COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

Undergraduate Programs

- **Dean's Scholar Program**
- **Preveterinary Instruction**
- **Agricultural and Technology Education**
- **Animal and Food Sciences**
- **Bioresources Engineering**
- **Entomology and Applied Ecology**
- **Food and Resource Economics**
- **General Agriculture**
- **Natural Resource Management**
- **Plant and Soil Sciences**
- **The Associate in Science Degree**

In the College of Agriculture and Natural Resources, business, science and technology are utilized 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 in the College of Agriculture and Natural Resources provide the undergraduate student: (1) knowledge pertaining to a specific agricultural science, (2) fundamental training in other basic sciences, and (3) a broad, general educational experience. The curricula provide a flexible program of study designed to keep the student up to date on the rapid changes and improvements in agriculture. Frequent counsultation with a faculty advisor helps the student make steady progress toward achieving these educational goals.

Undergraduate majors are offered in resource economics, agricultural and technology education, animal science, bioresources engineering technology, engineering technology, entomology, environmental soil science, food and agribusiness management, food science and technology, general agriculture, landscape horticulture, natural resource management, plant biology, plant protection, plant science, statistics, and wildlife conservation. Concentrations are available in agricultural and natural resources education, animal biotechnology, applied animal science, environmental economics, food marketing, food science, food technology, general animal science, preveterinary medicine, and technology education. Students interested in engineering technology or general agriculture may complete their degree requirements on the Newark campus or at Dover or Georgetown.

College faculty foster undergraduate student involvement in the University Honors Program through sponsorship of Science and Engineering Scholars and candidates for the Degree with Distinction. The teaching philosophy of the faculty is to emphasize basic knowledge pertaining to agriculture and natural resources.

DEAN'S SCHOLAR PROGRAM

The Dean's Scholar Program exists to serve the needs of 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 Associate or 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 Arts and Science and in Agriculture and Natural Resources may qualify for Honors Degrees. Contact the Assistant/Associate Dean in the college or go to http://www.udel.edu/provost/acadprog.html for more information and the application.

PREVETERINARY INSTRUCTION

Students in the College of Agriculture and Natural Resources who wish to prepare for entrance to a veterinary school should consult with the Department of Animal and Food Sciences. See the preveterinary undergraduate curriculum in department listing.

AGRICULTURAL AND TECHNOLOGY EDUCATION

This program offers a Bachelor of Science degree that qualifies the individual for teacher certification in two concentration areas, agricultural and natural resources education and technology education.

The Agricultural and Natural Resources Education concentration provides students with an opportunity to gain a broad understanding and professional preparation in the areas of animal science, plant and soil sciences, food science, engineering technology, entomology and wildlife conservation, agricultural economics, agribusiness, natural resource management, and biotechnology. Students develop and practice their leadership skills through participation in FFA activities and other student organizations.

The Technology Education concentration supplies students with the basic knowledge and skills needed for the next millennium. Students study the resources, systems, and products of technology and their social and cultural impact in three focus areas: communications, physical, and bio-related. Communications covers subjects such as graphics, photography, audio and video, drafting and design, electronic and telecommunications, desktop publishing, and other communications related topics. The physical area covers topics in construction, manufacturing, transportation, and other engineering-related subject matter. The bio-related area provides opportunities to study subjects related to biotechnology, environment technology, bioengineering, and other bio-related topics.

Both concentrations provide the pedagogical skills that give the student 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 both the classroom and laboratory setting using modern technology and techniques.

The curriculum in this major is arranged individually with the liaison professor in agricultural and technology education.

Telephone: (302) 831-1320
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http://ag.udel.edu/academicprograms/majors/agricultural_education.htm

DEGREE: BACHELOR OF SCIENCE
MAJOR: AGRICULTURAL AND TECHNOLOGY EDUCATION

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

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

MAJOR REQUIREMENTS

Computer Science

Computer Science course (FREC 135 or equivalent) 3

Agricultural and Biological Sciences 9-12

Minimum of one course in three of the following areas: Animal and Food Sciences, Engineering Technology, Food and Resource Economics (except FREC 135), Entomology and Applied Ecology, Plant and Soil Sciences, or Biological Science.

Literature and Arts 9

Nine credits from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed in these departments.

Social Sciences and Humanities 9

Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed in these departments.

Professional Studies

ATED 480	Career & Technical Education Materials & Approaches I	3
ATED 481	Career & Technical Education Materials & Approaches II	3
EDUC 419	Diversity in the Classroom (fulfills the University multicultural requirement)	3
EDUC 413	Educational Psychology – Social Aspects	3
EDUC 414	Educational Psychology – Cognitive Aspects	3
EDUC 420	Reading in the Content Area	1
EDUC 430	Classroom Management	1
EDUC 400	Student Teaching	9

The Agricultural and Technology Education program requires a 2.5 minimum overall G.P.A. and successfully completing the requirements of Praxis I for enrollment in EDUC 400, Student Teaching, a course required for the degree. The teacher education program adviser (see list on p. 184) should be consulted for other policies concerning qualifications for student teaching.

A minimum grade of C- is required in all ATED and EDUC courses.

In addition to completing the requirements of the core curriculum in Agricultural and Technology Education, students must complete the requirements for a concentration in Agricultural and Natural Resources Education or a concentration in Technology Education, as listed below.

DEGREE: BACHELOR OF SCIENCE
MAJOR: AGRICULTURAL AND TECHNOLOGY EDUCATION
CONCENTRATION: AGRICULTURAL AND NATURAL RESOURCES EDUCATION

Students must complete all the requirements for the core curriculum in Agricultural and Technology Education, in addition to the concentration requirements below.

Mathematics 3

Mathematics Course

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

Technical Agriculture & Natural Resources Courses 30

A 2.75 index in at least thirty credits of technical agriculture and natural resource courses from at least three departments in the college. Students are to meet with their Agricultural and Technology Education advisor before selecting these 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 and/or four credits of performing Music credit may be counted toward the degree.

CREDITS TO TOTAL A MINIMUM OF 124

DEGREE: BACHELOR OF SCIENCE
MAJOR: AGRICULTURAL AND TECHNOLOGY EDUCATION
CONCENTRATION: TECHNOLOGY EDUCATION

Students must complete all the requirements for the core curriculum in Agricultural and Technology Education, in addition to the concentration requirements below.

Mathematics 3

MATH 115 Pre-Calculus or higher level (MATH 221 strongly recommended; students taking MATH 115 will also need FREC 240 or equivalent.)

Physical Sciences 11-12

Minimum of eleven credits selected from one of the following course sequences:

CHEM 101/102 or 103/104 and a Physics course
PHYS 201/202 or 207/208 and a Chemistry course

Technology Courses 30

A 2.75 index in at least thirty credits of technology courses in the three focus areas: communications, physical, and bio-related, with at least six credit hours in each area. The remaining twelve credits are to be selected from one of the focus areas matching the student's interest. Students are to meet with their Agricultural and Technology Education advisor before selecting these 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 and/or four credits of performing Music credit may be counted toward the degree.

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

ANIMAL AND FOOD SCIENCES

The Department of Animal and Food Sciences offers undergraduate major programs leading to the Bachelor of Science degree as well as minor programs in Animal Science and in Food Science and Technology.

The Animal Science major encompasses a wide range of disciplines in which the principles of biology, chemistry and biochemistry are applied to animal agriculture. Instruction is offered in animal nutrition, physiology, genetics, and reproduction; in animal health and molecular biology; and in dairy, livestock and poultry management. The department offers four areas of concentration within the major: preveterinary medicine, animal biotechnology, applied animal science, and general animal science. Animal health, management, nutrition, molecular biology and physiology constitute areas in which the animal science student may wish to specialize. Students interested in pursuing graduate studies in the animal sciences are well prepared by available course work and laboratory experiences. Students interested in veterinary medicine have the opportunity to obtain preveterinary training required for admission to veterinary school. The preveterinary concentration is designed to meet not only the department, college, and University requirements for the B.S. degree, but also the admission requirements of the U.S. veterinary schools to which students apply. Students are encouraged to participate in a broad realm of animal science research projects in the department through independent study/special problems courses. An Honors Degree option is offered for all the concentrations in the Animal Sciences major. A minor in Animal Science is also available.

The Food Science and Technology 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. Students must choose one of two concentrations within the Food Science and Technology major. The Food Science Concentration has a greater 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. The Food Technology Concentration provides a curriculum which has less emphasis on the sciences; however, it allows the flexibility to choose minors in related disciplines such as Food and Agribusiness Management or Nutrition or to take courses in Hotel, Restaurant and Institutional Management. An Honors Degree option is offered in the Food Science major for both concentrations. A minor in Food Science is also available.

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http://ag.udel.edu/departments/anfs/index html

DEGREE: BACHELOR OF SCIENCE
MAJOR: ANIMAL SCIENCE
CONCENTRATION: GENERAL ANIMAL SCIENCE

CURRICULUM		CREDITS
UNIVERSITY REQUIREMENTS		
ENGL 110	Critical Reading and Writing (with minimum grade of C-)	3
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p. 57)		3
MAJOR REQUIREMENTS		
Computer Science course (FREC 135 or equivalent)		3
Agricultural and Biological Sciences		6-8
Minimum of one course in two of the following areas: Food and Resource Economics (except FREC 135), Food Science, Engineering Technology, Entomology and Applied Ecology, or Plant and Soil Sciences.		
Literature and Arts		6
Six credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed in these departments.		
Social Sciences and Humanities		9
Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed in these departments.		
MATH 115 or higher		3
BISC 207/208	Introductory Biology I and II	8
CHEM 101/102	General Chemistry I and II	
or		
CHEM 103/104	General Chemistry I and II	8
ANSC 101	Introduction to Animal Science	3
ANSC 111	Animal Science Laboratory	1
ANSC 140	Functional Anatomy	4
ANSC 251	Livestock Nutrition and Feeding	4
ANSC 265	Sophomore Seminar	1
ANSC 300	Principles of Animal and Plant Genetics	3
ANSC 332	Introduction to Animal Diseases	3
ANSC 345	Comparative Physiology of Domestic Animals	
or		
ANSC 441	Reproductive Physiology of Domestic Animals	3-4
Elective Animal Science courses		5
One course must be selected from the following:		4
ANSC 404	Dairy Production	
ANSC 417	Beef Cattle and Sheep Production	
ANSC 418	Swine Production	
ANSC 421	Poultry Production	

No more than five credits of ANSC 266, 366, 466, or 666 Special Problem/Independent Study may be used for the major.

Credit toward the major will be granted for only two of the following: ANSC 221, 322, 342, or 420. (ANSC 399 may be taken one time for a maximum of 2 credits toward graduation.)

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 and/or four credits of performing Music credit may be counted toward the degree.

Recommended Electives

FREC 201	Records and Accounts
ANSC 270	Biotechnology: Science and Socioeconomic Issues
ANSC 399	Teaching Assistant
ANSC 420	Equine Management
BISC 300	Introduction to Microbiology
COMM 350	Public Speaking
ENGL 312	Written Communications in Business

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

DEGREE: BACHELOR OF SCIENCE
MAJOR: ANIMAL SCIENCE
CONCENTRATION: ANIMAL BIOTECHNOLOGY

All requirements for the General Animal Science program must be met. The following courses are also required for the concentration:

Within the Concentration

ANSC 270	Biotechnology: Science and Socioeconomic Issues	3
ANSC 310	Animal Genetics Laboratory	1
ANSC 345	Comparative Physiology of Domestic Animals	4
ANSC 466	Independent Study (Approved research project)	3
ANSC 470	Molecular Genetics	3
BISC 300	Introduction to Microbiology	4
BISC 301	Molecular Biology of the Cell	4
CHEM 321/322	Organic Chemistry	8
CHEM 527	Introductory Biochemistry	
or		
CHEM 214/216	Elementary Biochemistry	
or		
CHEM 641/642	Biochemistry	3-6
MATH 221	Calculus I	3
PHYS 201/202	Introductory Physics I and II	8
Select one 600-level course from ANSC or Biology (see recommended electives)		3-4

ELECTIVES

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

Recommended Electives

ANSC 399	Teaching Assistant
ANSC 436	Immunology of Domestic Animals
ANSC 624	Monogastric Nutrition
ANSC 633	Poultry Pathology
ANSC 635	Introduction to Virology
ANSC 643	Molecular Endocrinology
ANSC 644	Bioinformatics
ANSC 645	Avian Physiology
ANSC 654	Ruminant Nutrition
BISC 601	Immunochemistry
BISC 602	Molecular Biology of the Cell
BISC 650	Bacterial Physiology
BISC 653	Recent Advances in Molecular Biology
BISC 654	Biochemical Genetics
BISC 658	Developmental Genetics
BISC 671	Immunobiology
BISC 679	Virology
BISC 693	Human Genetics
CHEM 220	Quantitative Analysis
CHEM 418	Introductory Physical Chemistry
COMM 350	Public Speaking
ENGL 312	Written Communication in Business
FOSC 439/639	Food Microbiology
FOSC 449/649	Fermentation Technology

CREDITS TO TOTAL A MINIMUM OF 130

DEGREE: BACHELOR OF SCIENCE
MAJOR: ANIMAL SCIENCE
CONCENTRATION: APPLIED ANIMAL SCIENCE

All requirements for the General Animal Science program must be met. The following courses are also required for the concentration:

Within the Concentration

ANSC 441	Reproductive Physiology	3
CHEM 213	Elementary Organic Chemistry	4
CHEM 214/216	Elementary Biochemistry with Lab	4
ENTO 205	Elements of Entomology	3
FREC 150	Economics of Agriculture and Natural Resources	3
FREC 201	Records and Accounts	3
PLSC 151	Introduction to Crop Science	3
PLSC 204	Introduction to Soil Science	3
Select one additional course from the following:		4
ANSC 404	Dairy Production	
ANSC 417	Beef Cattle and Sheep Production	
ANSC 418	Swine Production	
ANSC 421	Poultry Production	

ELECTIVES

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

Recommended Electives

ANSC 270	Biotechnology: Science and Socioeconomic Issues
ANSC 399	Teaching Assistant
ANSC 420	Equine Management
ANSC 436	Immunology of Domestic Animals
ANSC 438	Immunologic Techniques
BISC 300	Introduction to Microbiology
COMM 312	Oral Communication in Business
ENGL 312	Written Communications in Business
EGTE 328	Agricultural Waste Management Systems
FREC 350	Farm Management
PLSC 401	Agronomic Crop Science

CREDITS TO TOTAL A MINIMUM OF 130

DEGREE: BACHELOR OF SCIENCE
MAJOR: ANIMAL SCIENCE
CONCENTRATION: PREVETERINARY MEDICINE

All requirements for the General Animal Science program must be met The following courses are also required for the concentration:

Within the Concentration

ANSC 310	Animal Genetics Laboratory	1
ANSC 345	Comparative Physiology of Domestic Animals	4
BISC 300	Introduction to Microbiology	4
CHEM 321/322	Organic Chemistry	8
CHEM 527	Introductory Biochemistry	
or		
CHEM 214/216	Elementary Biochemistry	
or		
CHEM 641/642	Biochemistry	3-6
MATH 221	Calculus	3
PHYS 201/202	Introductory Physics I and II	8

ELECTIVES

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

Recommended Electives

FREC 201	Records and Accounts
ANSC 270	Biotechnology: Science and Socioeconomic Issues
ANSC 399	Teaching Assistant
ANSC 436	Immunology of Domestic Animals
ANSC 438	Immunologic Techniques
ANSC 635	Introduction to Virology
COMM 312	Oral Communication in Business
ENGL 312	Written Communications in Business
FREC 408	Research Methods

CREDITS TO TOTAL A MINIMUM OF 130

HONORS BACHELOR OF SCIENCE
ANIMAL SCIENCE

The recipient of this degree must complete:

1. All requirements for the Bachelor of Science: Animal Science (any concentration).
2. All the University generic requirements for the Honors degree (see page 43). Courses with the ANSC 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, ENTO, or BISC will, if taken as Honors, count toward the 12 Honors credits required in the major or in collateral disciplines.
3. A grade-point index of at least 3.400 in the major.

REQUIREMENTS FOR A MINOR IN ANIMAL SCIENCE

The minor in animal science requires 18 credits in animal science including the following: ANSC 101; 111; 251; 332; 441; and one course from ANSC 404, 417, 418, 420, and 421.

DEGREE: BACHELOR OF SCIENCE
MAJOR: FOOD SCIENCE AND TECHNOLOGY
CONCENTRATION: FOOD SCIENCE

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (with minimum grade of C-) 3
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p. 57) 3

MAJOR REQUIREMENTS

Agricultural and Biological Sciences 3-4
One course in any of the following areas: Engineering Technology, Animal Science, Entomology and Applied Ecology, or Plant and Soil Sciences.

Literature and Arts 6
Six credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed in these departments.

Social Sciences and Humanities 9
Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed in these departments.

Professional Studies

CHEM 101/102 General Chemistry
or
CHEM 103/104 General Chemistry 8

CHEM 214 Elementary Biochemistry
or
CHEM 527 Introductory Biochemistry 3

PHYS 201/202 Introductory Physics I and II 8
BISC 207/208 Introductory Biology I and II 8
BISC 300 Introduction to Microbiology 4
CHEM 220 Quantitative Analysis I 3
CHEM 221 Quantitative Analysis Laboratory 1
CHEM 321/322 Organic Chemistry 8
CHEM 418 Introductory Physical Chemistry 3
NTDT 200 Nutrition Concepts 3

MATH 221/222 Calculus I and II
or
MATH 241/242 Analytic Geometry and Calculus A and B 6-8

FREC 135 Introduction to Data Analysis 3
FREC 408 Research Methods 3

A minimum grade of C must be achieved for credits to count toward the fulfillment of 36 credits in FOSC; a minimum grade of 2.00 in 200-level courses must be achieved to proceed to upper-level courses; only 300-level courses and a maximum of four credits of Special Problems/Independent Study (FOSC x66) may count toward the fulfillment of this requirement. (FOSC 399, Teaching Assistant, may be taken one time allowing a maximum of 2 credits toward graduation.)

FOSC 102 Food for Thought 3
FOSC 265 Seminar: Food Science 1
FOSC 305 Food Science 3
FOSC 328 Food Chemistry 4
FOSC 329 Food Analysis 4
FOSC 359 Topics in Food Science 1
FOSC 409 Food Processing 4
FOSC 411 Food Science Capstone 4
FOSC 439 Food Microbiology 4
FOSC 445 Food Engineering Technology 4
FOSC 449 Food Biotechnology 4

ELECTIVES

After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only two credits of activity-type Physical Education and four credits of Music credits and four credits of 100- and 200-level courses in Military Science/Air Force may be counted toward the degree.

Recommended Electives

CHEM 419 Introductory Physical Chemistry
CHEM 445 Physical Chemistry Laboratory

CREDITS TO TOTAL A MINIMUM OF 128

DEGREE: BACHELOR OF SCIENCE
MAJOR: FOOD SCIENCE AND TECHNOLOGY
CONCENTRATION: FOOD TECHNOLOGY

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (with minimum grade of C-) 3
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p. 57) 3

MAJOR REQUIREMENTS

Agricultural and Biological Sciences 3-4
One course from any of the following areas: Bioresources Engineering, Animal Science, Entomology and Applied Ecology, or Plant and Soil Sciences

Literature and Arts 6
Six credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or any courses cross-listed in these departments.

Social Sciences and Humanities 9
Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or any courses cross-listed in these departments.

Professional Studies

CHEM 101/102 General Chemistry 8
CHEM 213 Elementary Organic Chemistry 4
CHEM 214/216 Elementary Biochemistry with Lab 4
CHEM 220 Quantitative Analysis 3
CHEM 221 Quantitative Analysis Laboratory 1
PHYS 104 Elementary Physics 3
BISC 207/208 Introductory Biology I and II 8
BISC 300 Introduction to Microbiology 4
NTDT 200 Nutrition Concepts 3
MATH 221/222 Calculus I and II 6

FREC 135 Introduction to Data Analysis 3
FREC 408 Research Methods 3

A minimum grade of C must be achieved for credits to count toward the fulfillment of 36 credits in FOSC; a minimum grade of 2.00 in 200-level courses must be achieved to proceed to upper-level courses; only 300-level courses and a maximum of four credits of Special Problems/Independent Study (FOSC x66) may count toward the fulfillment of this requirement. (FOSC 399, Teaching Assistant, may be taken one time allowing a maximum of 2 credits toward graduation.)

FOSC 102 Food for Thought 3
FOSC 265 Seminar: Food Science 1
FOSC 305 Food Science 3
FOSC 328 Food Chemistry 4
FOSC 329 Food Analysis 4
FOSC 359 Topics in Food Science 1
FOSC 409 Food Processing 4
FOSC 411 Food Science Capstone 4
FOSC 439 Food Microbiology 4
FOSC 445 Food Engineering Technology 4
FOSC 449 Food Biotechnology 4

ELECTIVES

After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Only two credits of activity-type Physical Education and four credits of Music credits and four credits of 100- and 200-level courses in Military Science/Air Force may be counted toward the degree.

CREDITS TO TOTAL A MINIMUM OF 128

HONORS BACHELOR OF SCIENCE: FOOD SCIENCE AND TECHNOLOGY

The recipient of this degree must complete:

1. All requirements for the Bachelor of Science: Food Science and Technology (either concentration).
2. All the University generic requirements for the Honors degree (see page 43). 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 related technical area will, if taken as Honors,

count toward the total of Honors credits required in the major or in collateral disciplines.
3. A grade-point index of at least 3.400 in the major at the time of graduation.

REQUIREMENTS FOR A MINOR IN FOOD SCIENCE

The minor in food science requires 15 food science credits and provides students in other degree programs with an opportunity to acquaint themselves with food science. Course selection depends on completion of prerequisites and other science and math preparation.

Student Eligibility Requirements

1 The minor is awarded only to students who have applied and been admitted to the program.
2 The minor in Food Science requires a minimum of 15 food science credits, including FOSC 305/306 (3 credits), and any 3 other FOSC courses above the 300-level.
3 A C grade or 2.00 or higher is required in all FOSC courses for the minor in Food Science.
4. Successful completion of MATH 221/222 Calculus I and II (6 credits) mathematics courses is required prior to taking food science courses for the minor.

FOSC 305/306	Food Science & Laboratory	3
Select any 3 courses from:		12
FOSC 328	Food Chemistry	
FOSC 329	Food Analysis	
FOSC 409	Food Processing	
FOSC 411	Food Science Capstone	
FOSC 439	Food Microbiology	
FOSC 445	Food Engineering Technology	
FOSC 449	Food Biotechnology	

Prerequisities 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 on readiness for specific FOSC courses and course selection for the minor.

CREDITS TO TOTAL A MINIMUM OF 15

BIORESOURCES ENGINEERING

The Bioresources Engineering Department offers undergraduate majors in Bioresources Engineering Technology and Engineering Technology. Both majors are accredited by the Accreditation Board for Engineering and Technology (ABET).

Bioresources engineering technology is the application of engineering techniques in such areas as production mechanization, energy, soil and water conservation, plant and animal environments, agricultural waste management, processing and storage, and building construction. This requires a knowledge of physical and natural sciences and technical skills to support engineering activities.

The bioresources engineering technology curriculum is designed to prepare students for engineering-related employment in agricultural, natural resources, and environmental industries. A scientific or business background may be obtained according to the student's interest through the selection of electives in the College of Agriculture and Natural Resources and other colleges of the University.

The computer is a heavily used tool throughout the bioresources engineering technology curriculum. Students are urged to purchase a personal computer. Please contact the department chair for further information on computer specifications.

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http://ag.udel.edu/departments/bioeng/index.html

DEGREE: BACHELOR OF APPLIED SCIENCE
MAJOR: BIORESOURCES ENGINEERING TECHNOLOGY

CURRICULUM		CREDITS
UNIVERSITY REQUIREMENTS		
ENGL 110	Critical Reading and Writing (with minimum grade C-)	3
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p. 57)		3
MAJOR REQUIREMENTS		
Communications		
Six additional credits to provide training in oral and written communications.		6
EGTE 365	Junior Seminar	1
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 200	Introduction to Human Communication Systems	
COMM 255	Fundamentals of Communication	
COMM 312	Oral Communication in Business	
COMM 350	Public Speaking	
COMM 356	Small Group Communication	
Social Sciences and Humanities		
ECON 151	Introduction to Microeconomics	3
ECON 152	Introduction to Macroeconomics	3
Nine additional credits to be selected from a minimum of three of the following areas: Anthropology, Art, Art History, Black American Studies, Criminal Justice, Economics, Education, English, Foreign Language, Geography, History, Music, Philosophy, Political Science, Psychology, Sociology, Theatre, or Women's Studies, or courses cross-listed in these departments.		9
Basic Sciences and Mathematics		
CHEM 103/104	General Chemistry I and II	8
PHYS 207/208	Fundamentals of Physics I and II	8
MATH 241/242/243	Analytic Geometry and Calculus A, B and C	12
Select one of the following Biology/Life Sciences options (I, II, or III):		7-8
I		
BISC 207/208	Introductory Biology I and II	
II		
BISC 103/113 and ENTO 201	General Biology and Wildlife Conservation and Ecology	
III		
PLSC 101 and ENTO 201	Botany I and Wildlife Conservation and Ecology	
Technical Sciences		
EGTE 215	Introduction to Hydraulics	4
EGTE 244	Electricity for Engineering Technology	4
EGTE 311	Fundamentals of Thermodynamics	3
EGTE 354	Rural/Light Industrial Buildings	4
Three credits selected from one of the following areas: Dynamics, Electronics, Materials Technology, or Strength of Materials. EGTE courses that satisfy this requirement are:		3
EGTE 344	Electronics and Microprocessors	
EGTE 435	Machinery Design and Development	
Technical Skills		
EGTE 111	Computer Applications in Engineering Technology	3
EGTE 125	Intro. to Bioresources Engineering Tech.	2
EGTE 209	Computer Aided Drafting	3
EGTE 223	Surveying	3
EGTE 443	Instrumentation	3
Technical Specialization		
EGTE 321	Storm-Water Management	4
EGTE 328	Waste Management Systems	3
EGTE 421	Bioresources Management Systems	4
EGTE 431	Mechanical Aspects of Biological and Natural Resources	4
EGTE 451	Senior Design	3

One of the following: 3-4
BREG 628 Land Application of Wastes
EGTE 331 Mechanical Power Units
EGTE 440 Plant Layout and Materials Handling
EGTE 444 Programmable Logic Control Systems
EGTE 445 Food Engineering Technology
EGTE 456 Fundamentals of HVAC

Technical Support

PLSC 204 Introduction to Soil Science 4
A minimum of three credits in biology/life sciences or natural resources, excluding courses used to satisfy the Biology, Chemistry, and Physics group 3
A minimum of eleven credits in the Bioresources Engineering Department or related courses approved by the student's advisor 11

To graduate with a major in Bioresources Engineering Technology, the student must attain an average 2 0 index in all courses with a BREG or EGTE prefix.

ELECTIVES

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

CREDITS TO TOTAL A MINIMUM OF 130

ENGINEERING TECHNOLOGY

Engineering technology is part of the broad discipline of engineering, in which a 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 or cost. Close liaison is maintained between the educational programs and employers to give graduates the greatest opportunity for career development.

Two concentrations are available within the major: technical applications and technical management. The *technical applications* concentration includes coursework in mechanization, energy management, hydraulics and hydrology, building environments, waste management, processing and construction. Students are prepared for engineering-related employment with industry, consulting firms, construction companies, and government agencies. The *technical management* concentration provides basic management concepts utilized in engineering and production-related activities. This concentration is often useful to the part-time student who already has an associate degree in engineering technology and desires to prepare for management opportunities, and for other individuals who need additional technical training.

Students who choose the engineering technology major may take all of the necessary courses at the University of Delaware or they may transfer previously completed appropriate course work from other accredited institutions. Students wishing 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 APPLIED SCIENCE
MAJOR: ENGINEERING TECHNOLOGY

CORE CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (with minimum grade of C-) 3
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p. 57) 3

MAJOR REQUIREMENTS

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
ENGL 415 Writing for the Professions

An oral communications course selected from: 3
COMM 200 Introduction to Human Communication Systems
COMM 255 Fundamentals of Communication
COMM 312 Oral Communication in Business
COMM 350 Public Speaking
COMM 356 Small Group Communication

Social Sciences and Humanities

ECON 151 Introduction to Microeconomics 3
ECON 152 Introduction to Macroeconomics 3
Nine additional credits to be selected from a minimum of three of the following areas: Anthropology, Art, Art History, Black American Studies, Criminal Justice, Economics, Education, English, Foreign Language, Geography, History, Music, Philosophy, Political Science, Psychology, Sociology, Theatre or Women's Studies, or courses cross-listed in these departments 9

Basic Sciences and Mathematics

Biology/Life Science course 3
CHEM 103/104 General Chemistry 8
PHYS 201/202 Introductory Physics I and II
or
PHYS 207/208 Fundamentals of Physics I and II 8
MATH 221/222 Calculus I and II
or
MATH 241/242 Analytic Geometry and Calculus A and B 6-8
MATH 201 Introduction to Statistics I
or
MATH 243 Analytic Geometry and Calculus C 3-4
Elective Mathematics or Statistics course numbered 201 or above 3

To graduate with a major in engineering technology, a student must attain at least a 2 0 average in EGTE courses and must earn at least a C- in all prerequisite courses to qualify for admission to the next course. This requirement is in addition to the University requirement of a 2 0 grade-point average. A student must complete a minimum of 48 semester hours in course work assigned to technical science, technical skills and technical specialization categories.

Technical Sciences

EGTE 215 Introduction to Hydraulics 4
EGTE 244 Electricity for Engineering Technology 4
EGTE 311 Fundamentals for Thermodynamics 3
EGTE 354 Rural/Light Industrial Buildings 4
Three credits selected from one of the following areas: 3
Dynamics, Electronics, Material Technology or Strength of Materials

In addition to completing the requirements of the core curriculum in Engineering Technology, students must complete the requirements for a concentration in Technical Applications or a concentration in Technical Management.

CONCENTRATION: TECHNICAL APPLICATIONS

Students must complete all the requirements for the core curriculum in Engineering Technology, in addition to the concentration requirements below.

Technical Skills

EGTE 111 Computer Application in Engineering Technology 3
EGTE 209 Computer Aided Drafting 3
Microcomputer course (EGTE 112 Personal Computers and Technology preferred) 3
Instrumentation or microprocessor course 3

A maximum of thirty semester credits will be permitted in this category. The selection of courses in the technical skills category must be consistent with the specialization. A maximum of six hours of drafting and one course in computer-aided drafting can be applied towards degree requirements. Also a maximum of eight hours of surveying and topographic mapping and a maximum of six hours of construction, operation, and production techniques can be applied towards degree requirements. For transfer students, after matriculation in the program, course work will normally be limited to instumentation and computer use.

Technical Specialization

One of the following (cannot be satisfied by transfer credit): 3-4
EGTE 321 Storm Water Management
EGTE 331 Mechanical Power Units
EGTE 435 Machinery Design and Development
EGTE 456 Fundamentals of HVAC

Four of the following: 12-15
EGTE 321 Storm Water Management
EGTE 328 Waste Management Systems
EGTE 331 Mechanical Power Units
EGTE 344 Electronics and Microprocessors
EGTE 435 Machinery Design and Development
EGTE 440 Plant Layout and Materials Handling
EGTE 443 Instrumentation
EGTE 444 Programmable Logic Control Systems
EGTE 445 Food Engineering Technology
EGTE 456 Fundamentals of HVAC

Technical Support

Nineteen credits selected to support the specialization and career interests of the student 19

ELECTIVES

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

CREDITS TO TOTAL A MINIMUM OF 130

CONCENTRATION: TECHNICAL MANAGEMENT

Students must complete all the requirements for the core curriculum in Engineering Technology, in addition to the concentration requirements below.

Technical Skills

EGTE 111 Computer Application in Engineering Technology 3
EGTE 209 Computer Aided Drafting 3
Microcomputer course
(EGTE 112 Personal Computers and Technology preferred) 3
Instrumentation or microprocessor course 3

A maximum of thirty semester credits will be permitted in this category. The selection of courses in the technical skills category must be consistent with specialization. A maximum of six hours of drafting and one course in computer-aided drafting can be applied towards degree requiremnets. Also a maximum of eight hours of surveying and topographic mapping and a maximum of six hours of construction, operation and production techniques can be applied toward degree requirements. For transfer students, after matriculation in the program, course work will normally be limited to instrumentation and computer use

Technical Specialization

One of the following (cannot be satisfied by transfer credit): 3-4
EGTE 321 Storm Water Management
EGTE 331 Mechanical Power Unit
EGTE 435 Machinery Design and Development
EGTE 456 Fundamentals of HVAC 3
Additional courses in technical design 5-6
to bring the total technical specialization credits to a minimum of nine.

Technical Management

FREC 201 Records and Accounts
or
ACCT 207 Accounting I 3
Additional courses in technical management 12

Accounting credits cannot exceed six of the fifteen total credit hours. FREC 201 will not substitute for ACCT 207, ACCT 207 will substitute for FREC 201. It is recommended that ACCT 207 and ACCT 208 be taken. Other courses can be selected from certain courses in Business Administration, Engineering Technology or Food and Resource Economics.

ELECTIVES

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

CREDITS TO TOTAL A MINIMUM OF 130

REQUIREMENTS FOR A 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 engineering technology courses in accordance with the requirements listed here. All students must meet the required prerequisites for any engineering technology course before it is taken. Before being admitted to the minor, the student must have successfully completed MATH 222 or MATH 242, CHEM 102 or CHEM 104, and PHYS 202 or PHYS 208. A grade point average of at least 2.0 is required in the 20 credits of engineering technology courses for the minor and in the mathematics and science courses listed above.

The required engineering technology courses are:
EGTE 209 Computer-Aided Drafting 3
EGTE 111 Computer Applications in Engineering Technology 3

An additional 14 credits in engineering technology must be taken of which at least 6 credits must be at the 300-level or higher. 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 concerned with the environment, these courses might include EGTE 103, 104, and 328; for those interested in electronics, EGTE 244 and 344. Courses can also be chosen to give the student's minor an emphasis in other areas such as manufacturing, mechanics, or technical management.

ENTOMOLOGY AND APPLIED ECOLOGY

Entomology emphasizes the structure, physiology, behavior, development, ecology, classification, and management of insects. Applied ecology uses practical methods to manage interrelationships of organisms with each other and their nonliving environment. Pest management and wildlife conservation are examples of applied ecology. Wildlife conservation is the effort to perpetuate free-living, breeding populations of non-domestic native species.

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 courses. The curriculum's flexibility accommodates career goals ranging from research to nature education, conservation advocacy and wildlife management. 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.

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

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http://ag.udel.edu/departments/ento/index.html

DEGREE: BACHELOR OF SCIENCE
MAJOR: ENTOMOLOGY

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (with minimum grade of C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57).

MAJOR REQUIREMENTS

Computer Science

Computer Science course (FREC 135 or equivalent) 3

Agricultural and Biological Sciences 6-8

Minimum of one course in two of the following areas: Food and Resource Economics (except FREC 135), Food Science, Engineering Technology, Animal Science (except ANSC 300), or Plant and Soil Sciences

Literature and Arts 6

Six credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed with these departments

Social Sciences and Humanities 9

Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed with these departments

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

Professional Studies

MATH 115/171 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 General Chemistry
or
CHEM 103/104 General Chemistry 8

ENTO 205 Elements of Entomology 3
ENTO 305 Entomology Laboratory 2
ENTO 406 Insect Identification—Taxonomy 3
ENTO 465 Seminar 1

ENTO 300 Principles of Animal and Plant Genetics 3
ENTO 405 Insect Structure and Function 4
ENTO 408 Field Taxonomy 3
ENTO 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 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 402 Plant Taxonomy

ELECTIVES

After required courses are completed, 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 activity-type Physical Education and performing Music may be counted toward the degree.

CREDITS TO TOTAL A MINIMUM OF 124

PLANT PROTECTION

Because of mutual interests and problems in the field of pest management, the Department of Entomology and Applied 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. It includes courses and field experience emphasizing 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

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (with a minimum grade of C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57).

MAJOR REQUIREMENTS

Computer Science

Computer Science course (FREC 135 or equivalent) 3

Agricultural and Biological Sciences 6-8

Minimum of one course in two of the following areas: Food and Resource Economics (except FREC 135), Food Science, Engineering Technology, Animal Science, Entomology and Applied Ecology, and Plant and Soil Sciences.

Literature and Arts 6

Six credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed with these departments.

Social Sciences and Humanities 9

Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed with these departments.

Professional Studies

MATH 115/171 Pre-Calculus or higher level 3
BISC 207/208 Introductory Biology I and II 8
CHEM 101/102 General Chemistry
or
CHEM 103/104 General Chemistry 8

ENTO 205 Elements of Entomology 3
ENTO 305 Entomology Laboratory 2
ENTO 406 Insect Identification—Taxonomy 3
ENTO 411 Insect Pest Management 3
ENTO 465 Seminar 1
PLSC 101 Botany I 4
PLSC 201 Botany II 4
PLSC 303 Introductory Plant Pathology 4
PLSC 411 Diagnostic Plant Pathology 3
PLSC 470 Weed Biology and Control 4
A plant production course selected from PLSC 105, 133, 213, or 302 3-4
Nine additional ENTO and/or PLSC credits, plus 3 credits of related Internship, Independent Study, Research or Field Experience 12

ELECTIVES

After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Courses in Agriculture, Biology, and the Physical Sciences are recommended. Only two credits of activity-type Physical Education and 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 complete their programs with electives that will provide an education best suited to their goals. Course selection should be made in consultation with the academic advisor during the preregistration period of each term.

CREDITS TO TOTAL A MINIMUM OF 124

DEGREE: BACHELOR OF SCIENCE
MAJOR: WILDLIFE CONSERVATION

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (with minimum grade of C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57).

MAJOR REQUIREMENTS

Computer Science course (FREC 135 or equivalent) 3

Agricultural and Biological Sciences 3-4

One course in any of the following areas: Food and Resource Eco-

nomics (except FREC 135), Food Science, Bioresources Engineering, or Animal Science (except ANSC 300).

Literature and Arts 3
Three credits (not from Group IV) selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed with these departments.

Social Sciences and Humanities 9
Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed with these departments.

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

Professional Studies

MATH 115, 171, 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
ENTO 201 Wildlife Conservation and Ecology 3
ENTO 205 Elements of Entomology 3
ENTO 305 Entomology Laboratory 2
ENTO 325 Wildlife Management 3
ENTO 415 Wildlife Research Techniques 3
ENTO 465 Seminar 1
ENTO courses (may include 3 credits maximum of Independent Study, Research, and Field Experience) 6

Four courses from the following: 11-12
ENTO 318 Taxonomy of Birds
ENTO 406 Insect Identification—Taxonomy
ENTO 408 Insect Field Taxonomy
ENTO 418 Avian Biology
ENTO 424 Herpetology
ENTO 425 Mammalogy
MAST 629 Topics in Marine Ecology: Ichthyology (all 3 sections required)

GROUP I: 7-8 credits from the following (or higher levels of CHEM and PHYS): 7-8
CHEM 213 Elementary Organic Chemistry
CHEM 214 Elementary Biochemistry
CHEM 216 Elementary Biochemistry Laboratory
GEOG 106 Physical Geography: Land Surface Properties
GEOL 107 General Geology
PHYS 201 Introductory Physics I
PHYS 202 Introductory Physics II4
PLSC 204 Introduction to Soil Science

GROUP II: 7-8 credits from the following: 7-8
ANSC 140 Functional Anatomy of Domestic Animals
BISC 300 Introduction to Microbiology
BISC 305 Cell Physiology
BISC 306 General Physiology
BISC 312 General Ecology Lab
BISC 315 Experimental Cell Biology
BISC 316 Experimental Physiology
BISC 324 Invertebrate Zoology
BISC 401 Molecular Biology of the Cell
BISC 403 Genetic and Evolutionary Biology
BISC 411 Molecular Biology of the Cell Laboratory
BISC 442 Vertebrate Morphology
BISC 480 Vertebrate Natural History
BISC 495 Evolution
BISC 637 Population Ecology
ENTO 300 Principles of Animal and Plant Genetics
ENTO 310 Animal and Plant Genetics Laboratory
(same as PLSC 300, 310; may not count for both Group II and III)
MAST 627 Marine Biology

GROUP III: 7-8 credits from the following: 7-8
PLSC 101 Botany I
PLSC 201 Botany II
PLSC 212 Woody Landscape Plants
PLSC 300 Principles of Animal and Plant Genetics
PLSC 306 Plant Molecular Biology
PLSC 310 Animal and Plant Genetics Lab
(same as ENTO 300, 310; may not count for both Group II and III)
PLSC 344 Forest Ecology (same as ENTO 344)
PLSC 402 Plant Taxonomy
PLSC 410 Introduction to Plant Physiology
PLSC 420 Plant Physiology Laboratory

GROUP IV: 6 credits from the following: 6
AGRI 312 Oral Communication in Business (same as COMM 312)
COMM 255 Fundamentals of Communication
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
GEOG 427 Applied Environmental Science
THEA 102 Introduction to Performance
THEA 204 Introduction to Voice and Speech

GROUP V: 6 credits from the following or higher-levels in addition to college math and computer requirements: 6
EGTE 111 Computer Applications in Engineering Technology
or
CISC 105 General Computer Science
or
GEOG 250 Computer Methods in Geography
FREC 408 Research Methods I
FREC 409 Research Methods II
FREC 480 Geographic Information Systems in Natural Resources Management
MATH 221 Calculus I
MATH 222 Calculus II
MATH 230 Finite Mathematics with Applications
STAT 200 Basic Statistical Practice

GROUP VI: 6 credits from the following: 6
ECON 151 Introduction to Microeconomics: Prices and Markets
or
FREC 150 Economics of Agriculture and Natural Resources
(Either of two previous courses is prerequisite to FREC 424, 444)
FREC 424 Resource Economics
FREC 444 Economics of Environmental Management
FREC 450 Topics in Environmental Law
GEOG 235 Conservation of Natural Resources
GEOG 236 Conservation: Global Issues
PHIL 340 Cross-cultural Environmental Ethics
PHIL 448 Environmental Ethics
POSC 105 The American Political System
POSC 220 Introduction to Public Policy
POSC 350 Politics and the Environment
SOCI 331 World Population: Profiles and Trends

ELECTIVES

After required courses are completed, sufficient credits must be taken to meet the minimum credits required for the degree. Number of elective credits depends on number of courses chosen for concentration groups that also satisfy college requirements. Only twocredits of activity-type Physical Education and 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 generic requirements for the Honors Baccalaureate degree (see page 43 of this catalog). Courses with the ENTO prefix taken at the 600-level or higher may be counted as Honors courses in the major. One 3- or 4-credit course in ANSC, PLSC, or BISC will, if taken as Honors, count toward the 12 Honors credits required in the major and/or in collateral disciplines.

REQUIREMENTS FOR A MINOR IN ENTOMOLOGY

The minor in entomology requires 18 credits of ENTO courses including ENTO 205, 305, 406, and 408. 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.

REQUIREMENTS FOR A MINOR IN WILDLIFE CONSERVATION

The minor in wildlife conservation requires 18 credits of courses including ENTO 201, 325 and three courses from among ENTO 205, 305, 318, 406, 418, 424, and 425, of which one must be at the 400-level. Remaining credits may be from any of the 300- and 400-level courses listed above or any other 300- or higher level ENTO course with content primarily focused on taxonomy, ecology, or conservation. 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.

FOOD AND RESOURCE ECONOMICS

The study of 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 utilization, and agricultural and environmental policies.

Undergraduate major programs 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 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 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, and 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. A concentration in environmental economics is offered as part of the resource economics major.

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

CURRICULUM		CREDITS
UNIVERSITY REQUIREMENTS		
ENGL 110	Critical Reading and Writing (minimum grade C-)	3
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p 57)		3
MAJOR REQUIREMENTS		
Agricultural and Biological Sciences		9
Minimum of one course in three of the following areas: Engineering Technology, Animal Science, Food Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology		
Social Sciences and Humanities		6
Minimum of one course in two of the following areas: Anthropology, Black American Studies, Criminal Justice, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed in these departments		
Physical Sciences		8
Minimum of eight credits 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 312	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 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 activity-type Physical Education and/or four credits of performing Music credit may be counted toward the degree. Included in the free electives are suggested Food and Resource Economics courses from the following areas:

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

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 6
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

CREDITS TO TOTAL A MINIMUM OF 128

REQUIREMENTS FOR A 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 also take five of the eight FREC courses listed below with a minimum of two courses in each area:

Marketing/Management Area:

FREC 305	Management and Leadership Development
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

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (with a minimum grade of C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57)

MAJOR REQUIREMENTS

Agricultural and Biological Sciences 9
Minimum of one course in three of the following areas: Food Science, Engineering Technology, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology

Social Sciences and Humanities 6
Minimum of one course in two of the following areas: Anthropology, Black American Studies, Criminal Justice, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed in these departments.

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

Professional Studies

MATH 115	Pre-Calculus (MATH 221 or higher is strongly recommended)	3
COMM 312	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 6
and Economics at the 300-level or higher
Students interested in a minor in Economics should see "The Minor in Economics" in the College of Business and Economics curricula

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 general 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, including Food and Resource Economics, may be counted toward a degree.

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 and/or four credits of performing Music credit may be counted toward the degree.

CREDITS TO TOTAL A MINIMUM OF 124

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 six FREC courses must be taken: 15-16

FREC 406	Agriculture and Natural Resource Policy
FREC 424	Resource Economics–Theory and Policy
FREC 429	Rural Economics Development-Theory and Policy
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 all 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

REQUIREMENTS FOR A 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

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (minimum grade C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57)

COLLEGE REQUIREMENTS

Skill Requirements

Writing: (minimum grade C-) 3
A second writing course involving significant writing experience including two papers with a combined minimum of 3,000 words to be submitted for extended faculty critique of both composition and content. This course must be taken after completion of 60 credit hours. Appropriate writing courses are normally designated in the semester's Registration Booklet. (See list of courses approved for second writing requirement, page 83.)

Foreign Language: 0-12
Completion of the intermediate-level course (107 or 112) in a given language. Number of credits needed and initial placement will depend on number of years of high school study of foreign language. Students with four or more years of high school work in a single foreign language may attempt to fulfill the requirement in that language by taking an exemption examination.
French, Russian or German is recommended.

Breadth Requirements (See page 85)
A total of twenty-one credits from Groups A, B and C is required with a minimum of six credits in each group. The six credits from each group could be from the same area. 21

Group A: Understanding and appreciation of the creative arts and humanities.

Group B: The study of culture and institutions over time.

Group C: Empirically based study of human beings and their environment.

MAJOR REQUIREMENTS

A grade of C- or better is required for all major courses and related work. Students lacking adequate preparation for MATH 242 should begin with MATH 241.

MATH 205 Statistical Methods 4
MATH 210 Discrete Mathematics I 3
MATH 242 Analytic Geometry and Calculus B 4
MATH 243 Analytic Geometry and Calculus C 4
MATH 245 Concepts of Analysis 3
MATH 349 Elementary Linear Algebra 3
MATH 302 Ordinary Differential Equations 3
MATH 426 Introduction to Numerical Analysis and Algorithmic Computation 3
MATH 401 Introduction to Real Analysis 3
STAT 370 Introduction to Statistical Analysis I 3
STAT 371 Introduction to Statistical Analysis II 3
STAT 418 Sampling Methods 3
STAT 420 Data Analysis and Nonparametric Statistics 3
STAT 611 Regression Analysis 3
STAT 615 Design and Analysis of Experiments 3
One of the following: 3
STAT 616 Design and Analysis of Experiments II
STAT 617 Multivariate Methods
STAT 618 Sampling Techniques

ENGL 312 Written Communications in Business 3
Two-semester sequence of laboratory science 8
(Courses designed for non-majors in a discipline are not appropriate.)

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 the department. Students must meet regularly with the advisor to develop it.

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 128

REQUIREMENTS FOR A 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.

REQUIREMENTS FOR A 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 of 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.

GENERAL AGRICULTURE

For the undergraduate student with broad interests, the major in general agriculture is offered. This program is administered through the Office of the Dean of Agriculture and Natural Resources.

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

DEGREE: BACHELOR OF SCIENCE
MAJOR: GENERAL AGRICULTURE

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (Minimum grade C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57)

MAJOR REQUIREMENTS

Mathematics and Computer Science

Mathematics course 3
Computer Science course (FREC 135 or equivalent) 3

Agricultural and Biological Sciences 9-12
Minimum of one course in three of the following areas: Food and Resource Economics (except FREC 135), Food Science, Bioresources Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences

Social Sciences and Humanities 9
Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed in these departments.

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

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 312 Oral Communication in Business
COMM 200 Introduction to Human Communication Systems
COMM 255 Fundamentals of Communication
COMM 312 Oral Communication in Business
COMM 350 Public Speaking
COMM 356 Small Group Communication

Within the college

Thirty additional credits from any of the following departments: 30
Food and Resource Economics, Bioresources Engineering, Agriculture, Animal Science, Entomology and Applied Ecology, Food Science, or Plant and Soil Sciences. (Fifteen of the 30 credits must be in courses specifically required by other majors in the college.) A maximum of twelve credits of Special Problem/Independent Study credits in all areas may be counted toward the degree, with a maximum of six credits in any one department.

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 and/or four credits of performing Music credit may be counted toward the degree.

CREDITS TO TOTAL A MINIMUM OF 130

NATURAL RESOURCE MANAGEMENT

Natural Resource Management is an interdepartmental undergraduate major administered by the Departments of Entomology and Applied 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 in the 21st century, together with the skills and capabilities to address those problems in the 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 will also have a broad interdisciplinary education in the arts, humanities, social sciences and environmental ethics.

Interested students should contact Dr. Steven Hastings, 209 Townsend Hall (302-831-1318).

http://ag.udel.edu/adacemicprograms/majors/natural_resource_management.htm

DEGREE: BACHELOR OF SCIENCE
MAJOR: NATURAL RESOURCE MANAGEMENT

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (minimum grade C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57)

MAJOR REQUIREMENTS

Literature and Arts 6
Six credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed in these departments

Social Sciences and Humanities 6
Minimum of one course in two of the following areas: Anthropology, Black American Studies, Criminal Justice, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed in these departments.

Professional Studies

AGRI 165 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 General Chemistry I and II
or
CHEM 103/104 General Chemistry I and II 8
ECON 151 Introduction to Microeconomics 3
ECON 152 Introduction to Macroeconomics 3
ENTO 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 4

GROUP I: Communications: 6 credits from the following: 6
(including a minimum of three credits in oral communications)
Any course satisfying the College of Arts and Science 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

AGRI 312 Oral Communication in Business
FREC 345 Strategic Selling and Buyer Communication
UNIV 401/402 Senior Thesis (Any student successfully completing a Senior Thesis may count three credits toward the writing course requirement of this group.)

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
ENTO 325 Wildlife Management
ENTO/PLSC 440 Integrated Disease and 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
ENTO 205 Elements of Entomology
ENTO 305 Entomology Laboratory
ENTO 406 Insect Identification - Taxonomy
ENTO 318 Taxonomy of Birds
ENTO 418 Avian Biology
ENTO 425 Mammology
ENTO 426 Aquatic Insects
PLSC 212 Woody Landscape Plants
PLSC 303 Introductory Plant Pathology
PLSC 402 Plant Taxonomy

GROUP VI: Land and Water Management: 6 credits from: 6
EGTE 103 Land and Water Management
EGTE 113 Land Surveying
EGTE 328 Waste Management Systems
GEOL 107 General Geology
GEOG 101 Physical Geography
GEOG 206 Physical Geography: Topography-Soils
GEOG 220 Meteorology
GEOG 320 Water and Society

GROUP VII: Natural Resource/Environmental Policy: 12 credits from (including a minimum of six credits in Food and Resource Economics): 12
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 Economics
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 activity-type Physical Education and/or four credits of performing Music credit may be counted toward the degree.

CREDITS TO TOTAL A MINIMUM OF 130

PLANT AND SOIL SCIENCES

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 active 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 Plant Science, Landscape Horticulture, Plant Biology or Environmental Soil Science. Minors are offered in Environmental Soil Science, Landscape Horticulture, and Plant Biology. The department also co-offers the interdisciplinary majors Natural Resource Management and Plant Protection.

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

DEGREE: BACHELOR OF SCIENCE
MAJOR: ENVIRONMENTAL SOIL SCIENCE

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (minimum grade C-) 3
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p. 57) 3

MAJOR REQUIREMENTS

Computer Science
Computer Science course (FREC 135 or equivalent) 3

Agricultural and Biological Sciences 3-4
One course in any of the following areas: Animal Science, Food Science, Entomology and Applied Ecology, or Biology

Literature and Arts 3
Three credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed in these departments.

Social Sciences and Humanities 6
Minimum of one course in two of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies or courses cross-listed in these departments

Professional Studies
CHEM 101/102 General Chemistry I and II
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 4
PLSC 305 Environmental Soil Management 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 two courses: 3-4
FREC 480 Geographic Information Systems in Natural Resource Management
or
GEOG 372 Geographic Information Systems
Three of the following four courses: 8-9
EGTE 103 Land and Water Management
EGTE 113 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

CREDITS TO TOTAL A MINIMUM OF 124

REQUIREMENTS FOR A 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 4
PLSC 305 Environmental Soil Management 4

Three of the following five 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

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (minimum grade C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57).

MAJOR REQUIREMENTS

Mathematics and Computer Science

Mathematics course 3
Computer Science course (FREC 135 or equivalent) 3

Literature and Arts 3

Three credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed in these departments

Social Sciences and Humanities 9

Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies or courses cross-listed in these departments.

Professional Studies

CHEM 101/102 General Chemistry I and II
or
CHEM 103/104 General Chemistry I and II 8
CHEM 213 Organic Chemistry 4
EGTE 103 Land and Water Management 3
ENTO 205 Elements of Entomology 3
FREC 150 Economics of Agricultural and Natural Resources 3
PLSC 101 Botany I 4
PLSC 133 Ornamental Horticulture 3
PLSC 201 Botany II 4
PLSC 204 Introduction to Soil Science 4
PLSC 211 Herbaceous Landscape Plants 3
PLSC 212 Woody Landscape Plants 4
PLSC 300 Principles of Animal and Plant Genetics 3
PLSC 303 Introductory Plant Pathology 4
PLSC 305 Environmental Soil Management 4
PLSC 313 Turf Establishment and Maintenance 4
PLSC 332 Basic Landscape Design 4
PLSC 364 Ornamental Horticulture Internship
or
PLSC 366 Independent Study 3
PLSC 410 Introduction to Plant Physiology 3
PLSC 455 Issues in Horticulture. 3
PLSC 470 Weed Biology and Control 3

One of the following Communication courses: 3
AGRI 312 Oral Communication in Business
COMM 312 Oral Communication in Business
COMM 350 Public Speaking
ENGL 312 Written Communication in Business
ENGL 410 Technical Writing

One of the following business-related courses: 3
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 Est 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 activity-type Physical Education and performing Music credit may be counted toward the degree.

CREDITS TO TOTAL A MINIMUM OF 124

REQUIREMENTS FOR A 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 313 Turf Establishment and Maintenance
PLSC 331 Landscape Construction
PLSC 332 Landscape Design
PLSC 422 Plant Propagation

DEGREE: BACHELOR OF SCIENCE MAJOR: PLANT BIOLOGY

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (minimum grade C-) 3
Three credits in an approved course or courses stressing 3
multicultural, ethnic, and/or gender-related content (see p. 57).

MAJOR REQUIREMENTS

Mathematics and Computer Science

Mathematics course 3
Computer Science course (FREC 135 or equivalent) 3

Agricultural and Biological Sciences 3-4

One course in any of the following areas: Food Science, Engineering Technology, Animal Science, or Entomology and Applied Ecology

Literature and Arts 3

Three credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed in these departments.

Social Sciences and Humanities 9

Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies or courses cross-listed in these departments.

Professional Studies

BISC 207 Introductory Biology I ... 4
BISC 300 Introduction to Microbiology ... 4
CHEM 101/102 General Chemistry I and II
or
CHEM 103/104 General Chemistry I and II ... 8
CHEM 213 Elementary Organic Chemistry
or
CHEM 321/322 Organic Chemistry ... 4-8
One of the following: ... 3-8
CHEM 214/216 Elementary Biochemistry and Lab
CHEM 527 Biochemistry
CHEM 641/642 Biochemistry
One of the following Communication courses: ... 3
AGRI 312 Oral Communication in Business
COMM 312 Oral Communication in Business
COMM 350 Public Speaking
ENGL 312 Written Communications in Business
ENGL 410 Technical Writing
PLSC 101 Botany I ... 4
PLSC 201 Botany II ... 4
PLSC 204 Introduction to Soil Science ... 4
PLSC 300 Principles of Plant and Animal Genetics ... 3
PLSC 303 Introductory Plant Pathology ... 4
PLSC 306 Introduction to Plant Molecular Biology ... 4
PLSC 410 Introduction to Plant Physiology ... 3
PLSC 435 Plant Development Biology ... 3
FREC 408 Research Methods ... 3
ENTO 465 Seminar ... 1
Other Life Science Courses ... 12
Minimum of four courses with at least six credits at the 400-level or above. See advisor for list of approved courses in various interest areas

ELECTIVES

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

Suggested courses include:
PHYS 201 or higher Introductory Physics
(Recommended for students interested in graduate school)
CHEM 220/221 Quantitative Analysis

CREDITS TO TOTAL A MINIMUM OF ... 124

REQUIREMENTS FOR A MINOR IN PLANT BIOLOGY

The minor in Plant Biology is open to students in any major and requires a minimum of 15 credits from the following:

PLSC 101 Botany I (4 cr.)
PLSC 201 Botany II (4 cr.)
PLSC 204 Introduction to Soil Science (4 cr.)
PLSC 300 Principles of Animal and Plant Genetics (3 cr.)
PLSC 303 Introductory Plant Pathology (4 cr.)
PLSC 306 Introduction to Plant Molecular Biology (3 cr.)
PLSC 402 Plant Taxonomy (3 cr.)
PLSC 410 Plant Physiology (3 cr.)
PLSC 411 Diagnostic Plant Pathology (3 cr.)
PLSC 414 Plant Cell and Tissue Culture (4 cr.)
PLSC 416 Plant Virology (4 cr.)
PLSC 435 Plant Development Biology (3 cr.)
PLSC 440 Integrated Pest and Disease Management (3 cr.)
PLSC 444 The Physiology of Plant Stress (3 cr.)
PLSC 602 Physiological Plant Productivity (3 cr.)
PLSC 605 Plant Breeding (3 cr.)
PLSC 607 Plant and Soil Water Relations (3 cr.)
PLSC 615 Vascular Plant Anatomy (3 cr.)

DEGREE: BACHELOR OF SCIENCE
MAJOR: PLANT SCIENCE

CURRICULUM CREDITS

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (minimum grade C-) ... 3
Three credits in an approved course or courses stressing ... 3
multicultural, ethnic, and/or gender-related content (see p. 57).

MAJOR REQUIREMENTS

Mathematics and Computer Science

Mathematics course ... 3
Computer Science course (FREC 135 or equivalent) ... 3

Agricultural and Biological Sciences ... 9-12

Minimum of one course in three of the following areas: Food and Resource Economics (except FREC 135), Food Science, Engineering Technology, Animal Science, Food Science, Entomology and Applied Ecology, or Biology.

Literature and Arts ... 6

Six credits selected from English, Art, Art History, Communication, Music, Theatre, or Foreign Language, or courses cross-listed in these departments.

Social Sciences and Humanities ... 9

Minimum of one course in three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Geography, History, Philosophy, Political Science, Psychology, Sociology, or Women's Studies, or courses cross-listed in these departments.

A course may be applied toward both the major requirements and a college requirement, but credits are counted only once toward graduation.

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: ... 4
PHYS 101 Introduction to Physics
GEOL 105 General Geology
CHEM 214 Elementary Biochemistry
PLSC 101 Botany I ... 4
PLSC 201 Botany II ... 4
PLSC 204 Introduction to Soil Science ... 4
PLSC 300 Principles of Animal and Plant Genetics ... 3
PLSC 303 Introductory Plant Pathology ... 4
PLSC 305 Environmental Soil Management ... 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 activity-type Physical Education and/or two credits of performing Music organization credit may be counted toward the degree.

CREDITS TO TOTAL A MINIMUM OF ... 124

THE ASSOCIATE IN SCIENCE DEGREE

A two-year Associate in Science (A.S.) degree is offered by the College of Agriculture and Natural Resources. 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 be in good academic standing (have a minimum grade point average 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. Later application requires the approval of the student's dean.

Although not necessarily 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 B.S. degree program at a later date if desired.

For those students in Kent and Sussex Counties, the first year could be taken in Dover or Georgetown in the University Parallel Program at the Delaware Technical & Community College. This option would require careful planning, since 30 credits of agricultural courses would be needed in the second year at the College of Agriculture and Natural Resources in Newark.