



COLLEGE OF AGRICULTURAL SCIENCES

- Dean's Scholar Program
- Agricultural Education
- Agricultural Engineering
- Animal Science and Agricultural Biochemistry
- Engineering Technology
- Entomology and Applied Ecology
- Entomology/Plant Pathology
- Food and Resource Economics
- Food Science
- Plant and Soil Sciences
- General Agriculture
- Preveterinary Instruction
- The Associate in Science Degree
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Many aspects of science, engineering, and economics are involved in the various professional goals of agricultural study and research. These broad fields of study extend throughout society and provide vocations in such work and services as the invention, development, manufacture, and sale of agricultural machinery, equipment, and chemicals; processing and marketing of farm products; biological research, regulatory, and service work with the U.S. Department of Agriculture and other federal and state agencies; school, college, and extension teaching; scientific investigation in agricultural experiment stations, private industry, and foundations; corporate farm management; ornamental horticulture and nursery management; and consultation work for foreign governments.

The objective of the College of Agricultural Sciences is to prepare students for this great variety of career opportunity in individual enterprise, teaching, and public service. The curricula are planned to provide the 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 that are taking place in agriculture. A program of frequent counseling with a faculty adviser helps the student make steady progress toward achieving these educational goals.

The college's offices, classrooms, and laboratories are housed in Townsend Hall, Worrlow Hall, Fischer Greenhouse Laboratory, and the O.A. Newton Building, located on the south campus 400-acre experimental farm.

The Research and Educational Center at Georgetown provides additional facilities for investigation in broiler and swine production, vegetables, and field crops.

Inspection trips to these facilities, to nearby agricultural laboratories, and to commercial production, processing and marketing plants are scheduled in many of the advanced courses.

Major programs are offered in agricultural business management, agricultural economics, agricultural education, agricultural engineering technology, animal science, entomology, food science, entomology/plant pathology, plant and soil sciences, and general agriculture. Concentrations are available in wildlife conservation, landscape horticulture, agronomy, pathology, general plant science, preveterinary medicine, agricultural biotechnology, applied animal science, general animal science, production and management, and resource economics and rural development.

A program in engineering technology is available for students who have completed an Associate Degree in Engineering Technology or related area. An attractive feature of this program, as well as of the general agriculture program, is that students may complete their degree requirements on the Newark campus or through the Parallel Program at Dover or Georgetown.

The Department of Food Science is located in the College of Agricultural Sciences. The Food Science major is for students with interest and ability in the sciences, particularly chemistry. The food scientist applies chemistry, microbiology, engineering and other basic and applied sciences to the production, processing, preservation, evaluation, distribution, storage, sanitation, and marketing of foods.

A great deal of responsibility is placed upon the student and the faculty adviser to explore different agricultural fields beyond those represented by the courses required for the freshman and sophomore years. In the final two years, courses should be selected with a view to filling gaps in the student's knowledge and experience and avoiding too narrow a specialization. Selection of courses in several different subject matter areas is strongly recommended in order that adequate preparation may be made to meet the diversified demands of most positions in agriculture.

Students electing agricultural education will have as their adviser the liaison professor for the College of Agricultural Sciences and the College of Education. Selected information in the section of this catalog on the College of Education may be helpful to those students interested in agricultural education.

DEAN'S SCHOLAR PROGRAM

Each year, the College of Agricultural Sciences selects a number of highly motivated students who have clearly defined educational goals and good academic records to pursue the Dean's Scholar Program. Students in the program are freed of most college requirements and develop individual programs of study under the supervision of their faculty adviser. The individual program must be put in writing and approved by the appropriate department chair and the associate dean of the college. Additional information is available from the dean's office.

AGRICULTURAL EDUCATION

Varied opportunities are open to those who prepare themselves in this field. This program qualifies the individual for certification by the State Department of Public Instruction as a comprehensive agricultural education instructor. Some students find it desirable to major in a particular area of agricultural sciences and include agricultural education courses in their bachelor's program, while others elect to double major.

A degree in agricultural education qualifies the graduate to serve as an instructor of agriculture in public or private secondary schools, as an instructor of adult classes in agriculture, or as an educational leader with state or federal agencies or private businesses. Other opportunities are to be found in educational administrative posi-

tions, production agriculture, the Agricultural Extension Service, the Soil Conservation Service, and various leadership positions in agricultural organizations and agencies. Those who continue agricultural education studies through graduate school may go into college and university teaching, research, and state, regional, or federal supervisory positions.

Curricula in agricultural education are arranged individually with the liaison professor in agricultural education. Selected information in the section of this catalog on the College of Education may be helpful to the agricultural education major.

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE MAJOR: AGRICULTURAL EDUCATION

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #	3 ¹⁻⁴

COLLEGE REQUIREMENTS

<i>Mathematics and Computer Science</i>	
Mathematics course	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ²
<i>Agricultural and Biological Sciences</i>	9-12 ^{1,2}
Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.	
<i>Literature and Arts</i>	9 ²
Nine credits from English and/or Communication.	
<i>Social Sciences and Humanities</i>	9 ²
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.	
<i>Physical Sciences</i>	8 ¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.	

MAJOR REQUIREMENTS

External to the College

EDST 304 Educational Psychology – Social Aspects	3 ³
EDST 305 Educational Psychology – Cognitive Aspects	3 ³
EDDV 400 Student Teaching	6 ⁴
One of the following three courses:	
EDST 201 Education in American Society	3 ²
EDST 461 Measurement Theory and Techniques for Classroom Teachers	3 ³
EDDV 620 Foundations of Reading Instruction	3 ³

Within the College

A 2.75 index in at least thirty credits of technical agriculture	30 ^{3,4}
from at least three departments in the college	

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements See page 27

Within the Department

Professional Education

AGED 380	Agricultural Education Materials and Approaches I	3 ³
AGED 381	Agricultural Education Materials and Approaches II	3 ³

ELECTIVES

Electives..... 32-35¹⁻⁴

May include Military Science, Music, or Physical Education.
(Only four credits of activity-type Physical Education and/or four credits of performing Music organization credit may be counted toward the degree.)

In order to graduate with a major in Agricultural Education, students must have a minimum of 40 credit hours of General Education.

CREDITS TO TOTAL A MINIMUM OF 130

AGRICULTURAL ENGINEERING

Agricultural engineering technology is a part of the broad discipline of agricultural engineering that bridges two fields of applied sciences: agriculture and engineering. Agricultural 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.

This agricultural engineering technology curriculum is designed to prepare students for engineering-related employment in agricultural industries. A scientific or business background may be obtained according to the student's interest through the selection of electives in the College of Agricultural Sciences and other colleges of the University. To graduate with a major in agricultural engineering technology, students must attain a 2.0 average in agricultural engineering technology courses. This is in addition to the University requirement for graduation that a 2.0 average be attained in all course work at the University.

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

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE MAJOR: AGRICULTURAL ENGINEERING TECHNOLOGY

CURRICULUM

CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110	Critical Reading and Writing	3 ¹
	Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #	3 ¹⁻⁴

COLLEGE REQUIREMENTS

Mathematics and Computer Science

Mathematics course	3-4 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ¹

Agricultural and Biological Sciences

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

Literature and Arts

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities

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.

Physical Sciences

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

MAJOR REQUIREMENTS†

External to the College

Chemistry and Physics

CHEM 103	General Chemistry	4 ²
CHEM 104	General Chemistry	4 ²
PHYS 201	General Physics	4 ²
or		
PHYS 207	General Physics	4
PHYS 202	General Physics	4 ²
or		
PHYS 208	General Physics	4

Mathematics and Statistics

A minimum of 12 credits in mathematics and statistics. Specific requirements are:

MATH 221	Calculus I	3 ¹
or		
MATH 241	Analytic Geometry and Calculus A	4
MATH 222	Calculus II	3 ²
or		
MATH 242	Analytic Geometry and Calculus B	4

Six credits chosen from: 6^{3,4}

Anthropology, Art, Art History, Black American Studies, Criminal Justice, Economics, Education, Foreign Language, Geography, History, Music, Philosophy, Political Science, Psychology, Sociology, Theatre, or Women's Studies.

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27

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

A minimum of one course in written communications chosen from the following:

ENGL 301	Problems in Composition	3 ³
ENGL 302	Advanced Composition	3
ENGL 307	News Writing and Editing	3
ENGL 312	Written Communications in Business	3
ENGL 410	Technical Writing	3

A minimum of one course in oral communications chosen from the following:

COMM 200	Introduction to Human Communication Systems	3 ³
COMM 255	Fundamentals of Communication	3
COMM 350	Public Speaking	3
COMM 356	Small Group Communication	3

Within the College

PLSC 204	Introduction to Soil Science	4 ³
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Within the Department

EGTE 111	Computer Applications in Engineering Technology	3 ¹
EGTE 113	Land Surveying	1 ¹
EGTE 218	Fundamentals of Hydraulic Systems	4 ¹
EGTE 244	Electricity for Engineering Technology	4 ²
EGTE 311	Fundamentals of Thermodynamics	3 ²
EGTE 335	Power and Machinery Management I	4 ²
EGTE 336	Power and Machinery Management II	4 ³
EGTE 323	Soil and Water Conservation	4 ³
EGTE 365	Junior Seminar	1 ³
EGTE 441	Engineering Aspects of Agricultural Process	4 ⁴
EGTE 454	Rural/Light Industrial Buildings	4 ⁴

A minimum of 30 credits in an area of specialization that may be satisfied in part or in total by additional course work in the Agricultural Engineering department or closely related subject matter, a double major within the College of Agricultural Sciences or relevant University-approved minor.

To graduate with a major in Agricultural Engineering Technology, students must attain a 2.0 index in Agricultural Engineering Technology courses.

Electives

Electives 1-2¹⁴

May include Military Science, Music, or Physical Education. (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

ANIMAL SCIENCE AND AGRICULTURAL BIOCHEMISTRY

Animal Science encompasses a wide range of disciplines in which the principles of biology, chemistry and biochemistry are applied to animal agriculture. The Animal Science curriculum prepares students for careers or graduate study in the areas of nutrition, breeding and management of livestock and poultry. Instruction is offered in animal nutrition, physiology, and reproduction; in animal health and molecular biology; and in dairy, livestock and poultry management. Students inter-

ested in veterinary medicine have the opportunity to obtain preveterinary training required for admission to a veterinary school. Suitable courses are also available to students interested in pursuing graduate studies in the animal sciences.

A highly qualified faculty, with expertise in animal and veterinary science, provides curricula to fit the scholastic backgrounds and professional objectives of students. Students are encouraged to participate in a broad realm of research projects under study in the department through independent study/special problems courses. Department faculty foster student involvement in the University Honors Programs through sponsorship of Science and Engineering Scholars and candidates for the Degree with Distinction. The teaching philosophy of the department faculty is to emphasize basic knowledge pertaining to animal science.

The department offers four areas of concentration within the major: preveterinary medicine, agricultural 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.

A curriculum for each concentration follows. 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 most veterinary schools to which students apply.

The department maintains registered and pedigreed Holstein and Guernsey dairy cattle, registered Angus cattle, registered Dorset sheep and a small equine herd for instructional purposes. Laboratory animals are available for undergraduate independent study and for basic research. Various breeds and strains of poultry are maintained for teaching purposes. Facilities for broiler and layer chickens are available at the poultry unit in Newark together with a small-scale, fully equipped broiler house and infectious disease isolation units. An environmentally controlled large animal research laboratory provides facilities suitable for study with cattle and swine. Commercial-type broiler and swine production units are located at the University's Research and Education Center in Georgetown, Delaware.

Modern laboratories provide state-of-the-art equipment for teaching and research in the areas of microbiology and immunology, molecular biology, nutrition and physiology. Students have access to microcomputers and mainframe computer terminals housed within the College of Agricultural Sciences, and at other sites on the University campus. A number of courses within the Animal Science curriculum utilize computer technology and other services provided by the University's Academic Computing Services and Instructional Technology Center.

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

CURRICULUM **CREDITS***

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content.#	3 ¹⁻⁴

COLLEGE REQUIREMENTS

Mathematics and Computer Science

Mathematics course (MATH 115 or higher level)	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ²

Agricultural and Biological Sciences

Minimum of one course outside the student's major in three of the following areas: Food and Resources Economics, Food Science, Agricultural Engineering, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.	9-12 ^{2,3}
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Literature and Arts

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.	6 ^{2,3}
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Social Sciences and Humanities

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.	9 ^{2,3}
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Physical Sciences

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.	8 ¹
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MAJOR REQUIREMENTS

External to the College

CHEM 101 General Chemistry	4 ¹
or	
CHEM 103 General Chemistry	4 ¹
CHEM 102 General Chemistry	4 ¹
or	
CHEM 104 General Chemistry	4 ¹

Within the Department

ANSC 101 Introduction to Animal Science	3 ¹
ANSC 111 Animal Science Laboratory	1 ¹
ANSC 140 Functional Anatomy	4 ¹
ANSC 251 Livestock Nutrition and Feeding	3 ²
ANSC 300 Principles of Animal and Plant Genetics	3 ³
ANSC 332 Introduction to Animal Diseases	3 ³
ANSC 345 Comparative Physiology of Domestic Animals	4 ³
ANSC 465 Seminar	1 ⁴

One course must be selected from the following:

ANSC 404 Dairy Production	3 ³⁻⁴
ANSC 417 Beef Cattle and Sheep Production	3 ³⁻⁴
ANSC 418 Swine Production	3 ³⁻⁴
ANSC 421 Poultry Production	3 ³⁻⁴

Animal Science courses	5 ³
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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.

Within the Concentration

ANSC 310 Animal Genetics Laboratory	1 ³
BISC 207 Introductory Biology I	4 ²
BISC 208 Introductory Biology II	4 ²
BISC 371 Introduction to Microbiology	4 ³
CHEM 321 Organic Chemistry	3 ²
CHEM 325 Organic Chemistry Laboratory	1 ²
CHEM 322 Organic Chemistry	3 ²
CHEM 326 Organic Chemistry Laboratory	1 ²
CHEM 527 Introductory Biochemistry or equivalent	3 ⁴
MATH 221 Calculus	3 ¹
PHYS 201 General Physics	4 ³
PHYS 202 General Physics	4 ³

ELECTIVES

Electives 30-33

May include Military Science, Music, or Physical Education.
 (Only four credits of activity-type Physical Education and/or four credits of performing Music organization credit may be counted toward the degree.)

Recommended Electives

FREC 201 Records and Accounts	3 ²⁻⁴
ANSC 270 Biotechnology: Science and Socioeconomic Issues	3 ²
ANSC 431 Infection and Immunity in Animal Diseases	4 ⁴
ANSC 446 Environmental Physiology of Domestic Animals	4 ³⁻⁴
ANSC 452 Advanced Comparative Animal Nutrition	4 ³⁻⁴
ANSC 635 Introduction to Virology	3 ⁴
COMM 312 Oral Communication in Business	3 ²
ENGL 312 Written Communications in Business	3 ²⁻⁴
FREC 408 Research Methods	3 ³⁻⁴

CREDITS TO TOTAL A MINIMUM OF 130

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: ANIMAL SCIENCE
CONCENTRATION: AGRICULTURAL BIOTECHNOLOGY

CURRICULUM **CREDITS***

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content.#	3 ¹⁻⁴

COLLEGE REQUIREMENTS

Mathematics and Computer Science

Mathematics course (MATH 115 or higher level)	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ²

Agricultural and Biological Sciences 9-12^{2,3}

Minimum of one course outside the student's major in three of the following areas: Food and Resources Economics, Food Science, Agricultural Engineering, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

Literature and Arts

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.	6 ^{2,3}
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Social Sciences and Humanities

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	9 ^{2,3}
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*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

Physical Sciences 8¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

MAJOR REQUIREMENTS**External to the College**

CHEM 101 General Chemistry 4¹
or
CHEM 103 General Chemistry 4¹
CHEM 102 General Chemistry 4¹
or
CHEM 104 General Chemistry 4¹

Within the Department

ANSC 101 Introduction to Animal Science 3¹
ANSC 111 Animal Science Laboratory 1¹
ANSC 140 Functional Anatomy 4¹
ANSC 251 Livestock Nutrition and Feeding 3²
ANSC 300 Principles of Animal and Plant Genetics 3³
ANSC 332 Introduction to Animal Diseases 3³
ANSC 345 Comparative Physiology of Domestic Animals 4³
ANSC 465 Seminar 1⁴

One course must be selected from the following:

ANSC 404 Dairy Production 3³⁻⁴
ANSC 417 Beef Cattle and Sheep Production 3³⁻⁴
ANSC 418 Swine Production 3³⁻⁴
ANSC 421 Poultry Production 3³⁻⁴

Animal Science courses 5³

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.

Within the Concentration

ANSC 270 Biotechnology: Science and Socioeconomic Issues 3²
ANSC 310 Animal Genetics Laboratory 1³
ANSC 431 Infection and Immunity in Animal Diseases 4⁴
ANSC 466 Independent Study (Approved research project) 3⁴
ANSC 670 Molecular Genetics 3⁴
BISC 207 Introductory Biology I 4¹
BISC 208 Introductory Biology II 4¹
BISC 301 Molecular Biology of the Cell 4²⁻³
BISC 371 Introduction to Microbiology 4²⁻³
CHEM 321 Organic Chemistry 3²
CHEM 325 Organic Chemistry Laboratory 1²
CHEM 322 Organic Chemistry 3²
CHEM 326 Organic Chemistry Laboratory 1²
CHEM 527 Introductory Biochemistry 3⁴
or
CHEM 641 and CHEM 642 Biochemistry 6⁴
MATH 221 Calculus 3¹
PHYS 201 General Physics 4³
PHYS 202 General Physics 4³

Select a minimum of one course from the following:

ANSC 624 Monogastric Nutrition 3⁴
ANSC 633 Poultry Pathology 3⁴
ANSC 635 Introduction to Virology 3⁴
ANSC 643 Molecular Endocrinology 3⁴
ANSC 645 Avian Physiology 4⁴
ANSC 654 Ruminant Nutrition 3⁴

One additional course must be selected from the following:

BISC 601 Immunochemistry 4⁴

BISC 602 Molecular Biology of Animal Cells 3⁴
BISC 650 Bacterial Physiology 3⁴
BISC 653 Recent Advances in Molecular Biology 3⁴
BISC 654 Biochemical Genetics 3⁴
BISC 658 Developmental Genetics 3⁴
BISC 671 Immunobiology 3⁴
BISC 679 Virology 3⁴
BISC 693 Human Genetics 3⁴

ELECTIVES

Electives 2-7

May include Military Science, Music, or Physical Education.
(Only four credits of activity-type Physical Education and/or four credits of performing Music organization credit may be counted toward the degree.)

Recommended Electives

CHEM 220 Quantitative Analysis 3²⁻⁴
CHEM 418 Introductory Physical Chemistry 3⁴
COMM 350 Public Speaking 3²
ENGL 312 Written Communications in Business 3²⁻⁴
FOSC 439/639 Food Microbiology 4⁴
FOSC 449/649 Fermentation Technology 4⁴

CREDITS TO TOTAL A MINIMUM OF 130

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

CURRICULUM

CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing 3¹
Three credits in an approved course or courses stressing 3¹⁻⁴
multicultural, ethnic, and/or gender-related content #

COLLEGE REQUIREMENTS*Mathematics and Computer Science*

Mathematics course (MATH 115 or higher level) 3¹
Computer Science course selected from CISC 105, EGTE 111, 3²
FREC 235, or equivalent

Agricultural and Biological Sciences

9-12^{2,3}
Minimum of one course outside the student's major in three of the following areas: Food and Resources Economics, Food Science, Agricultural Engineering, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

Literature and Arts

6^{2,3}
Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities

9^{2,3}
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.

Physical Sciences

8¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

MAJOR REQUIREMENTS**External to the College**

CHEM 101	General Chemistry	4 ¹
or		
CHEM 103	General Chemistry	4 ¹
CHEM 102	General Chemistry	4 ¹
or		
CHEM 104	General Chemistry	4 ¹

Within the Department

ANSC 101	Introduction to Animal Science	3 ¹
ANSC 111	Animal Science Laboratory	1 ¹
ANSC 140	Functional Anatomy	4 ¹
ANSC 251	Livestock Nutrition and Feeding	3 ²
ANSC 300	Principles of Animal and Plant Genetics	3 ³
ANSC 332	Introduction to Animal Diseases	3 ³
ANSC 345	Comparative Physiology of Domestic Animals	4 ³
ANSC 465	Seminar	1 ⁴

One course must be selected from the following:

ANSC 404	Dairy Production	3 ³⁻⁴
ANSC 417	Beef Cattle and Sheep Production	3 ³⁻⁴
ANSC 418	Swine Production	3 ³⁻⁴
ANSC 421	Poultry Production	3 ³⁻⁴

Animal Science courses 5³

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.

Within the Concentration

FREC 120	Elementary Agricultural Economics	3 ¹
FREC 201	Records and Accounts	3 ²⁻³
ANSC 201	Behavior of Domestic Animals	3
ANSC 441	Reproductive Physiology	3 ⁴
ANSC 446	Environmental Physiology of Domestic Animals	4 ⁴
ANSC 452	Advanced Comparative Animal Nutrition	4 ⁴
CHEM 213	Elementary Organic Chemistry	4 ²
CHEM 214	Elementary Biochemistry	3 ²
CHEM 216	Elementary Biochemistry Laboratory	1 ²
ENTO 205	Elements of Entomology	3 ²⁻³
PLSC 151	Introduction to Crop Science	3 ²⁻³
PLSC 204	Introduction to Soil Science	3 ²⁻³

Select a minimum of three courses from the following:

ANSC 404	Dairy Production	3 ³⁻⁴
ANSC 417	Beef Cattle and Sheep Production	3 ³⁻⁴
ANSC 418	Swine Production	3 ³⁻⁴
ANSC 420	Equine Management	3 ³⁻⁴
ANSC 421	Poultry Production	3 ³⁻⁴

ELECTIVES

Electives 21-24

May include Military Science, Music, or Physical Education.
(Only four credits of activity-type Physical Education and/or four credits of performing Music organization credit may be counted toward the degree.)

Recommended Electives

FREC 153	Agricultural Salesmanship	3 ¹⁻²
FREC 350	Farm Management	3 ³⁻⁴
EGTE 328	Agricultural Waste Management Systems	3 ³⁻⁴
ANSC 270	Biotechnology: Science and Socioeconomic Issues	3 ²
ANSC 431	Infection and Immunity in Animal Diseases	4 ⁴

BISC 207	Introductory Biology I	4 ²
BISC 208	Introductory Biology II	4 ²
BISC 371	Introduction to Microbiology	4 ³
COMM 312	Oral Communication in Business	3 ³
ENGL 312	Written Communications in Business	3 ²⁻⁴
PLSC 401	Agronomic Crop Science	3 ⁴

CREDITS TO TOTAL A MINIMUM OF 130

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE**MAJOR: ANIMAL SCIENCE****CONCENTRATION: GENERAL ANIMAL SCIENCE****CURRICULUM****CREDITS*****UNIVERSITY REQUIREMENTS**

ENGL 110	Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #		3 ¹⁻⁴

COLLEGE REQUIREMENTS

<i>Mathematics and Computer Science</i>		
Minimum of one course outside the student's major in three of the following areas: Food and Resources Economics, Food Science, Agricultural Engineering, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.		9-12 ^{2,3}
<i>Literature and Arts</i>		6 ^{2,3}
Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.		
<i>Social Sciences and Humanities</i>		9 ^{2,3}
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.		
<i>Physical Sciences</i>		8 ¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.		

MAJOR REQUIREMENTS**External to the College**

CHEM 101	General Chemistry	4 ¹
or		
CHEM 103	General Chemistry	4 ¹
CHEM 102	General Chemistry	4 ¹
or		
CHEM 104	General Chemistry	4 ¹

Within the Department

ANSC 101	Introduction to Animal Science	3 ¹
ANSC 111	Animal Science Laboratory	1 ¹
ANSC 140	Functional Anatomy	4 ¹
ANSC 251	Livestock Nutrition and Feeding	3 ²
ANSC 300	Principles of Animal and Plant Genetics	3 ³
ANSC 332	Introduction to Animal Diseases	3 ³

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

ANSC 345	Comparative Physiology of Domestic Animals.....	4 ³
ANSC 465	Seminar.....	1 ⁴

One course must be selected from the following:

ANSC 404	Dairy Production.....	3 ³⁻⁴
ANSC 417	Beef Cattle and Sheep Production.....	3 ³⁻⁴
ANSC 418	Swine Production.....	3 ³⁻⁴
ANSC 421	Poultry Production.....	3 ³⁻⁴

Animal Science courses.....	5 ³
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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.

ELECTIVES

Electives..... 58-61

May include Military Science, Music, or Physical Education. (Only four credits of activity-type Physical Education and/or four credits of performing Music organization credit may be counted toward the degree.)

Recommended Electives

FREC 201	Records and Accounts.....	3 ²⁻³
ANSC 270	Biotechnology: Science and Socioeconomic Issues.....	3 ²
BISC 207	Introductory Biology I.....	4 ²
BISC 208	Introductory Biology II.....	4 ²
BISC 371	Introduction to Microbiology.....	4 ³
COMM 350	Public Speaking.....	3 ²
ENGL 312	Written Communications in Business.....	3 ²⁻⁴

CREDITS TO TOTAL A MINIMUM OF 130

REQUIREMENTS FOR A MINOR IN ANIMAL SCIENCE

The minor in animal science requires 16-18 credits in animal science including the following: ANSC 101; 111; 251; 332; one course from ANSC 301, 431, 441, or 446; and one course from ANSC 404, 417, 418, 420, and 421.

ENGINEERING TECHNOLOGY

Engineering technology is part of the broad discipline of engineering, in which a knowledge of the mathematical and natural sciences is applied to utilize materials and forces for the benefit of mankind. Engineering technology requires the application of scientific and engineering knowledge combined with technical skills in support of engineering activities. Technical management, an integral part of the curriculum, provides basic management concepts utilized in engineering and production-related projects.

The engineering technology curriculum provides a student with a strong background in the basic sciences and the latest technological advances in engineering and management concepts. The engineering technologist is a problem solver and is applications oriented. The engineering technology curriculum prepares the engineering technologist to make independent judgments, to under-

stand systems components, and to operate systems to achieve conceptual goals without jeopardizing their effectiveness, safety or cost.

Career opportunities for engineering technologists lie in designing and developing hardware from proven concepts, analyzing and developing products, managing the construction and operation of production processes, servicing machines and systems, and providing sales support for technical products and systems. A major goal of any engineering technology program is to fully prepare graduates for employment opportunities. To accomplish this, close liaison is maintained between the educational programs and industry to give graduates the greatest opportunity for career development and to accommodate industry's needs for competent manpower.

Admission to the engineering technology major requires an Associate Degree in Engineering Technology or equivalent. The curriculum has been structured so that a student may pursue a B.A.S. degree on a full- or part-time basis. Students may complete degree requirements in Newark or through the University Parallel Program at Dover or Georgetown.

Because of mutual interests and problems in production, the ET major is jointly offered by the Department of Agricultural Engineering and the Department of Food and Resource Economics. Prospective students are urged to contact the ET adviser to evaluate their previous academic work prior to seeking formal admission to the program.

DEGREE: BACHELOR OF APPLIED SCIENCES

MAJOR: ENGINEERING TECHNOLOGY

CURRICULUM

CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110	Critical Reading and Writing.....	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content.#		3 ¹⁻⁴

COLLEGE REQUIREMENTS

<i>Communications</i>	6 ¹⁻³
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Six credits selected to provide training in oral and written communications to include:

A second writing course

An oral communications course

<i>Social Sciences and Humanities</i>	15 ¹⁻⁴
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Fifteen credits selected to provide an appreciation and understanding of our cultural heritage, interpersonal relationships, interrelationships between technology and society and a value system for sound decision making to include:

ECON 151	Introduction to Microeconomics.....	3
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ECON 152	Introduction to Macroeconomics.....	3
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Nine credits to be selected from a minimum of three of the following areas: Anthropology, Black American Studies, Criminal Justice, Economics, Education, Foreign Language, Geography, History, Philosophy, Political Science, Psychology, Sociology or Women's Studies

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

<i>Basic Sciences and Mathematics</i>	28 ¹⁻³
Twenty-eight credits selected to provide fundamental knowledge about nature and its phenomena and mathematics including calculus as follows:	
CHEM 103 General Chemistry	4
CHEM 104 General Chemistry	4
PHYS 201 General Physics	4
PHYS 202 General Physics	4
MATH 115 Pre-Calculus	3
MATH 221 Calculus I	3
MATH 222 Calculus II	3
Statistics course	3

MAJOR REQUIREMENTS†

<i>Technical Sciences</i>	15 ¹⁻³
Fifteen credits that deal with the application of engineering science subject matter to include one course in each of the following areas: Electricity, Fluid Mechanics, Statics, and Thermodynamics. In addition, a course must be selected from one of the following areas: Dynamics, Electronics, Materials Technology, or Strength of Materials.	

<i>Technical Skills‡</i>	30 ¹⁻³
Thirty credits selected to provide skills and knowledge of appropriate methods, procedures and techniques and may include computer use, graphics, problem solving, processes, construction techniques, instrumentation techniques, production methods, field operations, plant operations, safety and maintenance to include:	
Instrumentation or microprocessors course	3
FREC 235 Introduction to Data Analysis	3
EGTE 111 Computer Applications in Engineering	3
Technology	

<i>Technical Specialization</i>	9 ²⁻⁴
A minimum of nine credits selected from courses that involve technical design and electives. At least one course that emphasizes use of the computer as a problem-solving tool will be required. A course dealing with the broad discipline of earth and life sciences is strongly recommended.	

<i>Technical Management</i>	15 ²⁻⁴
A minimum of fifteen credits selected to enhance the ability to understand the operation and management of companies and/or their production units to include:	
FREC 201 Records and Accounts	3
or	
ACCT 207 Accounting I	3
ACCT 208 Accounting II	3
Accounting credits cannot exceed six of the fifteen credit hours. FREC 201 will not substitute for ACCT 207. ACCT 207 will substitute for FREC 201.	

CREDITS TO TOTAL A MINIMUM OF 130

Students entering this major are expected to have an associate degree and transfer fifty credits or more.

ENTOMOLOGY AND APPLIED ECOLOGY

Entomology is a biological science that emphasizes insects and their relatives: their structure, physiology, behavior, development, ecology, classification, and control. Applied ecology is the use of practical methods to manage interrelationships of organisms with each other and their nonliving environment. Pest management and wildlife conservation are examples of applied ecology.

Entomology is a separate field of biology because insects are the most varied and abundant animals on earth and because they are vitally important to humans. As prey, predators, parasites, and pollinators, they exert profound influences on ecosystems. The variety of insects challenges the inquisitive student to understand how insects tolerate environmental conditions, reproduce successfully, find specific food species, and develop from egg to adult. Insects are studied in many basic areas of biology such as ecology, behavior physiology, genetics, and evolution. They are of increasing concern to conservation biologists as well.

Some insects attack or damage plants, animals, structures, and stored products that humans value. Others pollinate plants or attack plants and animals that humans consider pests. Still others transmit disease agents. These aspects of insects have prompted a search for ways to manipulate insect populations. Heavy reliance on poisons to limit insect numbers in the past created new problems. Modern applied entomology seeks practical, ecologically sound methods for managing insect populations or coexisting with them.

Faculty who teach the undergraduate courses in the department are doing research on insects or birds in many of the areas noted above. Students have excellent opportunities to interact closely with them through small classes, independent study, field trips, and employment as research aides.

The Department of Entomology and Applied Ecology strives to cultivate inquiring attitudes and problem-solving skills in its students. The faculty emphasizes basic study in biology and other sciences. It also encourages students to be broadly educated through exposure to the social sciences, humanities, and arts and to develop good writing and speaking skills. In total, the department prepares students for full, knowledgeable participation in everyday living whether or not they ultimately choose a career directly related to entomology or wildlife conservation.

The faculty adviser and student jointly plan the course program according to each student's career objective. Successful students enter research, teaching, business and

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

‡Note the following guidelines for technical skills:

1. A maximum of thirty semester hours will be permitted in this category
2. Selection of courses must be consistent with specialization
3. A maximum of six hours of drafting and one course in Computer-Aided Drafting can be applied toward degree requirements.
4. A maximum of eight hours of surveying and topographic mapping can be applied toward degree requirements.
5. A maximum of six hours of construction, production and other techniques, methods or operations i.e., construction, operation and production techniques, can be applied toward degree requirements.
6. After matriculation in the program, course work will normally be limited to instrumentation and computer use.

public service positions, or they pursue graduate degrees in entomology, physiology, genetics, ecology, wildlife conservation, etc., that expand their career opportunities. Admission to, and successful completion of, graduate study require strong academic performance and a solid background in the sciences as preparation.

Students majoring in entomology choose one of two options: *general entomology* or *wildlife conservation*. These options carry no specific requirements but indicate a student's desire to emphasize one or the other aspect in his or her program.

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE MAJOR: ENTOMOLOGY

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #	3 ¹⁻⁴

COLLEGE REQUIREMENTS

<i>Mathematics and Computer Science</i>	
Mathematics course (MATH 115 or higher level)	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ^{1,2}

<i>Agricultural and Biological Sciences</i>	9-12 ¹⁻³
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Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

<i>Literature and Arts</i>	6 ¹⁻³
Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.	

<i>Social Sciences and Humanities</i>	9 ¹⁻³
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.	

<i>Physical Sciences</i>	8 ¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.	

MAJOR REQUIREMENTS†

Within or External to the College

CHEM 101 General Chemistry	4 ¹
CHEM 102 General Chemistry	4 ¹
BISC 207 Introductory Biology I	4 ^{1,2}
BISC 208 Introductory Biology II	4 ^{1,2}
BISC 302 General Ecology	3 ³
AGRI 211 Literature of the Agricultural and Life Sciences	1 ²
Nine credits from the following:	9 ^{3,4}
Biology courses at/or above the 300 level and the following PLSC courses:	
PLSC 151 Introduction to Crop Science	3

PLSC 204 Introduction to Soil Science	4
PLSC 303 Introductory Plant Pathology	4
PLSC 300 Principles of Animal and Plant Genetics	3
PLSC 402 Plant Taxonomy	3

Within the Department**

ENTO 205 Elements of Entomology	3 ¹
ENTO 305 Entomology Laboratory	2 ²
ENTO 405 Insect Structure and Function	4 ⁴
ENTO 406 Insect Identification—Taxonomy	3 ^{3,4}
ENTO 408 Field Taxonomy	2 ^{3,4}
ENTO 465 Seminar	1 ⁴
ENTO courses	9 ²⁻⁴

ELECTIVES

<i>Electives</i>	30 ²⁻⁴
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May include Military Science, Music, or Physical Education (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

Students should complete their programs with electives that broaden their views of the world and strengthen their preparation for a career. Organic chemistry, biochemistry, statistics, and additional writing courses are strongly recommended. A list of suggested courses and other information is available in the department office. Course selection should be made in consultation with the academic adviser during the preregistration period of each term.

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

Wildlife Conservation

An undergraduate major in entomology is appropriate for a student wishing to pursue graduate study and a career in wildlife conservation, ecology, or management. Students interested in this field should consult the PreWildlife Adviser in the department for information and guidance in course selection. The student will be an entomology major and must satisfy the same requirements. Careful selection of electives and courses to fulfill group requirements will provide sound preparation for graduate study in a wildlife-related area.

REQUIREMENTS FOR A MINOR IN ENTOMOLOGY

The minor in entomology requires 15 credits of courses with an ENTO prefix, including: ENTO 205, 305, and 406. A student may emphasize general entomology or wildlife conservation by proper choice of ENTO courses for the remaining 7 credits. 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.

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

**A grade of C or better is required for all ENTO credits used to satisfy departmental requirements.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

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

ENTOMOLOGY/PLANT PATHOLOGY

Because of mutual interests and problems in the broad field of food, fiber and health protection, the Department of Entomology and Applied Ecology and the Department of Plant and Soil Sciences offer a joint major, entomology/plant pathology (EPP), for a baccalaureate degree. In a world of expanding population and increasing pressure on supplies of food and fiber, both plant pathology and entomology offer the challenge and satisfaction of a career that contributes to human welfare. This combined major allows the student to study both insects and plant diseases and to emphasize one or the other depending on his or her interest.

Students majoring in EPP are neither entomology nor plant science majors and therefore are not subject to any special requirements of either department.

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE MAJOR: ENTOMOLOGY/PLANT PATHOLOGY

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing 3¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content # 3¹⁻⁴

COLLEGE REQUIREMENTS

Mathematics and Computer Science

Mathematics course (MATH 115 or higher level) 3¹
Computer Science course selected from CISC 105, EGTE 111, 3²
FREC 235, or equivalent

Agricultural and Biological Sciences 9-12¹⁻³

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

Literature and Arts 6¹⁻³

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities 9¹⁻³

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.

Physical Sciences 8¹

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

MAJOR REQUIREMENTS

External to the College

BISC 207 Introductory Biology I 4³
BISC 208 Introductory Biology II 4³

CHEM 101 General Chemistry 4²
or
CHEM 103 General Chemistry 4
CHEM 102 General Chemistry 4²
or
CHEM 104 General Chemistry 4

Within the College

AGRI 211 Literature of the Agricultural and Life Sciences 1²

Within the Departments

ENTO 205 Elements of Entomology 3¹
ENTO 305 Entomology Laboratory 2²
ENTO 406 Insect Identification—Taxonomy 3^{3,4}
ENTO 408 Field Taxonomy 2^{3,4}
ENTO 411 Economic Entomology 3^{3,4}
ENTO 465 Seminar 1⁴
PLSC 101 Botany I 4¹
PLSC 201 Botany II 4¹
PLSC 303 Introductory Plant Pathology 4³
PLSC 402 Plant Taxonomy 3^{3,4}
PLSC 411 Diagnostic Plant Pathology 2⁴
Sixteen credits from Entomology and Applied Ecology and/or Plant Science 16³

Five credits from among the following:

PLSC 412 Diagnostic Plant Pathology Laboratory 1-6⁴
PLSC 413 Principles of Plant Disease Control 3⁴
PLSC 429 Introductory Mycology 4⁴

ELECTIVES

Electives 11-14^{3,4}

Courses in Agriculture, Biology, and the Physical Sciences are recommended. (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 choice of department in which to complete the remaining credits provides the student with the opportunity to emphasize either applied entomology or plant pathology in his or her program.

The curriculum will prepare the student for graduate study in entomology, plant pathology or related areas or direct entry into various agricultural industries, government service, or education. For federal employment, a student must have 16 credits in entomology to qualify for a GS-5 rating as an entomologist. To qualify as a GS-5 as a plant pathologist, a student must have 10 plant pathology credits and 20 credits in basic botany or plant science.

Students should complete their programs with electives that will provide an education best suited to their goals. Course election should be made in consultation with the academic adviser during the preregistration period of each term. This program should include other courses in agriculture, biology, and physical sciences.

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

FOOD AND RESOURCE ECONOMICS

The study of agricultural economics is concerned with the economics of production and marketing in the agricultural-business complex. Courses and curricula are designed to provide a thorough background in the principles of organization and management of farms and of firms serving agriculture and food processing businesses. Agricultural economics also includes study of financing agricultural business firms, marketing agricultural products, price analyses, economics of land utilization, and agricultural policy.

Two major programs are offered: (a) agricultural business management and (b) agricultural economics. The curricula differ in the amount of emphasis given to agricultural production, business, and economics. Both curricula qualify the students for graduate work.

The curriculum in agricultural business management is offered cooperatively with the College of Business and Economics. The fundamentals of business are combined with a basic background in agriculture. This curriculum prepares the student for a career in management and research in farm-related businesses such as farm credit and financing, food processing, food wholesaling and retailing, feed and fertilizer companies, agricultural chemical companies, and agricultural cooperatives.

The curriculum in agricultural economics emphasizes farm management, production economics, and agricultural marketing, 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. Two concentrations are offered as part of the agricultural economics major. They are Production and Management and Resource Economics and Rural Development.

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE MAJOR: AGRICULTURAL BUSINESS MANAGEMENT

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #	3 ^{1,4}

COLLEGE REQUIREMENTS

Mathematics and Computer Science

Mathematics course (MATH 115 or higher level†)	3 ¹
Computer Science course (FREC 235 or equivalent)	3 ¹

Agricultural and Biological Sciences 9-12^{1,2}

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

<i>Literature and Arts</i>	6 ²
Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.	
<i>Social Sciences and Humanities</i>	9 ²
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.	
<i>Physical Sciences</i>	8 ¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.	

MAJOR REQUIREMENTS

External to the College

ACCT 207 Accounting I	3 ³
ACCT 208 Accounting II	3 ³
COMM 312 Oral Communication in Business	3 ⁴
ENGL 312 Written Communications in Business	3 ³
ECON 151 Introduction to Microeconomics	3 ³
ECON 152 Introduction to Macroeconomics	3 ³
BUAD 301 Introduction to Marketing	3 ^{3,4}
Two additional courses offered by the College of Business and Economics.	6 ^{3,4}

Within the Department

FREC 120 Elementary Agricultural Economics	3 ¹
FREC 125 Elementary Agricultural Economics: Applications	1 ¹
FREC 235 Introduction to Data Analysis	3 ¹
FREC 240 Quantitative Methods in Agricultural Economics	3 ²
FREC 406 Agricultural Policy	3 ^{3,4}
FREC 465 Seminar	1 ⁴

Seven courses at the 400 level or above with at least two in each of the following general areas:

1. Marketing/International Trade	
FREC 404 Food Marketing	3 ^{3,4}
FREC 410 International Agricultural Trade	3 ^{3,4}
FREC 441 Futures Markets in Agriculture	4 ^{3,4}
2. Production/Management	
FREC 403 Production Economics	3 ^{3,4}
FREC 408 Research Methods	3 ^{3,4}
FREC 615 Advanced Prices and Statistics	3 ^{3,4}
FREC 427 Agricultural Finance	3 ^{3,4}
3. Resources/Development	
FREC 420 Agriculture in Economic Development	3 ^{3,4}
FREC 424 Resource Economics Theory and Policy	3 ^{3,4}
FREC 429 Rural Development Theory and Policy	3 ^{3,4}
FREC 444 Economics of Environmental Management	3 ^{3,4}

FREC 405, FREC 435, FREC 630, and Independent Study may not be counted in the seven courses.

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

<i>Electives</i>	32-36 ^{1,4}
May include Military Science, Music, or Physical Education. (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

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

†MATH 221, MATH 230 and STAI 201 are strongly suggested.

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: AGRICULTURAL ECONOMICS
CURRICULUM **CREDITS***
UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #	3 ¹⁻⁴

COLLEGE REQUIREMENTS
Mathematics and Computer Science

Mathematics course (MATH 115 or higher level†)	3 ¹
Computer Science course (FREC 235 or equivalent)	3 ¹

Agricultural and Biological Sciences 9-12^{1,2}

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology

Literature and Arts 6²

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities 9²

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.

Physical Sciences 8^{1,2}

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

MAJOR REQUIREMENTS
External to the College

COMM 312 Oral Communication in Business	3 ⁴
ENGL 312 Written Communications in Business	3 ³
ECON 151 Introduction to Microeconomics	3 ³
ECON 152 Introduction to Macroeconomics	3 ³
ECON 302 Money, Credit and Banking	3 ^{3,4}
ECON 300 Intermediate Microeconomic Theory	3 ^{3,4}
ECON 303 Intermediate Macroeconomic Theory	3 ^{3,4}
Two additional courses offered by the College of Business and Economics at the 300 level or higher. ‡	6 ^{3,4}

Within the Department

FREC 120 Elementary Agricultural Economics	3 ¹
FREC 125 Elementary Agricultural Economics: Applications	1 ¹
FREC 201 Records and Accounts	3 ²
FREC 235 Introduction to Data Analysis	3 ¹
FREC 240 Quantitative Methods in Agricultural Economics	3 ²
FREC 406 Agricultural Policy	3 ^{3,4}
FREC 465 Seminar	1 ⁴

Seven courses at the 400 level or above with at least two in each of the following general areas:

1. Marketing/International Trade

FREC 404 Food Marketing	3 ^{3,4}
FREC 410 International Agricultural Trade	3 ^{3,4}
FREC 441 Futures Markets in Agriculture	4 ^{3,4}

2. Production/Management

FREC 403 Production Economics	3 ^{3,4}
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FREC 408 Research Methods	3 ^{3,4}
FREC 615 Advanced Prices and Statistics	3 ^{3,4}
FREC 427 Agricultural Finance	3 ^{3,4}

3. Resources/Development

FREC 420 Agriculture in Economic Development	3 ^{3,4}
FREC 424 Resource Economics—Theory and Policy	3 ^{3,4}
FREC 429 Rural Economic Development—Theory and Policy	3 ^{3,4}
FREC 444 Economics of Environmental Management	3 ^{3,4}

FREC 405, FREC 435, FREC 630, and Independent Study may not be counted in the seven courses.

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

Electives 29-33¹⁻⁴

May include Military Science, Music, or Physical Education. (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

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: AGRICULTURAL ECONOMICS
CONCENTRATION: PRODUCTION AND MANAGEMENT
CURRICULUM **CREDITS***
UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content.#	3 ¹⁻⁴

COLLEGE REQUIREMENTS
Mathematics and Computer Science

Mathematics course (MATH 115 or higher level†)	3 ¹
Computer Science course (FREC 235 or equivalent)	3 ¹

Agricultural and Biological Sciences 9-12^{1,2}

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

Literature and Arts 6²

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities 9²

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.

Physical Sciences 8^{1,2}

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

†MATH 221, MATH 230 and STAT 201 are strongly suggested.

‡Students can qualify for a minor in Economics if they take an additional 400-level Economics course and obtain a grade of C or better in all Economics courses (see "The Minor in Economics" in the College of Business and Economics curricula).

MAJOR REQUIREMENTS

External to the College

COMM 312	Oral Communication in Business	3 ⁴
ENGL 312	Written Communications in Business	3 ³
ECON 151	Introduction to Microeconomics	3 ^{1,2}
ECON 152	Introduction to Macroeconomics	3 ^{1,2}
ECON 302	Money, Credit and Banking	3 ^{3,4}
ECON 300	Intermediate Microeconomic Theory	3 ^{3,4}
ECON 303	Intermediate Macroeconomic Theory	3 ^{3,4}
Two additional courses offered by the College of Business and Economics at the 300 level or higher ‡		6 ^{3,4}

Within the Department

FREC 120	Elementary Agricultural Economics	3 ¹
FREC 125	Elementary Agricultural Economics: Applications	1 ¹
FREC 201	Records and Accounts	3 ²
FREC 235	Introduction to Data Analysis	3 ¹
FREC 240	Quantitative Methods in Agricultural Economics	3 ²
FREC 406	Agricultural Policy	3 ^{3,4}
FREC 465	Seminar	1 ⁴

Seven courses at the 400 level or above with at least two in each of the following general areas:

1. Marketing/International Trade		
FREC 404	Food Marketing	3 ^{3,4}
FREC 410	International Agricultural Trade	3 ^{3,4}
FREC 441	Futures Markets in Agriculture	4 ^{3,4}
2. Production/Management		
FREC 403	Production Economics	3 ^{3,4}
FREC 408	Research Methods	3 ^{3,4}
FREC 415	Advanced Prices and Statistics	3 ^{3,4}
FREC 427	Agricultural Finance	3 ^{3,4}
3. Resources/Development		
FREC 420	Agriculture in Economic Development	3 ^{3,4}
FREC 424	Resource Economics—Theory and Policy	3 ^{3,4}
FREC 429	Rural Economic Development—Theory and Policy	3 ^{3,4}
FREC 444	Economics of Environmental Management	3 ^{3,4}

The requirements for the major in Agricultural Economics must be met. In addition, the following courses must be taken:

FREC 350	Farm Management	3 ³
FREC 403	Production in Economics	3 ^{3,4}

Agricultural Economics (FREC) courses required for the Agricultural Economics major may be used to satisfy requirements for the Production and Management concentration.

In addition to the Business and Economic courses required for the Agricultural Economics major, the following courses must be taken:

BUAD 307	International Business Management	3 ^{3,4}
BUAD 309	Management and Organizational Behavior	3 ^{3,4}
ECON 415	Economic Forecasting	3 ^{3,4}
STAT 201	Introduction to Statistics I	3 ^{1,2}
STAT 202	Introduction to Statistics II	3 ^{1,2}

FREC 405, FREC 435, FREC 630, and Independent Study may not be counted in the seven courses.

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

Electives 11-15¹⁻⁴
May include Military Science, Music, or Physical Education. (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

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: AGRICULTURAL ECONOMICS
CONCENTRATION: RESOURCE ECONOMICS AND RURAL DEVELOPMENT

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110	Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content.#		3 ¹⁻⁴

COLLEGE REQUIREMENTS

Mathematics and Computer Science

Mathematics course (MATH 115 or higher level) †	3 ¹
Computer Science course (FREC 235 or equivalent)	3 ¹

Agricultural and Biological Sciences 9-12^{1,2}

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.

Literature and Arts 6²

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities 9²

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.

Physical Sciences 8¹

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

MAJOR REQUIREMENTS

External to the College

COMM 312	Oral Communication in Business	3 ⁴
ENGL 312	Written Communications in Business	3 ³
ECON 151	Introduction to Microeconomics	3 ^{1,2}
ECON 152	Introduction to Macroeconomics	3 ^{1,2}
ECON 302	Money, Credit and Banking	3 ^{3,4}
ECON 300	Intermediate Microeconomic Theory	3 ^{3,4}
ECON 303	Intermediate Macroeconomic Theory	3 ^{3,4}
Two additional courses offered by the College of Business and Economics at the 300 level or higher ‡		6 ^{3,4}

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

†MATH 221, MATH 230 and STAT 201 are strongly suggested.

‡Students can qualify for a minor in Economics if they take an additional 400-level Economics course and obtain a grade of C or better in all Economics courses (see "The Minor in Economics" in the College of Business and Economics curricula).

Within the Department

FREC 120	Elementary Agricultural Economics	3 ¹
FREC 125	Elementary Agricultural Economics: Applications	1 ¹
FREC 201	Records and Accounts	3 ²
FREC 235	Introduction to Data Analysis	3 ¹
FREC 240	Quantitative Methods in Agricultural Economics	3 ²
FREC 406	Agricultural Policy	3 ^{3,4}
FREC 465	Seminar	1 ⁴

Seven courses at the 400 level or above with at least two in each of the following general areas:

1. Marketing/International Trade		
FREC 404	Food Marketing	3,4
FREC 410	International Agricultural Trade	3,4
FREC 441	Futures Markets in Agriculture	4,3,4
2. Production/Management		
FREC 403	Production Economics	3,4
FREC 408	Research Methods	3,4
FREC 615	Advanced Prices and Statistics	3,4
FREC 427	Agricultural Finance	3,4
3. Resources/Development		
FREC 420	Agriculture in Economic Development	3,4
FREC 424	Resource Economics—Theory and Policy	3,4
FREC 429	Rural Economic Development—Theory and Policy	3,4
FREC 444	Economics of Environmental Management	3,4

The requirements for the major in Agricultural Economics must be met. In addition, the following courses must be taken:

FREC 424	Resource Economics—Theory and Policy	3 ^{3,4}
FREC 429	Rural Economics Development—Theory and Policy	3 ^{3,4}
FREC 444	Economics of Environmental Management	3 ^{3,4}

Agricultural Economics (FREC) courses required for the Agricultural Economics major may be used to satisfy requirements for the Resource Economics and Rural Development concentration.

One course in Geography	3 ¹⁻⁴
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In addition to the Business and Economics courses required for the Agricultural Economics major, four of the following courses, with at least one in each area, must be taken:

1. Political Economy		
ECON 306	Public Choice	3 ^{3,4}
ECON 311	Economic Growth and Development Policy	3 ^{3,4}
ECON 408	Economics of Law	3 ^{3,4}
ECON 411	Economics of Growth and Development	3 ^{3,4}
2. Quantitative Methods		
ECON 415	Economic Forecasting	3 ^{3,4}
ECON 422	Introduction to Econometrics	3 ^{3,4}
ECON 423	Econometric Applications	3 ^{3,4}
ECON 426	Mathematical Economics	3 ^{3,4}
3. Applications		
ECON 433	Economics of the Public Sector	3 ^{3,4}
ECON 475	Economics of Natural Resources	3 ^{3,4}
ECON 477	Benefit-Cost Analysis	3 ^{3,4}

FREC 405, FREC 435, FREC 630, and Independent Study may not be counted in the seven courses.

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

Electives	14-18 ¹⁻⁴
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May include Military Science, Music, or Physical Education. (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

FOOD SCIENCE

The Food Science major is designed to provide students with a broad understanding and professional preparation in areas of food production, processing, evaluation, and distribution. These include positions within the food and allied industries, the government, and independent research institutions. The role of the food scientist in such positions may involve production and process development, engineering, quality control, technical service and sales, and regulatory service, education, or basic research. The food science research program has opportunities for students in three areas: (1) packaging, package product interaction, and food chemistry; (2) biotechnology, fermentations, and food microbiology; and (3) process engineering technology.

Educational and research opportunities in biotechnology are fostered by the department's Biotechnology Group. The rapidly expanding field of biotechnology and food packaging has created both employment opportunities and the need for new research approaches to meet the potentials of genetic engineering, fermentation technology, medical applications, and improved food supplies. Rapid changes in industry processing techniques meet new consumer demands for products. Industry innovation also creates a demand for quality control specialists, food process engineers, and packaging specialists. The program includes course work in life and chemical sciences, mathematics and engineering, plus independent research work on applied science problems. A minimum of a 2.00 GPA is required for graduation. Students may join as members of the Institute of Food Technologists.

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: FOOD SCIENCE

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110	Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing		3 ¹⁻⁴
	multicultural, ethnic, and/or gender-related content.#	

COLLEGE REQUIREMENTS†

Mathematics and Computer Science	
Mathematics course	3 ¹
Computer Science course selected from CISC 105, EGTE 111,	3 ²
FREC 235, or equivalent	

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

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

<i>Agricultural and Biological Sciences</i>	9-12 ^{1,2}
Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology.	
<i>Literature and Arts</i>	6 ²
Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.	
<i>Social Sciences and Humanities</i>	9 ²
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.	
<i>Physical Sciences</i>	8 ¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.	

MAJOR REQUIREMENTS†**External to the College**

CHEM 103 General Chemistry	4 ¹
CHEM 104 General Chemistry	4 ¹
CHEM 214 Elementary Biochemistry	3 ²
CHEM 220 Quantitative Analysis I	3 ²
CHEM 221 Quantitative Analysis Laboratory	1 ²
PHYS 201 General Physics	4 ²
PHYS 202 General Physics	4 ²
BISC 207 Introductory Biology I	4 ¹
BISC 208 Introductory Biology II	4 ¹
BISC 371 Introduction to Microbiology	4 ²
CHEM 321 Organic Chemistry	3 ²
CHEM 325 Organic Chemistry Laboratory	1 ²
CHEM 322 Organic Chemistry	3 ²
CHEM 326 Organic Chemistry Laboratory	1 ²
CHEM 418 Introductory Physical Chemistry	3 ³
CHEM 419 Introductory Physical Chemistry	3 ³
CHEM 445 Physical Chemistry Laboratory	1 ³
NTDT 200 Nutrition Concepts	3 ¹
ECON 151 Introduction to Microeconomics	3 ¹
PSYC 201 General Psychology	3 ¹
PSYC 309 Measurement and Statistics	3 ³
MATH 221 Calculus I	3 ¹
or	
MATH 241 Analytic Geometry and Calculus A	4
MATH 222 Calculus II	3 ¹
or	
MATH 242 Analytic Geometry and Calculus B	4

Within the Department

A minimum grade of C must be achieved for credits to count toward the fulfillment of 36 credits in FS; a minimum grade of C 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 265 Seminar: Food Science	2 ¹
FOSC 306 Food Science Laboratory	1 ²
FOSC 365 Seminar: Food Science	1 ²
FOSC 409 Food Processing I	4 ⁴
FOSC 410 Food Processing II	4 ⁴
FOSC 415 Food Process Engineering Technology I	4 ⁴
FOSC 416 Food Process Engineering Technology II	4 ⁴
FOSC 428 Food Chemistry	4 ³

FOSC 429 Food Analysis	4 ³
FOSC 439 Food Microbiology	4 ³
FOSC 449 Food Biotechnology	4 ⁴

ELECTIVES

Electives	2-4 ³
May include Military Science, Music, or Physical Education (Only two credits of activity-type Physical Education and four credits of Music organization 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 132

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 fertility, 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. The teaching and research programs are supported by modern laboratory, greenhouse, and outdoor study areas.

Students pursuing a program of study leading to the degree Bachelor of Science in Agriculture—majoring in Plant Science—will select one of four areas of concentration: general plant science, ornamental horticulture, agronomy, or pathology.

Each candidate for a degree must earn a minimum of 124 credits; achieve a minimum cumulative grade point average of 2.0 on all work undertaken at the University of Delaware, and fulfill the course requirements of the degree program.

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: PLANT SCIENCE
CONCENTRATION: GENERAL PLANT SCIENCE

CURRICULUM**CREDITS*****UNIVERSITY REQUIREMENTS**

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content#	3 ¹⁻⁴

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27

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

COLLEGE REQUIREMENTS†*Mathematics and Computer Science*

Mathematics course	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ¹

Agricultural and Biological Sciences 9-12^{1,2}

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, or Biology.

Literature and Arts 6²

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities 9²

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.

Physical Sciences 8¹

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

MAJOR REQUIREMENTS†**External to the College**

CHEM 101 General Chemistry	4 ¹
or	
CHEM 103 General Chemistry	4 ¹
CHEM 102 General Chemistry	4 ¹
or	
CHEM 104 General Chemistry	4 ¹
CHEM 213 Elementary Organic Chemistry	4 ²

One of the following three courses:

PHYS 101 Introduction to Physics	4 ²
GEOL 105 General Geology	4 ²
CHEM 214 Elementary Biochemistry	3 ²

Within the Department

PLSC 101 Botany I	4 ²
PLSC 201 Botany II	4 ²
PLSC 204 Introduction to Soil Science	4 ³
PLSC 300 Principles of Animal and Plant Genetics	3 ³
PLSC 303 Introductory Plant Pathology	4 ³
PLSC 305 Soil Fertility and Plant Nutrition	4 ³
PLSC 410 Introduction to Plant Physiology	3 ⁴

ELECTIVES*Electives* 46-50¹⁻⁴

May include Military Science, Music, or Physical Education. (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

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: PLANT SCIENCE
CONCENTRATION: ORNAMENTAL HORTICULTURE

CURRICULUM**CREDITS*****UNIVERSITY REQUIREMENTS**

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #	3 ¹⁻⁴

COLLEGE REQUIREMENTS†*Mathematics and Computer Science*

Mathematics course	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ¹

Agricultural and Biological Sciences 9-12^{1,2}

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, or Biology.

Literature and Arts 6²

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities 9²

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.

Physical Sciences 8¹

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

MAJOR REQUIREMENTS†**External to the College**

CHEM 101 General Chemistry	4 ¹
or	
CHEM 103 General Chemistry	4 ¹
CHEM 102 General Chemistry	4 ¹
or	
CHEM 104 General Chemistry	4 ¹
CHEM 213 Elementary Organic Chemistry	4 ²

One of the following three courses:

PHYS 101 Introduction to Physics	4 ²
GEOL 105 General Geology	4 ²
CHEM 214 Elementary Biochemistry	3 ²

Within the Department

PLSC 101 Botany I	4 ²
PLSC 201 Botany II	4 ²
PLSC 204 Introduction to Soil Science	4 ²
PLSC 300 Principles of Animal and Plant Genetics	3 ³
PLSC 303 Introductory Plant Pathology	4 ³
PLSC 305 Soil Fertility and Plant Nutrition	4 ³
PLSC 410 Introduction to Plant Physiology	3 ⁴

Within the Concentration*Group One: Required courses*

PLSC 133 Ornamental Horticulture	3 ¹
PLSC 211 Herbaceous Landscape Plants	3 ²
PLSC 212 Woody Landscape Plants	3 ²
PLSC 422 Plant Propagation	3 ⁴

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

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

ENTO 205	Elements of Entomology	3 ²
ENTO 305	Entomology Laboratory	2 ³
<i>Group Two: Select a minimum of 12 credits from the following:</i>		
PLSC 302	Vegetable Science	3 ³
PLSC 332	Basic Landscape Design I	4 ³
PLSC 402	Plant Taxonomy	3 ^{3,4}
PLSC 403	Nursery and Garden Center Management	3 ^{3,4}
PLSC 411	Diagnostic Plant Pathology	2 ^{3,4}
PLSC 412	Diagnostic Plant Pathology Laboratory	1-6 ^{3,4}
PLSC 417	Greenhouse Management	4 ^{3,4}
PLSC 602	Physiological Plant Productivity	3 ⁴
PLSC 607	Plant and Soil Water Relations	3 ⁴
PLSC 615	Vascular Plant Anatomy	3 ⁴
PLSC 621	Plants and Design	3 ⁴
PLSC 623	Plant Cell and Tissue Culture	3 ⁴

ELECTIVES

Electives 17-21¹⁻⁴

May include Military Science, Music, or Physical Education.
(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

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: PLANT SCIENCE
CONCENTRATION: AGRONOMY

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110	Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #		3 ¹⁻⁴

COLLEGE REQUIREMENTS†*Mathematics and Computer Science*

Mathematics course	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ¹

Agricultural and Biological Sciences 9-12^{1,2}

Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, or Biology.

Literature and Arts 6²

Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language.

Social Sciences and Humanities 9²

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.

Physical Sciences 8¹

Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science.

MAJOR REQUIREMENTS†**External to the College**

CHEM 101	General Chemistry	4 ¹
or		
CHEM 103	General Chemistry	4 ¹
CHEM 102	General Chemistry	4 ¹
or		
CHEM 104	General Chemistry	4 ¹
CHEM 213	Elementary Organic Chemistry	4 ²

One of the following three courses:

PHYS 101	Introduction to Physics	4 ²
GEOL 105	General Geology	4 ²
CHEM 214	Elementary Biochemistry	3 ²

Within the Department

PLSC 101	Botany I	4 ²
PLSC 201	Botany II	4 ²
PLSC 204	Introduction to Soil Science	4 ³
PLSC 300	Principles of Animal and Plant Genetics	3 ³
PLSC 303	Introductory Plant Pathology	4 ³
PLSC 305	Soil Fertility and Plant Nutrition	4 ³
PLSC 410	Introduction to Plant Physiology	3 ⁴

Within the Concentration*Group one: Required courses*

PLSC 151	Introduction to Crop Science	3 ¹
PLSC 401	Agronomic Crop Science	3 ⁴
PLSC 411	Diagnostic Plant Pathology†	2 ^{3,4}
PLSC 412	Diagnostic Plant Pathology Laboratory†	1-6 ^{3,4}
CHEM 214	Elementary Biochemistry	3 ²
CHEM 216	Elementary Biochemistry Laboratory	1 ^{1,2}
ENTO 205	Elements of Entomology†	3 ²
ENTO 305	Entomology Laboratory	2 ³

Group Two: Select a minimum of 12 credits in consultation with your faculty adviser. 12^{3,4}

ELECTIVES

Electives 11-20¹⁻⁴

May include Military Science, Music or Physical Education.
(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 MINIMUM OF 124

DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: PLANT SCIENCE
CONCENTRATION: PATHOLOGY

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110	Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #		3 ¹⁻⁴

COLLEGE REQUIREMENTS†*Mathematics and Computer Science*

Mathematics course	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ¹

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc.

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

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

‡6-8 credits in Biological Sciences, Chemistry, or Geology may be substituted.

<i>Agricultural and Biological Sciences</i>	9-12 ^{1,2}
Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, or Biology	
<i>Literature and Arts</i>	6 ²
Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language	
<i>Social Sciences and Humanities</i>	9 ²
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	
<i>Physical Sciences</i>	8 ¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology, or Physical Science	

MAJOR REQUIREMENTS†**External to the College**

CHEM 101 General Chemistry	4 ¹
or	
CHEM 103 General Chemistry	4 ¹
CHEM 102 General Chemistry	4 ¹
or	
CHEM 104 General Chemistry	4 ¹
CHEM 213 Elementary Organic Chemistry	4 ²
One of the following three courses:	
PHYS 101 Introduction to Physics	4 ²
GEOL 105 General Geology	4 ²
CHEM 214 Elementary Biochemistry	3 ²

Within the Department

PLSC 101 Botany I	4 ²
PLSC 201 Botany II	4 ²
PLSC 204 Introduction to Soil Science	4 ³
PLSC 300 Principles of Animal and Plant Genetics	3 ³
PLSC 303 Introductory Plant Pathology	4 ³
PLSC 305 Soil Fertility and Plant Nutrition	4 ³
PLSC 410 Introduction to Plant Physiology	3 ⁴

Within the Concentration*Group one: Required courses*

BISC 207 Introductory Biology I	4 ²
BISC 208 Introductory Biology II	4 ²
BISC 371 Introduction to Microbiology	4 ³
ENTO 305 Entomology Laboratory	2 ³

Group Two: Select a minimum of 12 credits from the following:

PLSC 401 Agronomic Crop Science	3 ⁴
PLSC 411 Diagnostic Plant Pathology	2 ^{3,4}
PLSC 412 Diagnostic Plant Pathology Laboratory	1-6 ^{3,4}
PLSC 413 Principles of Plant Disease Control	3 ^{3,4}
PLSC 429 Introductory Mycology	4 ^{3,4}
PLSC 602 Physiological Plant Productivity	3 ^{3,4}
PLSC 605 Plant Breeding	3 ^{3,4}
PLSC 607 Plant and Soil Water Relations	3 ^{3,4}
PLSC 609 Plant Microtechnique	3 ^{3,4}
PLSC 623 Plant Cell and Tissue Culture	3 ^{3,4}
ENTO 465 Seminar	1 ^{3,4}

ELECTIVES

<i>Electives</i>	20-24 ¹⁻⁴
May include Military Science, Music, or Physical Education. (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**GENERAL AGRICULTURE**

For the student who does not wish to specialize in one field, the major in general agriculture is offered.

**DEGREE: BACHELOR OF SCIENCE IN AGRICULTURE
MAJOR: GENERAL AGRICULTURE**

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing	3 ¹
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content.#	3 ¹⁻⁴

COLLEGE REQUIREMENTS*Mathematics and Computer Science*

Mathematics course	3 ¹
Computer Science course selected from CISC 105, EGTE 111, FREC 235, or equivalent	3 ¹

<i>Agricultural and Biological Sciences</i>	9-12 ^{1,2}
Minimum of one course outside the student's major in three of the following areas: Food and Resource Economics, Food Science, Agricultural Engineering, Animal Science, Entomology and Applied Ecology, Plant and Soil Sciences, or Biology	

<i>Literature and Arts</i>	6 ²
Six credits selected from the general areas of English, Art, Art History, Communication, Music, Theatre, or Foreign Language	

<i>Social Sciences and Humanities</i>	9 ²
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	

<i>Physical Sciences</i>	8 ¹
Minimum of eight credits selected from one of the following areas: Chemistry, Physics, Geology	

External to the college

A minimum of one course in written communications chosen from the following:

ENGL 301 Problems in Composition	3 ^{3,4}
ENGL 302 Advanced Composition	3
ENGL 312 Written Communications in Business	3
ENGL 410 Technical Writing	3

*Superior figures indicate year or years in which the course is normally taken, i.e., ¹freshman year, ²sophomore year, etc

#This requirement may be fulfilled through a course taken to complete major, group, breadth, or elective requirements. See page 27.

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

A minimum of one course in oral communications chosen from the following:

COMM 200 Introduction to Human Communication Systems	3 ^{3,4}
COMM 255 Fundamentals of Communication	3
COMM 312 Oral Communication in Business	3
COMM 350 Public Speaking	3
COMM 356 Small Group Communication	3

Within the college

Thirty additional credits from any of the following departments: .. 30^{3,4}
 Food and Resource Economics, Agricultural Engineering, Agriculture, Animal Science and Agricultural Biochemistry, Entomology and Applied Ecology, or Plant and Soil Sciences. (Fifteen of the 30 credits must be in agriculture 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

Electives 56-59¹⁻⁴

May include Military Science, Music, or Physical Education. (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

PREVETERINARY INSTRUCTION

Students in the College of Agricultural Sciences who desire to prepare for entrance to a veterinary school should consult with the Chair of the Department of Animal Science and Agricultural Biochemistry. See curriculum in department listing.

THE ASSOCIATE IN SCIENCE DEGREE

A two-year Associate in Science (A.S.) degree is offered by the College of Agricultural Sciences. 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 those for the baccalaureate degree.

The Associate in Science as offered by the College of Agricultural Sciences provides a student the opportunity to follow an extremely flexible curriculum. The basic requirements are that the student must complete a minimum of 62 credit hours, with at least 30 of the credits earned within at least four of the six departments in the college. A minimum of 32 credits for the degree must be earned at the University of Delaware. In addition, to obtain the degree 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.

The flexibility of the curriculum allows students to select only those courses that they and their academic adviser deem most important to their career objective and to complete a program in two years. For example, it would allow students with an interest in horticulture careers to enroll in predominantly plant science and/or horticulture courses to build a program geared to their specific needs. The possibilities are numerous for just about any agricultural career in which the college offers course work and majors. Animal science, agribusiness, entomology, and agricultural engineering technology are all potential areas in addition to plant science.

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 Agricultural Sciences in Newark.

There is no special application form for the associate degree program. Students would make application as if they were planning to work toward a B.S. degree in General Agriculture. Then, upon arriving on campus they would inform the college adviser that they plan to work toward an associate degree.

OTHER COLLEGE RESOURCES

Cooperative Extension System. The Delaware Cooperative Extension System is part of a nationwide system whose mission is to improve American agriculture and to strengthen American families and communities through the dissemination and application of research-generated knowledge and leadership techniques. It serves as an educational resource to the people of Delaware for extending research results and advances in technology.

A major thrust of the Cooperative Extension system is to target programs to address critical national issues. The accelerating expansion of technology, the deteriorating economic situation in portions of the agricultural sector,

and the dynamic social conditions faced by many Americans, rural and metropolitan, require the Extension to reassess priorities and continuously adapt programs and activities to meet human needs.

Undergraduate students find opportunities to work with Extension specialists to gain practical experience in dealing with the public and in providing information to the public on a wide variety of agriculturally related topics.

Agricultural Experiment Station. The establishment of the Delaware Agricultural Experiment Station in 1888 was made possible by an act of Congress passed in 1887 known as the Hatch Act. The Experiment Station serves as the college's research arm, conducting research, fundamental and applied, in all phases of agriculture and rural life. By performing this function, it not only con-

tributes to increased and efficient production and to improved marketing of agricultural products, but it serves to stabilize production by developing practices and techniques designed to protect crops and livestock against diseases, pests, and certain physical forces of nature. A majority of the professors in the College of Agricultural Sciences have appointments in the Experiment Station.

Students find many opportunities to work with these professors in independent study projects that introduce them to biological, economic, and engineering technology research in the agricultural disciplines. Advanced undergraduates often gain valuable experience working for a professor in a laboratory or in the field on Experiment Station-sponsored research.

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