in the major. One 3- or 4-credit course in ANFS, PLSC, or BISC will, if taken as Honors, count toward the 12 Honors credits required in the major and/or in collateral disciplines.

## MINOR IN ENTOMOLOGY

The minor in entomology requires 16 credits of ENWC courses including ENWC 205, 215, 406, and at least 6 additional credits from courses focused primarily on insects. A minimum grade of C- is required in all courses counting toward the minor. Credits for Special Problem, Independent Study, Research, and Field Experience do not count toward the minor.

## MINOR IN WILDLIFE CONSERVATION

The minor in wildlife conservation requires 18 credits of ENWC courses including ENWC 201, 205, 325 and one course from among ENWC 418, 424, and 425. Additionally, BISC 302 is a prerequisite for ENWC 325 and this prerequisite is strictly enforced. Any substitutions require prior approval of the Department Chair. A minimum grade of C- is required in all courses counting toward the minor. Credits for Special Problem, Independent Study, Research, and Field Experience do not count toward the minor. Admission to the Minor in Wildlife Conservation requires: (1) a minimum GPA of 2.75; (2) prior completion or current enrollment in ENWC 201; and (3) at least 45 credits of coursework remaining to complete the BS or BA, independent of the minor. Students should note that WC majors have priority and sometimes may fill some courses required for the minor. Therefore, the Department cannot guarantee that a student will be able to complete all courses necessary or desired for the minor.

# FOOD AND RESOURCE ECONOMICS

Telephone: (302) 831-1318
E-mail: hastings@udel.edu
http://ag.udel.edu
Faculty Listing: http://ag.udel.edu/frec/faculty/facultyStaff.htm

Food and Resource Economics is concerned with agribusiness management, food marketing, and the economics of resource management and production. Courses are designed to provide a thorough background in the principles of organization and management of agribusiness firms, and includes study of financing agricultural business firms, marketing and international trade of agricultural products, price analyses, economics of land use, and agricultural and environmental policies.

Undergraduate majors are offered in Food and Agribusiness Management, Resource Economics, and Statistics. The curricula differ in the amount of emphasis given to agricultural production, business and economics. All the curricula may qualify the student for graduate work. The department also co-offers Natural Resource Management, an interdisciplinary major. Minors in Food and

Agribusiness Management, Resource Economics, Statistics, and Operations Research are also available.

The major in food and agribusiness management is offered cooperatively with the Alfred Lerner College of Business and Economics. This curriculum prepares the student for a career in agribusiness sales and marketing, food wholesaling and retailing, international trade, resource management, market analysis, finance and banking, or commodity marketing (futures and options). A concentration in food marketing is offered.

The major in resource economics emphasizes theory, quantitative methods, and policy, and provides a solid foundation in economics and business. It prepares the student to work in the fields of agriculture, government, teaching, extension and research. Concentrations in environmental economics and sustainable development are offered as options in the resource economics major.

The statistics major teaches the collection, management, analysis and interpretation of data. Statistical methodology is used in virtually every professional field as a way to conduct research and make important decisions. These include the pure sciences, such as biology, chemistry and physics, as well as engineering, business, medicine, and the social sciences (economics, political science, psychology, and sociology).

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: FOOD AND AGRIBUSINESS MANAGEMENT

CURRICULUM CREDITS

See page 73 for University and College requirements

### MAJOR REQUIREMENTS

***Physical Sciences*** . . . . . 8
Minimum of eight credits of lab science selected from Chemistry, Physics, Geology, or Physical Science.

***Professional Studies***

| | | |
|---|---|---|
| MATH 115 | Pre-Calculus or higher level (MATH 221*, MATH 230, and MATH 201 are strongly recommended) | 3 |
| ACCT 207/208 | Accounting I and II | 6 |
| COMM 212 | Oral Communication in Business | 3 |
| ENGL 312 | Written Communications in Business | 3 |
| ECON 151 | Introduction to Microeconomics:Prices and Markets | 3 |
| ECON 152 | Introduction to Macroeconomics:National Economy | 3 |
| BUAD 301 | Introduction to Marketing | 3 |
| Two additional courses offered by the College of Business and Economics at the 300 or 400 level. | | 6 |
| One foreign language course | | 3-4 |
| AGRI 165 | Mastering the Freshman Year | 1 |
| FREC 110 | Introduction to Food and Agribusiness Industry | 1 |
| FREC 135 | Introduction to Data Analysis | 3 |
| FREC 150 | Economics of Agriculture and Natural Resources | 3 |
| FREC 240 | Quantitative Methods in Agricultural Economics | 3 |
| FREC 305 | Management and Leadership Development | 3 |
| FREC 316 | Economics of Biotechnology and New Technologies | 3 |
| FREC 345 | Strategic Selling and Buyer Communication | 3 |
| FREC 404 | Food and Fiber Marketing | 3 |
| FREC 408 | Research Methods I | 3 |
| FREC 409 | Research Methods II | 3 |
| FREC 410 | International Agricultural Trade and Marketing | 3 |
| FREC 430 | Establishing and Managing a Food and Agribusiness Enterprise | 3 |

A maximum of three credits of Independent Study in Food and Resource Economics and a maximum of six credits of Independent Study in all areas, including Food and Resource Economics, may be counted toward a degree.

*MATH 221 or higher (with a minimum grade of C+) can be used as a substitute course for MATH 115 and FREC 240.

### ELECTIVES

After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only four credits of HESC 120 activity or four credits of performing Music credit may be counted toward the degree.

Suggested Food and Agribusiness Management Electives:

| | |
|---|---|
| FREC 212 | Food Retailing and Consumer Behavior |
| FREC 335 | Advanced Data Management |
| FREC 427 | Agribusiness Financial Management |
| FREC 464 | Agribusiness Internship |
| FREC 471 | Futures and Options Markets |

Suggested Resource Management Electives:

| | |
|---|---|
| FREC 406 | Agriculture and Natural Resource Policy |
| FREC 424 | Resource Economics |
| FREC 429 | Community Economic Development |
| FREC 444 | Economics of Environmental Management |
| FREC 480 | Geographic Information Systems in Natural Resource Management |

Suggested Communications and Writing Electives:

| | |
|---|---|
| ENGL 301 | Expository Writing |
| ENGL 410 | Technical Writing |

**CREDITS TO TOTAL A MINIMUM OF . . . . . 128**

## HONORS BACHELOR OF SCIENCE: FOOD AND AGRIBUSINESS MANAGEMENT

The recipient of this degree must complete:

1. All requirements for the Bachelor of Science: Food and Agricultural Business Management.
2. All the University requirements for the Honors degree (see page 52). Courses at the 600-level that satisfy requirements for the major will be considered to be honors courses for the degree.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: FOOD AND AGRIBUSINESS MANAGEMENT
## CONCENTRATION: FOOD MARKETING

The requirements for the major in Food and Agribusiness Management must be met. The following department courses are required for the concentration and may also be used as electives in the Food and Agribusiness Management major:

| | | |
|---|---|---|
| FREC 212 | Food Retailing and Consumer Behavior | 3 |
| FREC 335 | Advanced Data Management | 3 |
| FREC 427 | Agribusiness Financial Management | 3 |
| FREC 471 | Futures and Options Markets | 4 |
| Two Business Administration Courses at the 400-level in marketing related areas. These are in addition to BUAD 301-Introduction to Marketing and two additional Business and Economics courses at the 300 and 400 level required by the Food and Agribusiness Management major. | | 6 |

**CREDITS TO TOTAL A MINIMUM OF . . . . . 128**

## MINOR IN FOOD AND AGRIBUSINESS MANAGEMENT

The minor in Food and Agribusiness Management requires 18 credits with the FREC prefix, including FREC 150 - Economics of Agriculture and Natural Resources. Students must take five of the nine FREC courses listed below with a minimum of two courses in each area:

Marketing/Management Area:

| | |
|---|---|
| FREC 305 | Management and Leadership Development |
| FREC 316 | Economics of Biotechnology and New Technologies |
| FREC 345 | Strategic Selling and Buyer Communication |
| FREC 404 | Food and Fiber Marketing |
| FREC 471 | Futures and Options Markets |

Decision Analysis/International Trade Area:

| | |
|---|---|
| FREC 408 | Research Methods I |
| FREC 409 | Research Methods II |
| FREC 410 | International Agricultural Trade and Marketing |
| FREC 427 | Agribusiness Financial Management |

A minimum grade of C- is required in all courses counting toward the minor.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: RESOURCE ECONOMICS

CURRICULUM CREDITS

See page 73 for University and College requirements.

### MAJOR REQUIREMENTS

***Physical Sciences*** . . . . . 8
Minimum of eight credits of lab science selected from Chemistry, Physics, Geology, or Physical Science.

***Professional Studies***

| | | |
|---|---|---|
| MATH 115 | Pre-Calculus (MATH 221* or higher is strongly recommended) | 3 |
| COMM 212 | Oral Communication in Business | 3 |
| ENGL 312 | Written Communications in Business | 3 |
| One foreign language course | | 3-4 |
| ECON 151 | Introduction to Microeconomics: Prices and Markets | 3 |
| ECON 152 | Introduction to Macroeconomics: National Economy | 3 |
| ECON 300 | Intermediate Microeconomic Theory | 3 |
| ECON 302 | Banking and Monetary Policy | 3 |
| ECON 303 | Intermediate Macroeconomic Theory | 3 |
| Two additional courses offered by the College of Business and Economics at the 300-level or higher | | 6 |

*(Students interested in an Economics minor should see the College of Business and Economics section in this catalog.)*

| | | |
|---|---|---|
| FREC 135 | Introduction to Data Analysis | 3 |
| FREC 150 | Economics of Agriculture and Natural Resources | 3 |
| FREC 201 | Records and Accounts | 3 |
| FREC 240 | Quantitative Methods in Agricultural Economics | 3 |

Seven courses at the 400-level or above with at least two in each of the following three areas: . . . . . 21-22

***1. Theory***

| | |
|---|---|
| FREC 404 | Food and Fiber Marketing |
| FREC 410 | International Agricultural Trade and Marketing |
| FREC 424 | Resource Economics |
| FREC 444 | Economics and Environmental Management |
| FREC 471 | Futures and Options Markets |

***2. Methods***

| | |
|---|---|
| FREC 408 | Research Methods I |
| FREC 409 | Research Methods II |
| FREC 427 | Agribusiness Financial Management |
| FREC 480 | Geographic Information Systems in Natural Resource Management |

***3. Policy***

| | |
|---|---|
| FREC 406 | Agriculture and Natural Resource Policy |
| FREC 420 | Agriculture in Economic Development |
| FREC 429 | Community Economic Development |
| FREC 450 | Topics in Environmental Law |

A maximum of three credits of Independent Study in Food and Resource Economics and a maximum of six credits of Independent Study in all areas may be counted toward the degree.

*Math 221 or higher (with a minimum grade of C+) can be used to substitute for MATH 115 and FREC 240.

### ELECTIVES
After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only four credits of HESC 120 activity or four credits of performing Music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## HONORS BACHELOR OF SCIENCE: RESOURCE ECONOMICS

The recipient of this degree must complete:
1. All requirements for the Bachelor of Science: Resource Economics.
2. All the University requirements for the Honors degree (see page 52). Courses at the 600-level that satisfy requirements for the major will be considered to be honors courses for the degree.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: RESOURCE ECONOMICS
## CONCENTRATION: ENVIRONMENTAL ECONOMICS

The requirements for the major in Resource Economics must be met.

In addition, five of the following FREC courses must be taken: . . . . . 15-16

| | |
|---|---|
| FREC 406 | Agriculture and Natural Resource Policy |
| FREC 424 | Resource Economics–Theory and Policy |
| FREC 429 | Community Economic Development |
| FREC 444 | Economics of Environmental Management |
| FREC 450 | Environmental Law and Policy |
| FREC 480 | Geographic Information Systems in Natural Resource Management |

FREC courses required for the Resource Economics major may be used to satisfy requirements for the Environmental Economics concentration.

Two additional courses from the College of Business and Economics as required for the Resource Economics major, plus an additional course (three courses total) must be taken from the following courses. . . . . 9

| | |
|---|---|
| ECON 306 | Economic Theory of Politics |
| ECON 408 | Economics of Law |
| ECON 415 | Economic Forecasting |
| ECON 422 | Econometric Methods and Models I |
| ECON 423 | Econometric Methods and Models II |
| ECON 426 | Mathematical Economic Analysis |
| ECON 433 | Economics of the Public Sector |
| ECON 475 | Economics of Natural Resources |
| ECON 477 | Benefit-Cost Analysis |

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: RESOURCE ECONOMICS
## CONCENTRATION: SUSTAINABLE DEVELOPMENT

The requirements for the major in Resource Economics must be met.

In addition, the following six courses must be taken: . . . . . 18

| | |
|---|---|
| FREC 100 | Sustainable Development |
| FREC 410 | International Agricultural Trade and Marketing |
| FREC 424 | Resource Economics |
| FREC 429 | Community Economic Development |
| FREC 444 | Economics of Environmental Management |
| ENWC 201 | Wildlife Conservation and Ecology |

In addition, one of the following courses must be taken . . . . . 3

| | |
|---|---|
| ANTH 330 | Development and Underdevelopment |
| ECON 311 | Economics of Developing Countries |
| GEOG 422 | Resources, Development, and the Environment |
| POSC 311 | Politics of Developing Nations |
| SOCI 460 | Women in International Development |

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## MINOR IN RESOURCE ECONOMICS

The minor in Resource Economics requires 18 credits. Students must take FREC 150 and five of the FREC courses listed below, with a minimum of one course in each area:

***1. Theory***

| | |
|---|---|
| FREC 404 | Food and Fiber Marketing |
| FREC 410 | International Agricultural Trade and Marketing |
| FREC 424 | Resource Economics |
| FREC 444 | Economics and Environmental Management |
| FREC 471 | Futures and Options Markets |

***2. Methods***

| | |
|---|---|
| FREC 408 | Research Methods I |
| FREC 409 | Research Methods II |
| FREC 427 | Agribusiness Financial Management |
| FREC 480 | Geographic Information Systems in Natural Resource Management |

***3. Policy***

| | |
|---|---|
| FREC 406 | Agriculture and Natural Resource Policy |
| FREC 420 | Agriculture in Economic Development |
| FREC 429 | Community Economic Development |
| FREC 450 | Topics in Environmental Law |

A minimum grade of C- is required in all courses counting toward the minor.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: STATISTICS

CURRICULUM CREDITS

See page 73 for University and College requirements.

### MAJOR REQUIREMENTS

***Communications*** . . . . . 6
AGRI 212 or COMM 212 . . . . . 3
Any course satisfying the College of Arts and Sciences Second Writing Course requirement. Recommended courses are: ENGL 301- Expository Writing, ENGL 312 – Written Communications in Business, ENGL 410 Technical Writing, ENGL 415 Writing in the Professions. . . . . 3

***Physical Sciences*** . . . . . 8
Minimum of eight credits of lab science selected from Chemistry, Physics, Geology, or Physical Science.

***Professional Studies***

| | | |
|---|---|---|
| MATH 210 | Discrete Mathematics I | 3 |
| MATH 242 | Analytic Geometry and Calculus B | 4 |
| MATH 243 | Analytic Geometry and Calculus C | 4 |
| MATH 245 | An Introduction to Proof | 3 |
| MATH 349 | Elementary Linear Algebra | 3 |
| MATH 401 | Introduction to Real Analysis | 3 |
| MATH 426 | Introduction to Numerical Analysis and Algorithmic Computation | 3 |
| STAT 200 or STAT 408 | | 3 |
| STAT 370 | Introduction to Statistical Analysis I | 3 |
| STAT 371 | Introduction to Statistical Analysis II | 3 |
| FREC 409 | Research Methods II | 3 |
| STAT 409 | Regression and Experimental Design | 3 |

One of the following: . . . . . 3

| | | |
|---|---|---|
| STAT 611 | Regression Analysis | 3 |
| STAT 615 | Design and Analysis of Experiments | 3 |
| FREC 615 | Advanced Prices and Statistics | 3 |
| STAT 674 | Applied Data Base Management. | 3 |

One of the following options (A, B, or C):. . . . . 6-9

*Option A* (for students with previous experience with a programming language)
CISC 181 Introduction to Computer Science
and
CISC 220 Data Structures

*Option B* (for students with no previous experience with a programming language)
CISC 105 General Computer Science
and
CISC 181 Introduction to Computer Science
and
CISC 220 Data Structures

*Option C* (for students with no previous experience with a programming language)
CISC 105 General Computer Science
and
CISC 120 Object Oriented Programming in C++
and
CISC 220 Data Structures

Area of application: . . . . . 15
This program requires a fifteen-credit area of application outside Statistics. Students must meet regularly with the advisor to develop it.

Students lacking adequate preparation for MATH 242 should begin with MATH 241. A grade of C- or better is required for all courses under Professional Studies. A maximum of three credits of independent study in Food and Resources Economics and a maximum of six credits in all areas, including Food and Resource Economics, may be counted toward a degree.

### ELECTIVES

After required courses are completed, sufficient elective credits must be taken to meet the minimum credit requirement for the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## MINOR IN STATISTICS

A student seeking a minor in statistics must obtain permission from the chairperson or his/her designee in the Department of Food and Resource Economics. Course requirements include STAT 370, STAT 371, STAT 611 Regression Analysis, and FREC 674 cross-listed as STAT 674 Applied Data Base Management. Three additional credit hours in statistics are required above STAT 371. Credit toward the minor will not be given for STAT 475. A minimum grade of C is required in all courses counting toward the minor.

## MINOR IN OPERATIONS RESEARCH

The Operations Research Minor is designed to provide students with quantitatively based decision-making skills as well as exposure to a broad variety of applications. A student seeking a minor in Operations Research must obtain permission from the chair or his/her designee in the Department of Food and Resource Economics. 18 credit hours are required for the minor.

Required courses: (6 hours)
ORES 401 An Introduction to Operations Research
STAT 370 Introduction to Statistical Analysis I

Remaining four courses are to be selected from the following list:

| | |
|---|---|
| STAT 371 | Introduction to Statistical Analysis II |
| FREC 335 | Advanced Data Management |
| FREC 409 | Research Methods II |
| FREC 674 | Applied Data Base Management |
| MATH 389 | Graph Theory |
| MATH 529 | Linear Programming–Applications and Methods |
| ECON 415 | Economic Forecasting |
| BUAD 306 | Operations Management |
| CIEG 482 | Systems Design and Operation |
| CIEG 486* | Engineering Management |
| EGTE 401 | Introduction to Quality Control |
| EGTE 402 | Quality Control Applications |
| EGTE 416* | Project Economic Analysis |
| EGTE 417 | Project Management |

*Only 1 of CIEG 486 and EGTE 416 can be counted towards the minor. A minimum grade of C is required in all courses counting toward the minor.

## NATURAL RESOURCE MANAGEMENT

Telephone: (302) 831-1318
Email: hastings@udel.edu
http://ag.udel.edu

Natural Resource Management is an interdepartmental major administered by the Departments of Entomology and Wildlife Ecology, Food and Resource Economics, and Plant and Soil Sciences. The purpose of the major is to teach an understanding of the social, physical, economic, legal, and political problems of managing the use and perpetuation of natural resources together with the skills and capabilities to address those problems in public or private forums. It combines education in the basic and applied biological and physical sciences with the fundamentals of public policy formulation.

The curriculum includes courses to help students understand the natural sciences, mathematics and statistics, economics and public policy; appreciate the world's biodiversity; communicate effectively; use computers to manage information; and solve "real world" problems. Students also will have a broad interdisciplinary education in the arts, humanities, social sciences and environmental ethics.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: NATURAL RESOURCE MANAGEMENT

CURRICULUM CREDITS

See page 73 for University and College requirements

### MAJOR REQUIREMENTS

FREC165 Mastering the Freshman Year
(or any equivalent Department freshman seminar) . . . . . 1

BISC 207/208 Introductory Biology I and II
or
PLSC 101 Botany I. . . . . 4-8
CHEM 101/102
or
CHEM 103/104 General Chemistry I and II . . . . . 8
ECON 151 Introduction to Microeconomics . . . . . 3
ECON 152 Introduction to Macroeconomics . . . . . 3
ENWC 201 Wildlife Conservation and Ecology . . . . . 3
MATH 221/222 Calculus I and II . . . . . 6
FREC 135 Introduction to Data Analysis . . . . . 3
FREC 150 Economics of Agriculture and Natural Resources . . . . . 3
FREC 424 Resource Economics: Theory and Policy . . . . . 3
FREC 444 Economics of Environmental Management . . . . . 3
FREC 480 Geographic Information Systems in Natural Resource Management . . . . . 4
PLSC 201 Botany II . . . . . 4
PLSC 204 Introduction to Soil Science. . . . . 3
PLSC 205 Introduction to Soil Science Laboratory . . . . . 1

***GROUP I: Communications:***
6 credits from the following: . . . . . 6

Written Communication:
- Any course satisfying the College of Arts and Sciences second writing course requirement. Recommended courses are: ENGL 301-Expository Writing, ENGL 312-Written Communications in Business, ENGL 410-Technical Writing, ENGL 415-Writing in the Professions.
- Senior Thesis (Any student successfully completing a Senior Thesis may count three credits toward the writing course requirement of this group.)

Oral Communication:
AGRI 212 Oral Communication in Agriculture and Natural Resources
FREC 345 Strategic Selling and Buyer Communication

***GROUP II: Chemistry/Physics:***
8 credits from: . . . . . 8
CHEM 213 Elementary Organic Chemistry
CHEM 214 Elementary Biochemistry
CHEM 216 Elementary Biochemistry Laboratory
CHEM 220 Quantitative Analysis
CHEM 221 Quantitative Analysis Laboratory
CHEM 321 Organic Chemistry
CHEM 322 Organic Chemistry
PHYS 201 Introductory Physics I
PHYS 202 Introductory Physics II

***GROUP III: Statistics:***
6 credits from: . . . . . 6
FREC 408/409 Research Methods I and II
or
MATH 201/202 Introduction to Statistics I and II

***GROUP IV: Ecosystems:***
6 credits from: . . . . . 6
BISC 302 General Ecology
ENWC 325 Wildlife Management
ENWC/PLSC 440 Integrated Disease and Pest Management
or
ENWC 411 Insect Pest Management
GEOG 235 Conservation of Natural Resources
or
GEOG 236 Conservation: Global Issues
or
GEOG 230 Humans and Earth Ecosystem
PLSC 305 Environmental Soil Management

***GROUP V: Plants and Animals:***
6 credits from: . . . . . 6
BISC 300 Introduction to Microbiology
ENWC 205 Elements of Entomology
ENWC 215 Entomology Laboratory
ENWC 406 Insect Identification - Taxonomy
ENWC 318 Taxonomy of Birds
ENWC 418 Avian Biology
ENWC 425 Mammalogy
ENWC 426 Aquatic Insects
PLSC 212 Woody Landscape Plants
PLSC 303 Introductory Plant Pathology
PLSC 404 Plant Taxonomy

***GROUP VI: Land and Water Management:***
6 credits from: . . . . . 6
EGTE 103 Land and Water Management
EGTE 113 Introduction to Land Surveying
EGTE 328 Waste Management Systems
GEOL 107 General Geology
GEOG 101 Physical Geography: Climatic Processes
GEOG 106 Physical Geography: Land Surface Processes
GEOG 220 Meteorology
GEOG 320 Water and Society

***GROUP VII: Natural Resource/Environmental Policy:***
12 credits from . . . . . 12
(including a minimum of six credits from FREC choices):
ECON 306 Public Choice
ECON 332 Public Finance and Fiscal Policy
ECON 360 Government and Business
EGTE 416 Project Economics Analysis
FREC 406 Agriculture and Natural Resource Policy
FREC 429 Community Economic Development
FREC 450 Environmental Law and Policy
POSC 220 Introduction to Public Policy
POSC 350 Politics and the Environment

***GROUP VIII: Ethics:***
3 credits from: . . . . . 3
PHIL 200 Business Ethics
PHIL 202 Contemporary Moral Problems
PHIL 203 Ethics
PHIL 340 Cross Cultural Environmental Ethics
PHIL 448 Environmental Ethics

**ELECTIVES**
After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only four credits of HESC 120 activity or four credits of performing Music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 130**

## HONORS BACHELOR OF SCIENCE: NATURAL RESOURCE MANAGEMENT

The recipient of this degree must complete:
1. All requirements for the Bachelor of Science: Natural Resource Management.
2. All of the University's requirements for the Honors Baccalaureate degree (see page 52). Courses at the 600-level that satisfy requirements in the major will be considered to be Honors courses for the degree.

## PLANT AND SOIL SCIENCES

Telephone: (302) 831-2531
E-mail: dfrey@udel.edu
http://ag.udel.edu
Faculty Listing: http://ag.udel.edu/plsc/faculty/facultyStaff.htm

Plant and Soil Sciences includes disciplines of study that apply chemical, biological, and physical principles toward insuring adequate food supplies in a safe and aesthetic environment. Faculty in the department have teaching and research programs in plant molecular biology, botany, anatomy, physiology, taxonomy, genetics-plant breeding, cell and tissue culture, pathology, ornamental horticulture, landscape design, crop and vegetable science, soil chemistry, soil management, soil physics, and soil microbiology. Undergraduate students often are involved in some aspect of these research programs, which strengthens and broadens their understanding of science.

Students can major in Environmental Soil Science, Plant Science, or Landscape Horticulture and Design with a concentration in Landscape Horticulture, Landscape Design or Public Horticulture. Minors are offered in Environmental Soil Science and Landscape Horticulture. The department also co-offers the interdisciplinary majors Natural Resource Management and Plant Protection.

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: ENVIRONMENTAL SOIL SCIENCE

CURRICULUM CREDITS

See page 73 for University and College requirements.

### MAJOR REQUIREMENTS

CHEM 101/102
or
CHEM 103/104 General Chemistry I and II . . . . . 8
CHEM 213 Organic Chemistry . . . . . 4
CHEM 220/221 Quantitative Analysis with Lab . . . . . 4
ENGL 410 Technical Writing . . . . . 3
GEOG 220 Meteorology . . . . . 3
GEOL 107 General Geology I . . . . . 4
MATH 221 Calculus I . . . . . 3
PHYS 201 Introductory Physics I . . . . . 4
PLSC 101 Botany I . . . . . 4
PLSC 151 Introduction to Crop Science . . . . . 3
PLSC 204 Introduction to Soil Science . . . . . 3
PLSC 205 Introduction to Soil Science Lab . . . . . 1
PLSC 305 Soil Fertility and Plant Nutrition . . . . . 4
PLSC 319 Environmental Soil Microbiology . . . . . 4
PLSC 401 Agronomic Crop Science . . . . . 3
PLSC 438 Fate and Transport of Contaminants in Soil . . . . . 3
PLSC 608 Soil Chemistry . . . . . 3

One of the following courses: . . . . . 3-4
FREC 480 Geographic Information Systems in Natural Resource Management
or
GEOG 372 Geographic Information Systems

Three of the following courses: . . . . . 8-9
EGTE 103 Land and Water Management
EGTE 113 Introduction to Land Surveying
EGTE 328 Agricultural Waste Management
FREC 150 Economics of Agriculture and Natural Resources

### ELECTIVES

After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. May include the following suggested courses or other electives.
BISC 321 Environmental Biology
FREC 444 Economics of Environmental Management
GEOG 235 Conservation of Natural Resources
GEOL 415 General Geomorphology
GEOL 421 Environmental and Applied Geology
GEOL 428 Hydrogeology
PLSC 303 Introductory Plant Pathology
PLSC 603 Soil Physics
PLSC 607 Plant and Soil Water Relations
PLSC 619 Soil Microbiology
POSC 350 Politics and the Environment
Only two credits of HESC 120 activity or performing Music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## HONORS BACHELOR OF SCIENCE: ENVIRONMENTAL SOIL SCIENCE

The recipient of this degree must complete:
1. All requirements for the Bachelor of Science: Environmental Soil Science.
2. All of the University's requirements for the Honors Baccalaureate degree (see page 52). Courses at the 600-level that satisfy requirements in the major will be considered to be Honors courses for the degree.

## MINOR IN ENVIRONMENTAL SOIL SCIENCE

The minor in Environmental Soil Science is open to students in any major and requires a total of 17-18 credits, as follows:
PLSC 204 Introduction to Soil Science . . . . . 3
PLSC 205 Introduction to Soil Science Lab . . . . . 1
PLSC 305 Soil Fertility and Plant Nutrition . . . . . 4

Three of the following courses: . . . . . 9-10
PLSC 151 Introduction to Crop Science
PLSC 319 Environmental Soil Microbiology
PLSC 401 Agronomic Crop Science
PLSC 603 Soil Physics
PLSC 608 Environmental Soil Chemistry

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: LANDSCAPE HORTICULTURE AND DESIGN

CURRICULUM CREDITS

See page 73 for University and College Requirements.

### MAJOR REQUIREMENTS

CHEM 101 General Chemistry . . . . . 4
PLSC 101 Botany I . . . . . 4
PLSC 133 Ornamental Horticulture . . . . . 3
PLSC 171 New Student Colloquium . . . . . 1
PLSC 201 Botany II . . . . . 4
PLSC 204 Introduction to Soil Science . . . . . 3
PLSC 205 Introduction to Soil Science Lab . . . . . 1
PLSC 211 Herbaceous Landscape Plants . . . . . 3
PLSC 212 Woody Landscape Plants . . . . . 4
PLSC 214 Indigenous Woody Plants of Eastern US . . . . . 4

In addition to completing the above requirements, one of the following concentrations must be completed:

Landscape Horticulture
Landscape Design
Public Horticulture

***Landscape Horticulture Concentration***

In addition to fulfilling the Major requirements, the following requirements also must be completed:

**Concentration Requirements**

EGTE 113 Introduction to Surveying . . . . . 2
ENWC 201 Wildlife Conservation and Ecology . . . . . 3
ENWC 205 Elements of Entomology . . . . . 3
FREC 150 Economics of Ag and Natural Resources . . . . . 3
PLSC 232 Landscape Design I . . . . . 4
PLSC 331 Landscape Construction Systems . . . . . 4
PLSC 313 Turf Establishment and Maintenance . . . . . 4
PLSC 364 Environmental Horticulture Internship . . . . . 3
PLSC 403 Nursery and Garden Center Management . . . . . 4
PLSC 455 Issues in Plant and Soil Sciences . . . . . 3
SPAN 105 Spanish 1-Elementary . . . . . 4

**Three credits from the following Communication courses:**

AGRI 212 Oral Communication in Agriculture and Natural Resources
COMM 212 Oral Communication in Business
COMM 350 Public Speaking
ENGL 312 Written Communication in Business
ENGL 410 Technical Writing

**Three credits from the following business-related courses:**

ACCT 207 Accounting
ACCT 352 Law and Social Issues in Business
CNST 200 Consumer Economics
CNST 242 Consumer Movement in Perspective
ECON 151 Introduction to Microeconomics
ECON 152 Introduction to Macroeconomics
FREC 201 Records and Accounts
FREC 212 Food Retailing and Product Management
FREC 302 Management of Agribusiness Firms
FREC 404 Food and Fiber Marketing
FREC 406 Agricultural and Natural Resource Policy
FREC 430 Establishing and Managing a Food and Agribusiness Enterprise
PHIL 200 Business Ethics
POSC 220 Introduction to Public Policy
POSC 301 State and Local Government
PLSC 333 Bidding and Estimating

### ELECTIVES

After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only two credits of HESC 120 activity or performing music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

***Landscape Design Concentration***

Admission to the concentration is required. See below for details. In addition to fulfilling the Major requirements, the following requirements also must be completed:

**Concentration Requirements**

| | | |
|---|---|---|
| EGTE 113 | Introduction to Surveying | 2 |
| PLSC 103 | Landscape and Field Sketching | 4 |
| PLSC 202 | History of Landscape Design | 3 |
| PLSC 232 | Basic Landscape Design | 4 |
| PLSC 333 | Estimating and Bidding | 1 |
| PLSC 301 | CAD for Landscape Designers | 3 |
| PLSC 330 | Landscape Construction Materials and Methods | 4 |
| PLSC 331 | Landscape Construction Systems | 4 |
| PLSC 364 | Internship | 3 |
| PLSC 408 | Advanced Landscape Design | 4 |
| PLSC 450 | Planting Design | 4 |
| PLSC 455 | Issues in Plant and Soil Sciences | 3 |
| SPAN 105 | Spanish I - Elementary | 4 |
| PLSC 203 | Portfolio Review | 1 |

Students will be admitted to the concentration upon successful completion of 45 credit hours of undergraduate study (cumulative grade point average of 2.5 or higher) and submission of an acceptable portfolio of their own work. The Landscape Design Concentration candidate is required to attend their portfolio review. No student will be admitted to the concentration without a successful portfolio review.

Prior to review, a candidate must have successfully completed Landscape and Field Sketching (PLSC 103), a course that will help students prepare a portfolio for the review process; History of Landscape Design (PLSC 202); Basic Landscape Design (PLSC 232); and one of the ART courses listed below. Students should submit 15 to 20 images or examples of their creative work, along with a writing sample, that will offer insight into their creative problem solving skills and experiences in visual arts.

Examples of projects acceptable for the portfolio include (but are not limited to) figure and landscape drawing and/or painting, ceramics, photography, digital design work and written projects. A minimum of one project from each of the required courses must be included in the portfolio.

The candidate's portfolio will be reviewed by a committee comprised of PLSC faculty and professionals in the landscape design field. Students will be reviewed on individual merit and not compared to other applicants. For each review, the portfolios are ranked into two categories: admissible and not admissible. If a student receives a "not admissible" portfolio review, academic advising is provided to help the student choose an alternate concentration based on the talents and strengths of the student.

Three credits from the following Art courses:

| | |
|---|---|
| ART 129 | Design in Visual Arts |
| ART 130 | Drawing I: Tools and Techniques |
| ART 138 | Elementary Drawing and Painting 1 |

Three credits from the following business-related courses:

| | |
|---|---|
| ACCT 207 | Accounting |
| ACCT 352 | Law and Social Issues in Business |
| CNST 200 | Consumer Economics |
| CNST 242 | Consumer Movement in Perspective |
| ECON 151 | Introduction to Microeconomics |
| ECON 152 | Introduction to Macroeconomics |
| FREC 201 | Records and Accounts |
| FREC 212 | Food Retailing and Product Management |
| FREC 302 | Management of Agribusiness Firms |
| FREC 404 | Food and Fiber Marketing |
| FREC 406 | Agricultural and Natural Resource Policy |
| FREC 430 | Establishing and Managing a Food and Agribusiness Enterprise |
| PHIL 200 | Business Ethics |
| PLSC 403 | Nursery and Garden Center Management |
| POSC 220 | Introduction to Public Policy |
| POSC 301 | State and Local Government |

**ELECTIVES**

After required courses are completed,sufficient credits must be taken to meet the minimum credits required for the degree. Only two credits of HESC 120 activity or performing music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF .....124**

***Public Horticulture Concentration***

In addition to fulfilling the Major requirements, the following requirements also must be completed:

**Concentration Requirements:**

| | | |
|---|---|---|
| ENWC 205 | Elements of Entomology | 3 |
| FREC 150 | Economics of Ag and Natural Resources | 3 |
| LEAD 100 | Leadership, Integrity, and Change | 3 |
| LEAD 404 | Leadership in Organizations | 3 |
| PLSC 202 | History of Landscape Design | 3 |
| PLSC 253 | Triad Internship | 3 |
| PLSC 313 | Turf Establishment and Maintenance | 4 |
| PLSC 433 | Public Garden Management | 3 |
| PLSC 453 | Capstone Public Horticulture Practicum | 3 |
| PLSC 465 | Seminar: Public Horticulture | 1 |

Three credits from the following Communication courses:

| | |
|---|---|
| COMM 212 | Oral Communication in Business |
| COMM 350 | Public Speaking |
| ENGL 312 | Written Communications in Business |

Six credits from the following Business courses:

| | |
|---|---|
| ACCT 207 | Accounting |
| ACCT 352 | Law and Social Issues in Business |
| FREC 201 | Records and Accounts |
| FREC 406 | Agricultural and Natural Resource Policy |
| PHIL 200 | Business Ethics |
| POSC 220 | Introduction to Public Policy |
| POSC 301 | State and Local Government |
| PLSC 403 | Nursery and Garden Center Management |

Three credits from the following Related Issues in Management courses:

| | |
|---|---|
| UAPP 602 | Intro. to Comprehensive Planning |
| UAPP 616 | Volunteer Management |
| UAPP 621 | Conflict Resolution |
| UAPP 642 | Strategic Planning: Public & Nonprofits |
| UAPP 644 | Grantsmanship and Proposal Writing |
| UAPP 670 | Fund Dev.: Fundraising from Individuals |
| UAPP 671 | Fund Dev.: Fundraising from Institutions |

**ELECTIVES**

After required courses are completed,sufficient credits must be taken to meet the minimum credits required for the degree. Only two credits of HESC 120 activity or performing music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF .....124**

## HONORS BACHELOR OF SCIENCE: LANDSCAPE HORTICULTURE AND DESIGN

The recipient of this degree must complete:

1. All requirements for the Bachelor of Science: Landscape Horticulture and Design.
2. All of the University's requirements for the Honors Baccalaureate degree (see page 52). Courses at the 600-level that satisfy requirements in the major will be considered to be Honors courses for the degree.

## MINOR IN LANDSCAPE HORTICULTURE

The minor in Landscape Horticulture is open to students in any major and requires a total of 17-18 credits, as follows:

| | | |
|---|---|---|
| PLSC 101 | Botany I | 4 |
| PLSC 133 | Ornamental Horticulture | 3 |
| PLSC 211 | Herbaceous Landscape Plants | 3 |
| PLSC 212 | Woody Landscape Plants | 4 |

One of the following five courses: . . . . . 3-4

| | |
|---|---|
| PLSC 204 | Introduction to Soil Science |
| PLSC 232 | Landscape Design |
| PLSC 313 | Turf Establishment and Maintenance |
| PLSC 331 | Landscape Construction |
| PLSC 422 | Plant Propagation |

## DEGREE: BACHELOR OF SCIENCE
## MAJOR: PLANT SCIENCE

CURRICULUM CREDITS

See page 73 for University and College Requirements.

Three credits in an approved course or courses stressing multi-cultural, ethnic, and/or gender-related course content (see pages 69-71) . . . . . 3

**MAJOR REQUIREMENTS**

***Mathematics***

Mathematics course . . . . . 3

***Professional Studies***

CHEM 101/102 General Chemistry I and II
or
CHEM 103/104 General Chemistry I and II . . . . . 8
CHEM 213 Elementary Organic Chemistry . . . . . 4

One of the following: . . . . . 3-4
PHYS 201 Introduction to Physics
GEOL 107 General Geology
CHEM 214 Elementary Biochemistry
GEOG 255 Applied Climatology

PLSC 101 Botany I . . . . . 4
PLSC 201 Botany II. . . . . 4
PLSC 204 Introduction to Soil Science. . . . . 3
PLSC 205 Introduction to Soil Science Lab. . . . . 1
PLSC 300 Principles of Animal and Plant Genetics . . . . . 3
PLSC 303 Introductory Plant Pathology . . . . . 4
PLSC 305 Soil Fertility and Plant Nutrition . . . . . 4
PLSC 410 Introduction to Plant Physiology . . . . . 3

**ELECTIVES**

After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only two credits of HESC 120 activity or two credits of performing Music credit may be counted toward the degree.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## HONORS BACHELOR OF SCIENCE: PLANT SCIENCE

The recipient of this degree must complete:

1. All requirements for the Bachelor of Science: Plant Science.
2. All of the University's requirements for the Honors Baccalaureate degree (see page 52). Courses at the 600-level that satisfy requirements in the major will be considered to be Honors courses for the degree.

## PLANT PROTECTION

Telephone: (302) 831-2526 or (302) 831-2531
email: jhough@udel.edu or tomevans@udel.edu
http://ag.udel.edu

Because of mutual interests and problems in the field of pest management, the Department of Entomology and Wildlife Ecology and the Department of Plant and Soil Sciences offer a joint major, Plant Protection. In a world of expanding human population and increasing pressure on supplies of food and fiber, studies in plant pathology, entomology, and weed science can lead to a challenging and satisfying career that contributes to human welfare. This combined major allows students to study applied and basic aspects of insects, plant diseases, and weeds. Courses and field experience emphasize recognition of pests and their symptoms and strategies for pest management compatible with agriculture and the environment.

**DEGREE: BACHELOR OF SCIENCE**
**MAJOR: PLANT PROTECTION**

CURRICULUM CREDITS

See page 73 for University and College requirements.

**MAJOR REQUIREMENTS**

FREC 135 Introduction to Data Analysis . . . . . 3
MATH 115 Pre-Calculus or higher level. . . . . 3
BISC 207/208 Introductory Biology I and II . . . . . 8
CHEM 101/102
or
CHEM 103/104 General Chemistry . . . . . 8
ENWC 205 Elements of Entomology . . . . . 3
ENWC 215 Entomology Laboratory . . . . . 2
ENWC 406 Insect Identification—Taxonomy. . . . . 3
ENWC 411 Insect Pest Management . . . . . 3
ENWC 465 Senior Capstone Experience . . . . . 1
PLSC 151 Intro ot Crop Sciene. . . . . 3
PLSC 201 Botany II. . . . . 4
PLSC 303 Introductory Plant Pathology . . . . . 4
A plant production course selected from PLSC 105, 133, or 302 . . . . . 3-4
A plant pathology or related course from PLSC 319, 411, 416, or 429 . . . . 3-4
Nine additional ENWC and/or PLSC credits` . . . . . 9

**ELECTIVES**

Beyond required courses, sufficient credits must be taken to meet the minimum credits required for the degree. Courses in agriculture, biology, statistics, and the physical sciences and additional writing courses are recommended. Only two credits of HESC 120 or performing music may be counted toward the degree.

The choice of department in which to complete the remaining credits provides the student with the opportunity to emphasize applied entomology, plant pathology, or weed science in his or her program. Students should consult with their advisor on course selection to choose electives that will provide an education best suited to their goals.

**CREDITS TO TOTAL A MINIMUM OF . . . . . 124**

## THE ASSOCIATE IN SCIENCE DEGREE

The College of Agriculture and Natural Resources offers a two-year Associate in Science (AS) degree in Newark. This degree is ideal for students interested in agriculture who desire to spend only two years working toward a degree or who are unsure of their plans for higher education. Admission requirements for the associate degree are the same as for the baccalaureate degree.

The Associate in Science offers an extremely flexible curriculum. The student must complete a minimum of 62 credit hours, with at least 30 of the credits earned within at least four of the five departments in the college. A minimum of 32 credits for the degree must be earned at the University of Delaware. In addition, the recipient must have a minimum GPA of 2.0. A candidate must apply for the associate degree during the academic term in which all requirements for the degree are to be completed and must, at the time of application, be enrolled in the college.

Although not recommended, a student could take all 62 credits in agricultural courses. A better approach would be for the student to take some course work in the areas of physical science, social science, English, and mathematics, along with his or her courses in agriculture. This approach would allow the student to more easily complete a BS degree program at a later date.