



# College of Agricultural Sciences and Natural Resources

*Caula A. Beyl, Dean*

*Mary Lewnes Albrecht, Associate Dean for Academic Programs*

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<http://casnr.tennessee.edu/>

The College of Agricultural Sciences and Natural Resources (CASNR) dates back to 1869 when the university was designated as Tennessee's federal land-grant institution. Under terms of the Federal Land-Grant Act, the university was enabled for the first time to offer instruction in agriculture. Later, federal legislation provided resources for agricultural research and extension programming for dissemination of research findings to the people of Tennessee. Over time, the college expanded its academic majors from traditional agricultural fields to include natural resources and agribusiness. Today, academic majors represent the breadth of modern natural resources and agricultural sciences. The college, the Tennessee Agricultural Experiment Station, UT Extension, and the College of Veterinary Medicine constitute the University of Tennessee Institute of Agriculture (<http://www.agriculture.utk.edu>).

The College of Agricultural Sciences and Natural Resources faculty conduct research using the resources available to them from the Tennessee Agricultural Experiment Station. They are engaged in significant basic and applied research ranging from biotechnology to wildlife management to agricultural economics to public horticulture. On-campus and field research laboratories are used in the instructional programs of the college, while extension and research activities provide many students excellent opportunities for individualized study with faculty mentors, as well as part-time job opportunities.

The college offers a broad range of majors that prepare students for natural and social sciences based careers in a wide array of opportunities in agricultural sciences and natural resources.

## Majors, Concentrations, and Departments

- Agriculture and natural resource leadership, education and communications with concentrations in agricultural science, agricultural leadership, agricultural education and agricultural extension education (interdepartmental unit).
- Animal science with concentrations in production/business/communications, science/technology, science/technology-pre-veterinary medicine, and pre-veterinary medicine 3+1 (Department of Animal Science).
- Biosystems Engineering with a pre-professional concentration (Department of Biosystems Engineering and Soil Science).
- Environmental and soil sciences with concentrations in agricultural systems technology, environmental science,

and soil science (Department of Biosystems Engineering and Soil Science).

- Food and agricultural business with a concentration in agricultural equipment systems management (Department of Agricultural Economics).
- Food science and technology with concentrations in technology/business, pre-professional, and science (Department of Food Science and Technology).
- Forestry with concentrations in forest resources management and wildland recreation (Department of Forestry, Wildlife and Fisheries).
- Natural resource and environmental economics (*pending THEC approval*) (Department of Agricultural Economics).
- Plant sciences with concentrations in bioenergy, biotechnology, horticulture science and production, landscape design and construction, public horticulture, and turfgrass science and management (Department of Plant Sciences).
- Wildlife and fisheries science with concentrations in wildlife and fisheries management and wildlife health (Department of Forestry, Wildlife and Fisheries).

The Department of Entomology and Plant Pathology offers undergraduate courses in support of the above majors and an undergraduate minor. It does not offer an undergraduate major.

The professional degree program in biosystems engineering receives strong support from the College of Engineering and is fully accredited by the Accreditation Board of Engineering and Technology. The forest resources management and wildland recreation concentrations are fully accredited by the Society of American Foresters. The food science and technology program maintains the professional standards as established by the Institute of Food Technologists. The agricultural education concentration meets state of Tennessee teacher education standards and is NCATE accredited.

A pre-veterinary medicine curriculum is offered in the college. This program is designed to prepare students for admission to the College of Veterinary Medicine located on the Knoxville campus. The pre-professional program in food science and technology allows students to be awarded a Bachelor of Science in Food Science after three years and upon successful completion of the first year at UT-Memphis dental, medical or pharmacy programs, or at the University of Tennessee, Knoxville, College of Veterinary Medicine.

Specific degree requirements are given under each of the departmental headings in this section of the catalog. A student must meet all degree requirements as outlined by the department in which he/she is majoring in order to receive a degree. In all majors, particular emphasis is placed upon the sciences that are fundamental to agricultural sciences and natural resources; other courses are included to provide a university general education. In all curricula, there is the opportunity to select elective courses appropriate to the educational objectives of the individual students. The choice of electives in each major should be made with the guidance of the faculty academic advisor. However, it is ultimately the responsibility of the student to understand what is required to earn a degree.

All academic and general requirements of the university as stated in the front section of this catalog must be met by students enrolled in CASNR majors and they must complete the requirements in one of the majors. Students transferring into the College of Agricultural Sciences and Natural Resources from other than the University of Tennessee, Knoxville, must have a grade point average of 2.00.

The use of transfer credit in subject areas appropriate to each organized curriculum will be considered by the student's academic advisor. If deemed appropriate, the petition to apply transfer courses will be processed through departments and submitted to the college dean's office for final approval. All university guidelines and policies must be followed. When desirable, validating or proficiency examinations may be requested to determine competence in an area and to avoid unnecessary repetition. Such examinations should be taken during the first semester in residence and must be conducted under the supervision of the head of the department in which the course is offered.

A minimum of 18 semester hours of upper-division agriculture and natural resources coursework appropriate to a specified major requirement, and approved by the major advisor, must be completed in residence to fulfill the requirements of baccalaureate degrees offered in the college.

A minimum grade point average of 2.00 for all courses taken in the department offering the major/concentration is required. All courses must be passed. A student cannot graduate with a grade of F in any course in the major/concentration. Students must repeat courses in the major/concentration and earn a passing grade prior to the awarding of the degree.

## Selection of a Major

When registering as freshmen, students who have decided upon their area of study select the major that meets their interests or career goals. A faculty member from the department that manages the major will serve as the academic advisor. It is not necessary, however, that freshman students select their major until the end of the first year. Undecided students will be assigned an academic advisor to assist them in exploring College of Agricultural Sciences and Natural Resources programs and to guide them in the planning of appropriate courses of study for the freshman year. Undecided students are encouraged to enroll in Agriculture and Natural Resources 100, Orientation to Studies in Agriculture and Natural Resources, during the fall semester of their first year of enrollment at the University of Tennessee, Knoxville. When they choose a major, an academic advisor will be assigned from the appropriate department.

Students interested in a career with a state's extension service should select the agricultural science major and follow the agricultural extension education concentration.

A foundation for advanced study beyond the baccalaureate degree may be established in any major if appropriate electives are included. Most departments offer a science concentration intended for those students who have a strong interest in pursuing graduate studies. A very careful choice of electives enables a student with an excellent academic record to complete a double or triple major by satisfying all the requirements in each major. For this purpose, the academic advisors of each major should be consulted. The academic advisors will work with the student to ensure that degree requirements are met. However, it is ultimate-

ly the responsibility of the student to understand what is required to complete multiple majors. Completing multiple majors will normally require more than 124 credit hours for graduation. It is the student's responsibility to keep academic advisors informed about each major and/or minor he/she is pursuing.

## Satisfactory/No Credit Courses

Students may include a maximum of 21 hours in non-directed electives taken on a satisfactory/no credit basis in the total hours required for graduation.

## Graduate Studies

The College of Agricultural Sciences and Natural Resources faculty participates in both Master of Science and doctoral graduate student education and training. Master of Science study is available from all academic departments. Graduate programs leading to the Doctor of Philosophy degree in animal sciences; biosystems engineering; food technology and science; natural resources; and plants, soils, and insects are available.

## Minimum Requirements for Baccalaureate Degree Programs

All Bachelor of Science degree programs offered in the college have the following minimum requirements.

- Communicating through Writing – three courses to include English Composition (101-102) and one writing-intensive (WC) course from the university-approved list.
- Communicating Orally – one course from Communication Studies 210 or 240 or a course with an (OC) designation from the university-approved list.
- Quantitative Reasoning – two courses from a two-course mathematics sequence or one mathematics course and one course with a (QR) designation from the university-approved list.
- Arts and Humanities – two courses from the university-approved list.
- Social Sciences – two courses from the university-approved list.
- Biological Sciences – two courses, minimum 6 hours, one course may be a College of Agricultural Sciences and Natural Resources course.
- Physical Sciences – two courses, minimum 6 hours from chemistry, physics, geology, Geography 131-132 (physical geography), Environmental and Soil Sciences 210.  
*Note: At least one of the four biological and physical sciences courses must be a lab course.*
- Cultures and Civilizations – two courses from the university-approved list or a two-course sequence in a foreign language at the intermediate level (200-level).
- Computer Technology/Applications – one course from Agriculture and Natural Resources 290 or a course in which computer technology is an integral and necessary component and is approved by the College of Agricultural Sciences and Natural Resources Undergraduate Council as such.
- Major courses – minimum of 22 hours in the major to include an orientation course (Agriculture and Natural Resources 100 or an equivalent orientation course in the department or university).

For a total of 120 hours minimum.

## Selection of a Minor

Students may have a single or multiple minors in any of the University of Tennessee, Knoxville, colleges recorded on their transcripts without regard to course overlap among majors and minors. Minors offered by departments require a minimum of 15 credit hours in courses offered in the program. The majority of credit hours must be at the 300 and 400 level. No departmental or college orientation

100-level course may be used to satisfy the requirements of the minor. At least 9 of the credit hours required for the minor must be completed at the Knoxville campus. Each department offering a minor lists specific requirements. Minors offered in the College of Agricultural Sciences and Natural Resources are open to students of any other colleges who have the approval of their academic advisor and department. Students working on a minor in the College of Agricultural Sciences and Natural Resources should contact the specific department to have an academic advisor assigned.

**Minors and Departments**

- Animal science (Department of Animal Science).
- Biosystems engineering technology (Department of Biosystems Engineering and Soil Science).
- Entomology and plant pathology (Department of Entomology and Plant Pathology).
- Environmental and soil sciences (Department of Biosystems Engineering and Soil Science).
- Food and agricultural business (Department of Agricultural Economics).
- Food science and technology (Department of Food Science and Technology).
- Forestry (Department of Forestry, Wildlife and Fisheries).
- International agriculture and natural resources (Office of the Dean).
- Plant sciences (Department of Plant Sciences).
- Wildlife and fisheries science (Department of Forestry, Wildlife and Fisheries).

**Independent Study**

Independent study, special topics courses, and seminars offered in each department provide exceptional students the opportunity to explore in greater depth subject matter of unusual significance to agriculture and natural resources. Students gain experience and are encouraged to assume responsibilities not available in formally organized courses. Working with students and faculty from all phases of agriculture and natural resources in the study of a common problem provides an exciting experience.

Students may also earn academic credit for faculty-guided international study. Students should consult with their academic advisors, department heads, or the Associate Dean for Academic Programs about international experiences in agriculture and natural resources.

**CASNR Honors Research and Creative Achievements Program**

The CASNR Honors Research and Creative Achievements Program is designed to allow students to expand and improve their critical thinking and analytical skills while pursuing the baccalaureate degree in the college. Students in this program will complete an Honors project, related to research, teaching or extension, under the guidance of a faculty member, and report that work in both written and oral format in a one-hour course, Agriculture and Natural Resources 498. The program objectives are

- to increase the scope of educational attainment by providing a program with greater breadth and depth.
- to provide special recognition for outstanding scholastic achievement.
- to foster a sustained interest in advanced education, research and creative achievement.

To be eligible, a student must be a junior, senior, or second semester junior transfer student with a minimum grade point average of 3.25. Additionally, once a student is admitted to the program, he/she must maintain a GPA of 3.25 or above. Students will be invited by the college to participate in the program the first semester they are eligible and once per academic year thereafter. Students must apply for the program and be approved by a College Honors Committee. This application includes details of the proposed research,

teaching or extension project. Upon admission, the student can enroll in Agriculture and Natural Resources 497, Honors Project (repeatable for a maximum of 6 hours), or departmental independent study credit. The student should enroll during the semester(s) that he/she is actively working on the project. Some departments may elect to allow some or all of this credit to count toward graduation requirements. Upon completion of their work, students must enroll in Agriculture and Natural Resources 498, Honors Presentations (1). Students prepare a written report and give an oral presentation to the Committee and interested individuals.

Participation in and completion of a CASNR Honors Research and Creative Achievements project will be noted on the student's university transcript as follows: College of Agricultural Sciences and Natural Resources Honors and Creative Achievements Program participant. More detailed information is available from the college dean's office.

**Course Load**

Students desiring to take more than 19 hours per semester must have the approval of their academic advisor and the dean of the college.

**Transfer Students**

Students who transfer to the College of Agricultural Sciences and Natural Resources from another institution or from another college at the University of Tennessee, Knoxville, should contact the specific department of the major they wish to follow for assignment to an appropriate advisor. If the student is unsure of the specific major, he/she should contact the dean's office. Requests for substitutions (application of transfer credit to meet degree requirements if not already assigned through the Degree Audit Report System) or special examinations should be submitted for consideration during the first semester of study in the selected major.

**DEPARTMENT OF AGRICULTURAL ECONOMICS**

<http://economics.ag.utk.edu/>

*Dan L. McLemore, Head*

**Professors**

Cross, T.L., PhD	.....	Oregon State
English, B.C., PhD	.....	Iowa State
Garland, C.D., PhD	.....	Tennessee
Gerloff, D.G., PhD	.....	Texas A&M
Jensen, K.L., PhD	.....	Oklahoma State
Klindt, T.H., PhD	.....	Kentucky
McLemore, D.L., PhD	.....	Clemson
Orr, R.H., PhD	.....	Illinois
Park, W.M., PhD	.....	Virginia Tech
Rawls, E.L., PhD	.....	Virginia Tech
Ray, D.E., PhD	.....	Iowa State
Riley, J.B., PhD	.....	Oklahoma State
Roberts, R.K., PhD	.....	Iowa State
Smith, G.F., PhD	.....	Tennessee

**Associate Professors**

De La Torre Ugarte, D.G., PhD	.....	Oklahoma State
Larson, J.A., PhD	.....	Oklahoma State
Yen, S.T., PhD	.....	Minnesota

**Assistant Professors**

Bazen, E.F., PhD	.....	Kentucky
Cho, S.H., PhD	.....	Oregon State
Clark, C.D., PhD	.....	Vanderbilt
Lambert, D.M., PhD	.....	Purdue
Tiller, K.H., PhD	.....	Tennessee
Velandia, M., PhD	.....	Texas Tech
Wilcox, M.D., PhD	.....	Purdue

# FOOD AND AGRICULTURAL BUSINESS MAJOR

## Advisors

McLemore, Park, and Riley

Students majoring in food and agricultural business are prepared for a wide variety of career opportunities. The focus of their studies is on the functioning of the agri-food sector in the global economic system and the economic principles for decision making by business managers, consumers, policymakers and others within that sector. Students complete a curriculum designed to provide them with a broad-based education and the specialized skills necessary for a successful career in the agri-food industry or with a related organization or public agency. The curriculum builds upon the university-wide general education requirements by adding a set of directed electives from within the College of Agricultural Sciences and Natural Resources, a set of core courses from within the College of Business Administration, and a set of required courses within the Department of Agricultural Economics. Students customize their program by selecting among upper-division electives within the department. General elective hours in the curriculum allow flexibility for students to pursue a minor within some area of technical agriculture or another field such as communications. Students have ample opportunity to develop strong microcomputer skills and gain practical real-world experiences through case study analyses, the NAMA marketing team, internships, and extracurricular activities.

Students graduating with a major in food and agricultural business have many career options. Many graduates take positions in management or marketing with businesses involved in the farm input supply sector. This would include large multinational corporations that manufacture inputs such as machinery, chemicals, and feed, as well as local retailers of such items. Other graduates manage operations involved in the production of agricultural commodities or the processing of food products. Graduates also find career opportunities with food distribution and retailing companies serving as managers, marketing representatives, or in areas of customer service and public relations. Graduates are employed in financial institutions, insurance agencies, or real estate companies. Many industry organizations and government agencies also have employment opportunities for our graduates. It is not uncommon for our graduates to take positions with businesses that are outside the agri-food industry. Graduates also find themselves well prepared for graduate study in agricultural economics or agribusiness management, as well as for professional programs such as law.

## Requirements for the Bachelor of Science in Agriculture • Food and Agricultural Business Major

First Year	Hours Credit
Agricultural Economics 110	.1
Nutrition 100*	.3
<sup>1</sup> Biological Science Elective*	.4
<sup>2</sup> Cultures and Civilizations Electives*	.6
English 101*, 102*	.6
Mathematics 123*, 125*	.6
Psychology 110* or Political Science 102* or Sociology 120*	.3
Second Year	
Accounting 200	.3
Agricultural Economics 212	.3
Economics 201*	.4
Food Science and Technology 101 or 150	.3
Agricultural and Natural Resources 290	.3
Philosophy 243*	.3
<sup>3</sup> Physical Sciences Electives*	.8
Statistics 201*	.3
Third Year	
Agricultural Economics 310, 320, 324, 342, 350, 412	.16
Agricultural Extension Education 440* or English 360* or Journalism and Electronic Media 201*	.3
<sup>4</sup> Nondepartmental CASNR Electives	.6
Communication Studies 210* or 240*	.3
<sup>2</sup> Arts and Humanities Electives	.3

## Fourth Year

Agricultural Economics 410, 442	.4
<sup>5</sup> Agricultural Economics Electives	.12
Any 300-level Economics course	.3
<sup>4</sup> Nondepartmental CASNR Electives	.3
Free Electives	.8
<b>Total</b>	<b>120</b>

\* Meets University General Education Requirement.

1 Selected from Biology 101, 102, 130, 140.

2 Selected from any course on the University General Education list.

3 Selected from Chemistry 100, 110, 120, 130, Geography 131, 132, Geology 101, 102, 103, ESS 210.

4 Selected from any CASNR course with the following exceptions: (1) if Environmental and Soil Science 120 or 220 or Agricultural and Extension Education 440 are used to meet other requirements, they may not be used to meet this requirement; and (2) no more than three credit hours can be used from Animal Science 360 and 461.

5 A maximum of 3 credit hours can be used from each of the following courses: Agricultural Economics 356, 492 and 493.

## AGRICULTURAL EQUIPMENT SYSTEMS MANAGEMENT CONCENTRATION

The agricultural equipment systems management concentration is a unique interdisciplinary program that combines courses from the food and agricultural business major with courses from Biosystems Engineering Technology. Students develop a high degree of technical expertise with respect to agricultural equipment, as well as the ability to apply sound business and economic principles to management of a business. Graduates are particularly well prepared for career opportunities in the agricultural machinery industry as dealership managers, as well as with agribusiness firms in operations management.

Students in this concentration are strongly encouraged to obtain an industry internship that will complement their academic program.

## Requirements for the Bachelor of Science in Agriculture • Food and Agricultural Business Major • Agricultural Equipment Systems Management Concentration

First Year	Hours Credit
Agricultural Economics 110	.1
Biology 111*, 112*	.8
<sup>1</sup> Cultures and Civilizations*	.6
English 101*, 102*	.6
Mathematics 123*, 125*	.6
Agricultural and Natural Resources 290	.3
Second Year	
Accounting 200	.3
Agricultural Economics 212	.3
Economics 201*	.4
Biosystems Engineering Technology 202	.3
Chemistry 120*	.4
Philosophy 243*	.3
Physics 161*	.3
Environmental and Soil Sciences 210	.4
Statistics 201*	.3
Third Year	
Agricultural Economics 310, 320, 324, 342, 350, 412	.16
Environmental and Soil Sciences 324	.3
Biosystems Engineering Technology 326	.3
Agricultural Extension Education 440* or English 360* or Journalism and Electronic Media 201*	.3
<sup>1</sup> Arts and Humanities Elective*	.3
Communication Studies 210* or 240*	.3
Psychology 110* or Political Science 102* or Sociology 120*	.3
Fourth Year	
Agricultural Economics 410, 442	.4
<sup>2</sup> Agricultural Economics Electives	.9
Biosystems Engineering Technology 432, 442, 452, 462	.12
Any 300-level Economics course	.3
<b>Total</b>	<b>122</b>

\* Meets University General Education Requirement.

1 Choose any course from University General Education list.

<sup>2</sup> A maximum of three credit hours can be used from each of the following courses: Agricultural Economics 356, 492 and 493.

**Minor in Food and Agricultural Business**

Required Courses	Hours Credit
Economics 201	.4
Agricultural Economics 212, 342, 350, 412	.12
Accounting 200	.3
Agricultural Economics Elective	.3
<b>Total 22</b>	

**NATURAL RESOURCE AND ENVIRONMENTAL ECONOMICS MAJOR\***

**Advisors**

Clark and Park

*\*This program is pending approval from the Tennessee Higher Education Commission. Students will be admitted to the major should the program be approved.*

Students majoring in natural resource and environmental economics are prepared for a variety of careers in both the private and public sectors. With increasing competition for limited land, water and other natural resources in the U.S. and throughout the world, as well as growing concern about environmental degradation of various sorts, there is a growing need for professionals who can assist in the process of balancing economic and environmental tradeoffs. Private firms face serious challenges in meeting stricter environmental regulations and achieving self-imposed environmental goals. Public agencies must continually seek to design policies so that society's resource conservation or environmental quality goals are achieved in a cost-effective manner.

The curriculum builds upon the university-wide general education requirements with a set of core courses in business and economics. Students then take advanced and specialized course work that focuses on the economic foundations for policies designed to foster natural resource conservation or enhance environmental quality. The curriculum is highly interdisciplinary. Courses are required in the physical and environmental sciences covering subject matter such as conservation, ecology and forestry, as well as soil and water resource issues. Course work is required in environmental ethics, environmental law and other social science disciplines such as sociology. Students gain skills using tools such as geographic information systems for analysis of spatially-referenced data.

Students graduating with this major may find employment in private firms with environmental compliance activities or conservation initiatives directed toward energy or other natural resources. Opportunities also exist with consulting firms that assist clients in meeting environmental objectives. Many non-profit environmental organizations seek to employ staff with economic training. Several federal government agencies, including the Environmental Protection Agency and the departments of Agriculture, Interior and Energy, employ natural resource and environmental economists. State and local government agencies also provide opportunities for employment. The major provides a strong background for graduate studies in natural resource and environmental economics, leading to career opportunities in teaching and/or research, as well as high-level policy positions. Students would also be well prepared to pursue a professional program in environmental law.

**Requirements for the Bachelor of Science in Agriculture • Natural Resource and Environmental Economics Major**

First Year	Hours Credit
Agricultural Economics 110	.1
Forestry, Wildlife and Fisheries 250*	.3
<sup>1</sup> Biological Science Elective*	.4
Environmental and Soil Science 120* and 220*	.6
English 101*, 102*	.6
Mathematics 123*, 125*	.6
Psychology 110* or Political Science 102* or Sociology 120*	.3

<b>Second Year</b>	
Accounting 200	.3
Agricultural Economics 212	.3
Economics 201*	.4
<sup>2</sup> Arts and Humanities Elective*	.3
Agricultural and Natural Resources 290	.3
Philosophy 245*	.3
<sup>3</sup> Physical Sciences Elective*	.4
Environmental and Soil Sciences 210	.4
Statistics 201*	.3

<b>Third Year</b>	
Agricultural Economics 310, 315, 320, 342 or 350, 430	.13
Economics 362	.3
Biosystems Engineering Technology 326	.3
<sup>4</sup> Nondepartmental CASNR Electives	.6
Communication Studies 210* or 240*	.3
Agricultural Economics 324	.3

<b>Fourth Year</b>	
Agricultural Economics 410, 470, 471	.7
Economics 463	.3
<sup>5</sup> Agricultural Economics Electives	.6
Agricultural Extension Education 440* or English 360* or Journalism and Electronic Media 201*	.3
Economics 361 or 371, or Geography 340 or 346 or 436, or Sociology 360	.3
Electives	.8

**Total 120**

\* Meets University General Education Requirement.

<sup>1</sup> Selected from Biology 101, 102, 111, 112, 130.

<sup>2</sup> Selected from any course on the University General Education list.

<sup>3</sup> Selected from Chemistry 100, 110, 120, 130, Geography 131, 132, Geology 101, 102, 103.

<sup>4</sup> Selected from Environmental and Soil Science 324, 462; Forestry 314, 321, 420, 422; Forestry, Wildlife and Fisheries 420.

<sup>5</sup> A maximum of three credit hours can be used from each of the following courses: Agricultural Economics 356, 492 and 493.

**AGRICULTURE AND NATURAL RESOURCES (Interdepartmental Unit)**

**Professor**

Waters, R.G., PhD .....Penn State

**Assistant Professor**

Fritz, C.A., PhD .....Iowa State

**Emeriti Faculty**

Lessly, R.R., EdD .....Oklahoma State

Todd, J.D., EdD .....Illinois

Agriculture and Natural Resources is an interdepartmental unit that offers a major in agriculture and natural resource leadership, education and communications with concentrations in agricultural science, agricultural leadership, agricultural education and agricultural extension education. The major is designed for students who want a broad, general background in agriculture and natural resources and wish to develop their leadership and communication skills to pursue careers in the area of leadership in business and industry, agricultural education, agricultural extension and agricultural communications. The agricultural science concentration is designed for students who want a broad, general background in agriculture and natural resources. The agricultural leadership concentration is designed for students who want to develop their leadership skills and pursue careers in government, youth organizations, trade and breed associations, business/industry, international environments and leadership positions within the community. The agricultural education concentration leads to teacher licensure in agricultural sciences in the State of Tennessee. The agricultural extension concentration is designed for those interested in agricultural extension careers. This major is also designed for students who want an individualized plan of study. Students involved in the agricultural science and agricultural leadership concentrations will also select a minor to accommodate their course of study.

Students in the agricultural education and agricultural extension

sion education concentrations or one of the minors offered by the College of Communication and Information should follow the appropriate concentration and work with faculty in agricultural and extension education housed in Morgan Hall.

Students who are undecided as to their studies in agriculture and natural resources are advised to follow the agricultural science concentration and explore the different majors available in the college. They should work with their assigned advisor to eventually choose one of the minors offered by CASNR, the College of Communication and Information, or submit an individualized plan of study before the third year, for approval by the advisor and the Office of the Dean.

## AGRICULTURE AND NATURAL RESOURCE LEADERSHIP, EDUCATION AND COMMUNICATIONS MAJOR AGRICULTURAL SCIENCE CONCENTRATION

### Advisors

Contact Office of the Dean, College of Agricultural Sciences and Natural Resources

### Requirements for the Bachelor of Science in Agriculture • Agriculture and Natural Resource Leadership, Education and Communications Major • Agricultural Science Concentration

First Year	Hours	Credit
Agriculture and Natural Resources 100	1	.1
Agriculture and Natural Resources 290	3	.3
Animal Science 160	3	.3
<sup>1</sup> Chemistry 100*-110* or 120*-130*	8	.8
English 101*, 102*	6	.6
Mathematics 113* and Quantitative Reasoning Course*	6	.6
Plant Sciences 115	3	.3
<b>Second Year</b>		
Agricultural and Extension Education 211	3	.3
Agricultural Economics 212	3	.3
<sup>1</sup> Biology 130*-140* or 101*-102*	8	.8
Communication Studies 210* or 240*	3	.3
<sup>2</sup> Economics Elective	3-4	.3-4
Environmental and Soil Sciences 210	4	.4
Food Science and Technology 101	3	.3
<sup>3</sup> Free Elective	3	.3
<b>Third Year</b>		
<sup>3</sup> Agricultural Sciences and Natural Resources Elective	6	.6
Entomology and Plant Pathology 313 or 321	3	.3
<sup>3,4</sup> Cultures and Civilizations Elective*	3	.3
<sup>3,4</sup> Arts and Humanities Elective*	3	.3
<sup>5</sup> Minor	15	.15
<b>Fourth Year</b>		
<sup>3</sup> Agricultural Sciences and Natural Resources Electives	9	.9
<sup>3,4</sup> Arts and Humanities Elective*	3	.3
<sup>3,4</sup> Cultures and Civilizations Elective*	3	.3
<sup>2,3,4</sup> Social Sciences Elective*	3-6	.3-6
<sup>3</sup> Free Electives	2-5	.2-5
<sup>5</sup> Minor	9	.9
<b>Total</b>		<b>124</b>

\* Meets University General Education Requirement.

- 1 Chemistry 130 is a prerequisite/corequisite to Biology 140, therefore a student selects Chemistry 120-130 and Biology 130-140; otherwise the student must elect Chemistry 100-110 and Biology 101-102.
- 2 Economics 201(4) satisfies the University General Education-Social Science requirement and the major requirement for economics. If the student transfers ECON LD for 3 credits, it will satisfy the major requirement, but will not satisfy the General Education-Social Science requirement. In these cases, the student should take two courses from the approved General Education-Social Sciences list.
- 3 One of the University General Education Electives, Agricultural Sciences and Natural Resources Electives, Free Electives or a course taken as part of one of the minors must be a Communicating through Writing (WC) course.
- 4 Choose from the University General Education lists.

- 5 Students should select one of the minors offered by the College of Agricultural Sciences and Natural Resources: animal science, biosystems engineering technology, entomology and plant pathology, environmental and soil sciences, food and agricultural business, food science and technology, forestry, international agriculture and natural resources, plant sciences, wildlife and fisheries science, or one of the minors in the College of Communication and Information (see listing in this catalog), or submit an individualized plan of study before the third year, for approval by the advisor, department head, and the Dean's Office. If the minor is less than 23 hours, the excess hours will become free electives.

## AGRICULTURAL LEADERSHIP CONCENTRATION

### Advisors

Cooper, Fritz

### Requirements for the Bachelor of Science in Agriculture • Agricultural and Natural Resource Leadership, Education and Communications Major • Agricultural Leadership Concentration

First Year	Hours	Credit
Agriculture and Natural Resources 100 or Agriculture and Natural Resource Leadership 101	1	.1
Agricultural and Natural Resource Leadership 102	3	.3
Agricultural Economics 212	3	.3
Agriculture and Natural Resources 290	3	.3
<sup>1</sup> Biology 130*-140* or 101*-102* or 111*-112*	8	.8
English 101*, 102*	6	.6
Mathematics 113* and Quantitative Reasoning Course*	6	.6
<b>Second Year</b>		
Agricultural and Extension Education 211	3	.3
Agricultural and Natural Resource Leadership 202	3	.3
Animal Science 220 or Plant Sciences 210	3	.3
<sup>1</sup> Chemistry 100*-110* or 120*-130*	8	.8
Communication Studies 210* or 240*	3	.3
<sup>2</sup> Economics Elective	3-4	.3-4
Environmental and Soil Sciences 210	4	.4
Food Science and Technology 101 or 269	3	.3
Plant Sciences 290 or 291	3	.3
<b>Third Year</b>		
Agricultural and Natural Resource Leadership 303, 304	6	.6
Agricultural and Extension Education 440*	3	.3
Entomology and Plant Pathology 313 or 321	3	.3
<sup>3,4</sup> Cultures and Civilizations Elective*	3	.3
<sup>3,4</sup> Arts and Humanities Elective*	3	.3
<sup>5</sup> Minor	9	.9
<b>Fourth Year</b>		
Agricultural and Natural Resource Leadership 412	3	.3
Agricultural and Natural Resource Leadership 492	3	.3
Animal Science 495	1	.1
Biosystems Engineering and Technology 452	3	.3
Philosophy 245*	3	.3
<sup>3,4</sup> Cultures and Civilizations Elective*	3	.3
<sup>2,3,4</sup> Social Sciences Elective*	3	.3
<sup>4</sup> Free Electives	5-6	.5-6
<sup>5</sup> Minor	9	.9
<b>Total</b>		<b>124</b>

\* Meets University General Education Requirement.

- 1 Chemistry 130 is a prerequisite/corequisite to Biology 140, therefore a student selects Chemistry 120-130 and Biology 130-140; otherwise the student must elect Chemistry 100-110 and Biology 101-102. Biology 111-112 has no chemistry prerequisite.
- 2 Economics 201(4) satisfies the University General Education-Social Science requirement and the major requirement for economics. If the student transfers ECON LD for 3 credits, it will satisfy the major requirement, but will not satisfy the General Education-Social Science requirement. In these cases, the student should take two courses from the approved General Education-Social Sciences list.
- 3 Choose from the University General Education lists.
- 4 One of the University General Education Electives, Agricultural Sciences and Natural Resources Electives, Free Electives or a course taken as part of one of the minors must be a Communicating through Writing (WC) course.

5 Students should select one of the minors offered by the College of Agricultural Sciences and Natural Resources: animal science, biosystems engineering technology, entomology and plant pathology, environmental and soil sciences, food and agricultural business, food science and technology, forestry, international agriculture and natural resources, plant sciences, wildlife and fisheries science, or one of the minors in the College of Communication and Information (see listing in this catalog), or submit an individualized plan of study before the third year, for approval by the advisor, department head, and the Dean's Office. If the minor is less than 23 hours, the excess hours will become free electives.

## AGRICULTURAL EDUCATION CONCENTRATION

<http://aee.tennessee.edu>

**Advisor**

Fritz

**Requirements for the Bachelor of Science in Agriculture**  
**• Agricultural and Natural Resource Leadership, Education and Communications Major • Agricultural Education Concentration**

	<b>Hours Credit</b>
<b>First Year</b>	
Agricultural and Natural Resource Leadership 101 or Agriculture and Natural Resources 100	.1
Agricultural and Natural Resource Leadership 102	.3
Agriculture and Natural Resources 290	.3
<sup>1</sup> Biology 101*-102* or 130*-140*	.8
Economics 201*	.4
English 101*, 102*	.6
Environmental and Soil Sciences 120* or 220*	.3
Mathematics 113* and 115*	.6
<b>Second Year</b>	
Agricultural and Extension Education 211	.3
Agricultural and Extension Education 201	.1
Agricultural and Natural Resource Leadership 202	.3
Agricultural Economics 212	.3
Animal Science 220	.3
<sup>2</sup> Arts and Humanities Elective*	.3
<sup>1</sup> Chemistry 100*-110* or 120*-130*	.8
Environmental and Soil Sciences 210	.4
Plant Sciences 230 and 290 or 291	.6
<b>Third Year</b>	
Agricultural and Extension Education 345	.3
Biosystems Engineering Technology 202 and 452	.6
Educational Psychology 401	.3
Entomology and Plant Pathology 313 or 321	.3
Forestry, Wildlife and Fisheries 212 or 317	.3
Plant Sciences 250	.3
Psychology 110*	.3
Special Education 402	.3
<sup>2</sup> Cultures and Civilizations Elective*	.3
<b>Fourth Year</b>	
Agricultural and Extension Education 435 and 436	.12
Agricultural and Extension Education 440*	.3
Agricultural and Extension Education 434	.3
Animal Science 360* and 381	.6
<sup>2</sup> Arts and Humanities Elective*	.3
<b>Total 125</b>	

\* Meets University General Education Requirement  
 1 Chemistry 130 is a prerequisite/corequisite to Biology 140, therefore a student selects Chemistry 120-130 and Biology 130-140; otherwise the student must elect Chemistry 100-110 and Biology 101-102. Biology 111-112 has no chemistry prerequisite.  
 2 Choose from the University General Education lists.

## AGRICULTURAL EXTENSION EDUCATION CONCENTRATION

**Advisor**

Waters

**Requirements for the Bachelor of Science in Agriculture**  
**• Agricultural and Natural Resource Leadership, Education and Communications Major • Agricultural Extension Education Concentration**

	<b>Hours Credit</b>
<b>First Year</b>	
Agricultural and Extension Education 211	.3
Agriculture and Natural Resources 100	.1
Agriculture and Natural Resources 290	.3
Animal Science 280	.3
<sup>1</sup> Biology 101*-102* or 130*-140*	.8
English 101*, 102*	.6
Environmental and Soil Sciences 120* or 220*	.3
Mathematics 113* and second Quantitative Reasoning course*	.6
<b>Second Year</b>	
Agricultural and Extension Education 201	.1
Agricultural Economics 212	.3
Animal Science 220	.3
<sup>1</sup> Chemistry 100*-110* or 120*-130*	.8
Communication Studies 210*	.3
Economics 201*	.4
Environmental and Soil Sciences 210	.4
Plant Sciences 115	.6
Psychology 110*	.3
<b>Third Year</b>	
Agricultural and Extension Education 345	.3
Agricultural Economics 342	.3
Animal Science 330	.3
Entomology and Plant Pathology 313 (preferred) or 321	.3
Environmental and Soil Sciences 344	.3
Food Science and Technology 269	.2
Forestry, Wildlife and Fisheries 250	.3
Plant Sciences 250	.3
<sup>2,3</sup> Cultures and Civilizations Elective*	.3
<sup>2,3</sup> Art and Humanities Elective*	.3
<b>Fourth Year</b>	
Agricultural and Extension Education 434	.3
<sup>3</sup> Agricultural Sciences and Natural Resources Elective	.3
Animal Science 381	.3
Biosystems Engineering Technology 432, 442, and 462	.9
Plant Sciences 330 or 430	.2-3
<sup>2,3</sup> Arts and Humanities Elective*	.3
<sup>3</sup> Free Electives	.3-4
<b>Total 124</b>	

\* Meets University General Education Requirement  
 1 Chemistry 130 is a prerequisite/corequisite to Biology 140, therefore a student selects Chemistry 120-130 and Biology 130-140; otherwise the student must elect Chemistry 100-110 and Biology 101-102. Biology 111-112 has no chemistry prerequisite.  
 2 Choose from the University General Education lists.  
 3 One of the University General Education Electives, Agricultural Sciences and Natural Resources Electives or Free Electives must be a Communicating through Writing (WC) course.

## Minor in International Agriculture and Natural Resources

The minor in international agriculture and natural resources is intended for students interested in gaining an international perspective to the world's food, fiber, and natural resources systems.

	<b>Hours Credit</b>
<b>Required courses</b>	
<sup>1</sup> Select Agriculture and Natural Resources 491 or the <sup>2</sup> second course of a foreign language at the intermediate level*	.3
Agriculture and Natural Resources 481	.3
<sup>3,4</sup> Select 2 courses from Africana Studies 235*, 236*; Anthropology 130*, 316, 319, or 463; Geography 101*, 102*, 345, 371, or 373; Global Studies 250*; Political Science 365, 370, or 471; Religious Studies 102*; or Sociology 446	.6
<sup>4</sup> Select 2 courses from Agricultural Economics 420; Agriculture and Natural Resources 333; Entomology and Plant Pathology 201*; Environmental and Soil Sciences 120*, 220*, 334, or 442; Forestry, Wildlife and Fisheries 420; or Plant Sciences 250	.6
<b>Total 18</b>	

\* Meets University General Education Requirement.  
 1 The international experience is a planned experience in a foreign country, such as a study abroad program, semester abroad, or internship, with approval on a case-by-case basis.

- 2 Second courses of a foreign language at the intermediate level are Arabic 222, Asian Languages 232 or 252, Asian Studies 222 or 242 or 262, Chinese 232, French 212 or 218, German 202, Hebrew 242, Italian 212, Japanese 252, Persian 262, Portuguese 212, Russian 252, or Spanish 212 or 218.
- 3 One course should correspond with subject matter for the continent of the international experience. If the chosen course appears on the approved University General Education list, it may be used for both the minor and the University General Education Requirement. This selected course should be completed before Agriculture and Natural Resources 491 is taken.
- 4 Only one 100-level course may be taken as a part of the minor as a prerequisite to other courses in the minor. Any deviations need to be requested via a petition.

## DEPARTMENT OF ANIMAL SCIENCE

<http://animalscience.ag.utk.edu/>

Alan G. Mathew, Head

### Professors

Conatser, G.E., MS	.....	Kentucky
Godkin, J.D., PhD	.....	Massachusetts
Heitmann, R.N., PhD	.....	Maine
Hopkins, F., DVM	.....	Tennessee
Kattesh, H.G., PhD	.....	Virginia Tech
Kirkpatrick, F.D., PhD	.....	Tennessee
Lane, C.D., PhD	.....	Tennessee
Mathew, A.G., PhD	.....	Purdue
Meadows, D.G., PhD	.....	Texas A&M
Neel, J.B., PhD	.....	Tennessee
Oliver, S.P., PhD	.....	Ohio State
Robbins, K.R., PhD	.....	Illinois
Rogers, G.W., PhD	.....	North Carolina State
Saxon, A., PhD	.....	North Carolina State
Schrick, F.N., PhD	.....	Clemson
Smith, M.O., PhD	.....	Oklahoma State

### Associate Professors

Edwards, J.L., PhD	.....	Florida
Grizzle, J.M., PhD	.....	Florida
Pighetti, G.P., PhD	.....	Penn State
Waller, J.C., PhD	.....	Nebraska

### Assistant Professors

Kojima, C.J., PhD	.....	Missouri
Lin, J., PhD	.....	Ohio State

### Instructor

Fisher, A.E., MS	.....	Tennessee
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### Advisors

Fisher, Godkin, Grizzle, Heitmann, Kattesh, Kojima, Pighetti, Robbins, Schrick, Smith, Waller

The curriculum is designed to prepare students for leadership careers in livestock production and related industries. Courses in horse, swine, poultry, sheep, dairy, beef cattle and companion, zoo and lab animal production and management may be elected, providing the opportunity for special or additional training in the dynamic livestock and husbandry technology (production) areas. Through course selection, students may prepare for general or livestock farming, management, business, or science, or elect the pre-veterinary courses preparatory for specialization. Elective selection permits special training for work with feed companies, meat animal, milk, egg, or poultry production, managerial or marketing groups, other educational agencies, supply and equipment business, agricultural extension services, agricultural communication, public relations, and various organizations associated with agriculture.

For a complete list of accepted directed electives appearing in the showcases below see the departmental Undergraduate Advising Guide at [http://www.animalscience.ag.utk.edu/undr\\_guide.htm](http://www.animalscience.ag.utk.edu/undr_guide.htm).

## ANIMAL SCIENCE MAJOR

### PRODUCTION/BUSINESS/COMMUNICATION CONCENTRATION

*Requirements for the Bachelor of Science in Animal Science • Animal Science Major • Production/Business/Communication Concentration*

First Year	Hours	Credit
Animal Science 160	.....	3
Biology 130*-140* or 101*-102*	.....	8
English 101*-102*	.....	6
Mathematics 125* or 141* or 151* and second approved	.....	
Quantitative Reasoning Course*	.....	6-8
Chemistry 100*, 110* or 120*, 130*	.....	8
Second Year		
Animal Science 220, 280*	.....	6
Agriculture and Natural Resources 290	.....	3
Environmental and Soil Sciences 210	.....	4
Economics 201*	.....	4
<sup>1</sup> Arts and Humanities Electives*	.....	6
<sup>2</sup> Business Administration minor or		
<sup>3</sup> Agricultural Economics and Business minor or		
<sup>4</sup> Communication and Information minor	.....	3
<sup>1</sup> Social Science Elective*	.....	3
Free Electives	.....	3
Third Year		
Animal Science 320, 330, 340, 380, 395	.....	13
Biological Science Restricted Elective	.....	3
<sup>1</sup> Cultures and Civilizations Electives*	.....	6
Animal Science 360*	.....	3
<sup>2</sup> Business Administration minor or		
<sup>3</sup> Agricultural Economics and Business minor or		
<sup>4</sup> Communication and Information minor	.....	6
Fourth Year		
Animal Science 430,495	.....	4
Select two courses from: Animal Science 481 or 482; 483 or 484; 485 or 489	.....	6
<sup>2</sup> Business Administration minor (10 credits) or		
<sup>3</sup> Agricultural Economics and Business minor (9 credits) or		
<sup>4</sup> Communication and Information minor (9 credits)	.....	9-10
Free Electives	.....	8-11
		<b>Total 124</b>

\* Meets University General Education Requirement.

- 1 Courses selected from the University General Education lists. Animal Science 280 satisfies the WC requirement. Animal Science 360 satisfies the OC requirement.
- 2 Requirements for the business administration minor are Accounting 200 (3); Economics 201 (4); Statistics 201 (3); Business Administration 201 (4); Finance 301 (3); Marketing 300 (3); Management 300 (3). Total 23 hours.
- 3 Requirements for the agricultural economics and business minor are Economics 201 (4); Accounting 200 (3); Agricultural Economics 212, 342, 350, 412 (12); Agricultural Economics elective (3). Total 22 hours.
- 4 Requirements for the communication and information minor are Communication and Information 150 (3); select 6 hours from Advertising 250, Communication Studies 201; Information Sciences 102, Journalism and Electronic Media 200 or 275, or Public Relations 270; select 9 hours of 300-level or above from one or more of the following areas: advertising, communication studies, information sciences, journalism and electronic media, or public relations. Total 18 hours.

## SCIENCE/TECHNOLOGY CONCENTRATION

*Requirements for the Bachelor of Science in Animal Science • Animal Science Major • Science/Technology Concentration*

First Year	Hours	Credit
Animal Science 160	.....	3
Biology 130*- 140*	.....	8
English 101*-102*	.....	6
Mathematics 125* or 141* or 151* and second approved	.....	
Quantitative Reasoning Course	.....	6-8
Chemistry 120*-130*	.....	8

<b>Second Year</b>	
Animal Science 220, 280*	6
Agriculture and Natural Resources 290	3
Communication Studies 210* or 240* or Animal Science 360*	3
1Arts and Humanities Elective*	3
Economics 201*	4
Physical Science and Mathematics Restricted Elective	8
Biological Science Restricted Elective	3
<b>Third Year</b>	
Animal Science 320, 330, 340, 380, 395	13
Biological Science Restricted Elective	8
Physical Science and Mathematics Restricted Elective	6
1Cultures and Civilizations Elective*	3
<b>Fourth Year</b>	
Animal Science 495	1
Select two courses from Animal Science 481 or 482; 483 or 484; 485 or 489	6
1Arts and Humanities Elective*	3
Biological Science Restricted Elective	3
1Cultures and Civilizations Elective*	3
1Social Science Elective*	3
Business Elective	5
Free Electives	7-9

**Total 124**

\* Meets University General Education Requirement.  
 1 Courses selected from University General Education lists. Animal Science 280 satisfies the WC requirement. Animal Science 360 satisfies the OC requirement.

**SCIENCE/TECHNOLOGY – PRE-VETERINARY MEDICINE CONCENTRATION**

*Requirements for the Bachelor of Science in Animal Science • Animal Science Major • Science/Technology – Pre-Veterinary Medicine Concentration*

<b>First Year</b>		<b>Hours Credit</b>
Animal Science 160		3
Biology 130*-140*		8
English 101*- 102*		6
Mathematics 125* or 141* or 151* and second approved Quantitative Reasoning Course		6-8
Chemistry 120*-130*		8
<b>Second Year</b>		
Animal Science 220, 280*		6
Agriculture and Natural Resources 290		3
Communication Studies 210* or 240* or Animal Science 360*		3
1Arts and Humanities Elective*		3
Economics 201*		4
Chemistry 350, 360, and 369		8
Biology 240		4
<b>Third Year</b>		
Animal Science 320, 330, 340, 380, 395		13
Biological Science Restricted Elective		3
Physics 221*-222*		8
1Arts and Humanities Elective*		3
1Cultures and Civilizations Elective*		3
<b>Fourth Year</b>		
Animal Science 495		1
Select two courses from Animal Science 481 or 482; 483 or 484; 485 or 489		6
Biological Science Restricted Elective		3
Biochemistry and Cellular and Molecular Biology 401		4
1Cultures And Civilizations Elective*		3
1Social Science Elective*		3
Business Elective		5
Free Electives		5-7

**Total 124**

\* Meets University General Education Requirement.  
 1 Courses selected from University General Education lists. Animal Science 280 satisfies the WC requirement. Animal Science 360 satisfies the OC requirement.

**PRE-VETERINARY MEDICINE PROGRAM (3+1)**

This program allows students to be awarded a Bachelor of Science in Animal Science after the successful completion of the first two semesters in the College of Veterinary Medicine (CVM). Students must begin this program early in the pre-veterinary curriculum. The specific requirements are as follows.

- Completion of all pre-veterinary requirements.
  - English Composition 101, 102 (3,3) – 6 hours; Humanities and Social Sciences – 18 hours; Elements of Physics 221, 222 (4,4) – 8 hours; General Chemistry 120-130 (4,4) – 8 hours; Organic Chemistry 350, 360 and Laboratory 369 (3,3,2) – 8 hours; Cellular and Comparative Biochemistry 401 (4) – 4 hours; General Biology 130, 140 (4,4) – 8 hours; Biology 240 – 4 hours or Animal Science 340 – 3 hours; Biology Elective – 4 hours.
- The last 30 hours of the three-year pre-veterinary curriculum must be taken at the University of Tennessee, Knoxville.
- At least 12 hours of upper-division (300- and 400-level courses) technical agriculture courses must be taken at the University of Tennessee, Knoxville.
- In addition to all the required pre-veterinary medical courses, the following (or approved equivalents) must be completed before entering the College of Veterinary Medicine.
  - Mathematics 125 or 141 or 151 plus any QR; Animal Science 160 – 3 hours; Animal Science 220 – 3 hours; Animal Science 320 – 3 hours; Animal Science 330 – 3 hours; Animal Science 340 – 3 hours; Animal Science 380 – 3 hours; Agriculture and Natural Resources 290 – 3 hours; Economics 201 – 4 hours; Communication Studies 210 or 240 or Animal Science 360 – 3 hours.
  - NOTE: Economics 201 and Communication Studies 210 or 240 will be accepted by the CVM as meeting requirements in Humanities/Social Science category. The remainder must be a Social Science elective, Arts and Humanities electives (6 hours) and Cultures and Civilizations electives (6 hours); one of which must be writing intensive.
- Satisfactory completion of the first two semesters in the College of Veterinary Medicine professional program.
- No later than the first day of the first semester of the student's first year in the College of Veterinary Medicine, (s)he should contact the Department of Animal Science in order to check on graduation procedures for this program.
- A total of 124 hours must be completed by the end of the first year in the College of Veterinary Medicine.

*Requirements for the Bachelor of Science in Animal Science • Animal Science Major • Pre-Veterinary Medicine Program (3+1)*

<b>First Year</b>		<b>Hours Credit</b>
Animal Science 160		3
Biology 130*- 140*		8
English 101*- 102*		6
Mathematics 125* or 141* or 151* and second approved Quantitative Reasoning Course		6-8
Chemistry 120*-130*		8
<b>Second Year</b>		
Animal Science 220, 280*		6
Biology 240		4
Agriculture and Natural Resources 290		3
Communication Studies 210* or 240* or Animal Science 360*		3
Chemistry 350, 360, 369		8
Physics 221*-222*		8
<b>Third Year</b>		
Animal Science 320, 330, 340, 380, 395		13
Biochemistry and Cellular and Molecular Biology 401		4
1Arts and Humanities Elective*		6
Economics 201*		4
1Cultures and Civilizations Elective*		6
1Social Science Elective*		3

**Total 99-101**

\* Meets University General Education Requirement.

1 Courses selected from University General Education lists. Animal Science 280 satisfies the WC requirement. Animal Science 360 satisfies the OC requirement.

This curriculum meets the requirements for entrance to the College of Veterinary Medicine and after the first successful year in the College of Veterinary Medicine, the student will be awarded a Bachelor of Science in Animal Science. Should the student not gain admittance to the College of Veterinary Medicine after the junior year, the student could complete the requirements for a major in animal science during the senior year.

## Minor in Animal Science

Required Courses	Hours Credit
Animal Science 220 .....	.3
Animal Science 280 .....	.3
Animal Science 381 .....	.3
Animal Science 480 series .....	.3
Nine credits from Animal Science 320, 330, 340, 360, 380, 420, 430, and the 480 series .....	.9
<b>Total 21</b>	

NOTE: The core courses give the student a broad background in physiology, nutrition, and management. Careful selection of the directed electives allows the student to emphasize physiological reproduction, nutrition, or management.

# DEPARTMENT OF BIOSYSTEMS ENGINEERING AND SOIL SCIENCE

<http://bioengr.ag.utk.edu>

George F. Grandle, Interim Head

### Professors

Ammons, J.T., PhD .....	West Virginia
Ayers, P.D., PhD, PE .....	North Carolina State
Buschermohle, M.J., PhD .....	Clemson
Essington, M.E., PhD .....	California (Riverside)
Freeland, R.S., PhD, PE .....	Tennessee
Mote, C.R. (Assistant Dean, Tennessee Agricultural Experiment Station), PhD, PE .....	Ohio State
Tompkins, F.D. (Associate Vice President for Research), PhD, PE .....	Tennessee
Tyler, D.D., PhD .....	Kentucky
Wilkerson, J.B., PhD .....	Purdue
Wills, J.B., MS .....	Tennessee
Womac, A.R., PhD, PE .....	Tennessee
Yoder, D.C., PhD, PE .....	Purdue

### Associate Professors

Buchanan, J.R., PhD, PE .....	Tennessee
Eash, N.S., PhD .....	Iowa State
Grandle, G.F., PhD .....	Tennessee
Hart, W.E., PhD .....	Purdue
Hayes, D.G., PhD .....	Michigan
Lee, J., PhD .....	Iowa State
Leib, B.G., PhD .....	Penn State
Logan, J., PhD .....	Nebraska
Radosevich, M., PhD .....	Ohio State
Savoy, H.J., PhD .....	Louisiana State
Tyner, J.S., PhD .....	Oklahoma State
Walker, F.R., PhD .....	North Carolina State

### Assistant Professors

Hawkins, S.A., PhD, PE .....	Tennessee
Johnson, A.M., PhD .....	North Carolina State
Ye, X., PhD .....	Minnesota

The Department of Biosystems Engineering and Soil Science offers two undergraduate degree programs – Bachelor of Science in Biosystems Engineering and Bachelor of Science in Environmental and Soil Sciences. Biosystems engineering is a four-year, ABET accredited engineering program emphasizing engineering applications to biological systems. Environmental and soil sciences is a strong science-based program for students interested in environmental science, soil science, and agricultural systems technology. Stu-

dents in the agricultural systems technology concentration who follow a specific list of pre-approved classes are eligible to sit for the Tennessee Professional Land Surveyor-In-Training exam. Please see <http://biosystems.utk.edu/surveying> for more details. Minors in either environmental and soil sciences or in biosystems engineering technology are also available. More detailed descriptions of each program are included with the curricular material that follows.

In order to provide students with the best advice concerning course selection, general academic success, and career choices, the programs within the Department of Biosystems Engineering and Soil Science require that all undergraduate students meet with their academic advisors every semester before registering for classes.

## BIOSYSTEMS ENGINEERING MAJOR

### Advisors

Ayers, Freeland, Hart, Hayes, Wilkerson, Womac, Yoder

The College of Agricultural Sciences and Natural Resources, in cooperation with the College of Engineering, offers a four-year curriculum leading to the Bachelor of Science in Biosystems Engineering. The curriculum is accredited by the Engineering Commission of the Accreditation Board for Engineering and Technology (ABET). Overall goals of the program are emphasized in the educational objectives and program outcomes statements listed below. Program details are given in the showcase curricula and the individual course descriptions.

Career opportunities for graduates include the design, development, or management of practices that minimize soil erosion and conserve water resources; biological waste treatment systems; safer machinery systems with lower environmental impact and improved food and bio-processing systems. Employment opportunities are available in a wide variety of industries, government agencies, research and testing organizations, and educational and non-profit institutions.

The mathematics requirement for freshman admission to the biosystems engineering program is 3½ units, including trigonometry and geometry. Otherwise, the general admission requirements of the university apply.

The curriculum provides instruction in the analytical and design skills needed to solve engineering problems related to biological and agricultural systems. Comprehensive design of systems and their components is emphasized in the senior year. In addition to the standard biosystems engineering curriculum, a pre-professional concentration is available. The degree program has provisions for elective courses to be taken in specified subject areas. Students should outline a plan for all such electives not later than their second year of study. Proper scheduling of courses is very important since prerequisite requirements must be met. Students must consult with their advisors each semester to review their scheduling plan.

Students majoring in biosystems engineering are eligible to participate in the Engineering Cooperative Scholarship Program and other student activities in the College of Engineering. Biosystems engineering majors interested in the Engineering Cooperative Scholarship Program should consult with their faculty advisor or the head of the Biosystems Engineering and Soil Science Department, (865) 974-7266; e-mail [bess@utk.edu](mailto:bess@utk.edu).

The biosystems engineering program at the University of Tennessee, Knoxville, has specific educational objectives that follow the objectives of the University of Tennessee Institute of Agriculture. In order to meet the Institute's objectives, program graduates will receive the educational tools necessary to perform as entry-level engineering professionals. Recent graduates are to be

- Competitive in seeking employment or graduate placement at the regional and national levels.
- Aware of meeting their own and societal needs consistent with the goals of life-long learning, professional ethics, and leadership.
- Performing as entry-level engineers or graduate students in a manner that positively reflects on the overall program's reputation.

## Program Outcomes

To achieve the educational objectives listed above, a series of program outcomes have been adopted. These program outcomes provide specific measures to determine the degree of success in meeting each of the educational objectives. These outcomes are as follows.

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs.
- An ability to function on multi-disciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- A recognition of the need for and an ability to engage in, life-long learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- An understanding of the complexity of biological systems and the ability to apply engineering principles to those systems.

One of the primary tools engineers bring to the solution of many problems is a mastery of mathematics, so mathematical competence is a critical component of an engineering education. In order to graduate with a major in biosystems engineering, students must display this competence by achieving an average GPA of at least 2.00 in the required mathematics courses. It is the student's responsibility to work with their academic advisor in assuring that they meet this requirement.

### Requirements for the Bachelor of Science in Biosystems Engineering • Biosystems Engineering Major

First Year	Hours	Credit
Biosystems Engineering 104	.1	
Engineering Fundamentals 105, 151, 152, 202	.11	
<sup>1</sup> Chemistry 120*	.4	
<sup>1, 2</sup> Mathematics 141*, 142*	.8	
<sup>1</sup> English 101*, 102*	.6	
<sup>3</sup> Cultures and Civilizations Elective*	.3	
<b>Second Year</b>		
Biosystems Engineering 201, 221, 231, 321	.10	
Mechanical Engineering 231, 321, 331	.9	
Mathematics 231, 241	.7	
Microbiology 210*	.3	
Environmental and Soil Sciences 210	.4	
<b>Third Year</b>		
Biosystems Engineering 411, 416, 431, 451	.13	
Statistics 251	.3	
Electrical and Computer Engineering 301	.3	
Mathematics 200	.1	
<sup>4</sup> Fluid Science Elective	.3	
<sup>5</sup> Technical Elective	.3	
<sup>3</sup> Arts and Humanities Elective*	.3	
English 360*	.3	
<b>Fourth Year</b>		
Biosystems Engineering 401*, 402, 404, 444	.14	
<sup>5</sup> Technical Elective	.3	
Economics 201 (Social Sciences Elective)*	.4	
<sup>3</sup> Social Sciences Elective*	.3	
<sup>3</sup> Arts and Humanities Elective*	.3	
<sup>3</sup> Cultures and Civilizations Elective*	.3	
<b>Total</b>	<b>128</b>	

\* Meets University General Education Requirement.  
 1 Or equivalent honors course.

- 2 If mathematics placement test does not indicate placement into at least Mathematics 141, discuss mathematics options with advisor.
- 3 Select from the corresponding University General Education list after consultation with advisor.
- 4 Select from Civil and Environmental Engineering 390 or Aerospace Engineering 341 after consultation with advisor.
- 5 Typically, upper-division courses in engineering or related areas. Must be approved in advance by advisor.

## PRE-PROFESSIONAL CONCENTRATION

The pre-professional concentration provides comprehensive training in biosystems engineering while preparing the student for candidacy to medical school. While this program meets most of the general published pre-medical requirements, it is the student's responsibility to work with an academic advisor to ensure that his or her program meets the demands of specific schools.

### Requirements for the Bachelor of Science in Biosystems Engineering • Biosystems Engineering Major • Pre-Professional Concentration

First Year	Hours	Credit
Biosystems Engineering 104	.1	
Engineering Fundamentals 105, 151, 152, 202	.11	
<sup>1</sup> Chemistry 120*, 130*	.8	
<sup>1, 2</sup> Mathematics 141*, 142*	.8	
<sup>1</sup> English 101*, 102*	.6	
<b>Second Year</b>		
Biosystems Engineering 201, 221, 231, 321	.10	
Mechanical Engineering 231, 321, 331	.9	
Mathematics 231, 241	.7	
Biology 130*	.4	
Chemistry 350	.3	
<b>Third Year</b>		
Biosystems Engineering 411, 431, 451	.10	
Statistics 251	.3	
Electrical and Computer Engineering 301	.3	
Mathematics 200	.1	
<sup>3</sup> Fluid Science Elective	.3	
English 360*	.3	
Chemistry 360, 369	.5	
<sup>4</sup> Arts and Humanities Elective*	.3	
<b>Fourth Year</b>		
Biosystems Engineering 401*, 402, 404, 444	.14	
Economics 201 (Social Sciences Elective)*	.4	
<sup>4</sup> Social Sciences Elective*	.3	
<sup>4</sup> Arts and Humanities Elective*	.3	
<sup>4</sup> Cultures and Civilizations Electives*	.6	
<b>Total</b>	<b>128</b>	

- \* Meets University General Education Requirement.
- 1 Or equivalent honors course.
- 2 If mathematics placement test does not indicate placement into at least Mathematics 141, discuss mathematics options with advisor.
- 3 Select from Civil and Environmental Engineering 390 or Aerospace Engineering 341 after consultation with advisor.
- 4 Select from the corresponding University General Education list after consultation with advisor.

## Minor in Biosystems Engineering Technology

### Advisors

Ayers, Freeland, Hart, Wilkerson, Womac, Yoder

No baccalaureate degree program is offered in biosystems engineering technology; however, undergraduate courses are offered to prepare students in other disciplines to apply elementary principles, techniques, and systems of engineering to the broad industry of agriculture.

Required Courses	Hours	Credit
Biosystems Engineering Technology 202 or 412, 326, and 432	.9	
Select three from 414, 422, 434, 442, 452, 462, 474	.9	
<b>Total</b>	<b>18</b>	

## ENVIRONMENTAL AND SOIL SCIENCES MAJOR

### Advisors

Eash, Essington, Hart, Lee, Logan, Radosevich

Many human activities adversely impact soil, water, and environmental quality. The Bachelor of Science in Environmental and Soil Sciences provides students with a strong grounding in basic sciences and technology to prepare them for careers in environmental and natural resource management. Students in this program study basic natural sciences as well as applied areas such as ecology, soil sciences, and natural resource policy. Students also build expertise with modern technologies such as geographical information systems, global positioning systems, and computer applications in natural resource management. Graduates are prepared to work in a wide variety of interesting and challenging career paths and to work with a broad variety of other professionals to solve complex problems. Examples of potential careers include soil and environmental specialists and scientists; state and federal regulatory agency work; private consulting in environmental and agricultural areas; and working with non-governmental organizations with interests in agriculture, environment, and natural resources. Students receiving this degree are also very competitive for placement in graduate programs in environmental and agricultural sciences and technology, as well as law school.

The core program provides a strong grounding in the sciences and technology, while concentrations permit a focus on either science or technology. The three concentrations in this program are soil science, environmental science, and agricultural systems technology.

### TECHNICAL ELECTIVES FOR SOIL SCIENCE AND ENVIRONMENTAL SCIENCE CONCENTRATIONS

*Note that some electives have required prerequisites. The prerequisites are either required in the major or are listed below. See individual course descriptions in the catalog for specific information.*

Animal Science 220, 280, 320, 330, 380, 381; Biochemistry and Cellular and Molecular Biology 306, 310, 321, 401, 402, 404, 411, 471, 481; Biology 240, 250; Biosystems Engineering Technology (any course not required for the major); Chemistry 230, 310, 319, 320, 329, 350, 360, 369, 430, 439, 471, 481; Ecology and Evolutionary Biology 240, 304, 305, 330, 370, 380, 410, 414, 421, 433, 470, 474, 484, 495; Entomology and Plant Pathology 313, 321, 451; Environmental and Soil Sciences (any course not required for the major); Food Science and Technology 420, 429; Forestry 314, 321; Forestry, Wildlife and Fisheries 250, 312, 313, 317, 410, 412, 420; Geography 101, 102, 131, 132, 310, 334, 410, 411, 412, 413, 415, 434, 436, 439; Geology 102, 103, 201, 202, 203, 310, 345, 370, 381, 450, 455, 485, 486; Management 301, 321, 431; Microbiology 310, 319, 410, 411, 470; Physics 222; Plant Sciences 250, 434, 435, 457, 461; Political Science 300, 330, 340, 402, 430, 431, 440, 442, 470; Public Health 310; Sociology 360, 462, 464, 465; Statistics (any course above 201); University Studies 322.

### TECHNICAL ELECTIVES FOR AGRICULTURAL SYSTEMS TECHNOLOGY CONCENTRATION

*Note that some electives have required prerequisites. The prerequisites are either required in the major or are listed below. See individual course descriptions in the catalog for specific information.*

Accounting 200; Agricultural and Extension Education 450; Agricultural Economics 342, 350, 355; Biosystems Engineering Technology 202, 442, 452; Business Administration 201; Entomology and Plant Pathology 325, 410; Environmental and Soil Sciences 442, 444, 462; Industrial Engineering 304, 423; Marketing 300; Plant Sciences 240, 410, 430, 434, 435.

### AGRICULTURAL SYSTEMS TECHNOLOGY CONCENTRATION

The agricultural systems technology concentration emphasizes the skills needed to manage the sophisticated technological systems that are increasingly essential to modern agricultural production. The program starts with a basic science foundation, adds courses in crop production, pest control, and protection of soil and

water resources, then introduces the technologies and control systems available to make production more efficient and environmentally sound. It rounds out the curriculum with analysis and management courses to tie all the information together and to most effectively use it in making and carrying out management decisions. Directed technical electives allow the student to concentrate in a particular area of agricultural production or to develop increased skills with particular technologies or management tools. Students from this program will have the skills and understanding to be successful in agribusiness, agricultural consulting, or employment with agricultural equipment and material suppliers.

This degree program has pre-approved educational courses for Tennessee Professional Land Surveyor-In-Training application. For more information, visit <http://bioengr.ag.utk.edu/surveying>.

### Requirements for the Bachelor of Science in Environmental and Soil Sciences • Environmental and Soil Sciences Major • Agricultural Systems Technology Concentration

First Year	Hours	Credit
Biology 111*, 112*	8	
Chemistry 120*, 130*	8	
English 101*, 102*	6	
Mathematics 151*, 152*	6	
<sup>1</sup> Social Sciences Elective*	3	
<b>Second Year</b>		
Accounting 200	3	
Agricultural Economics 212	3	
Agriculture and Natural Resources 290	3	
<sup>1</sup> Arts and Humanities Elective*	3	
<sup>1</sup> Cultures and Civilizations Elective*	3	
Economics 201*	4	
Environmental and Soil Sciences 210	4	
Communication Studies 210* or 240*	3	
Physics 221*	4	
Statistics 201*	3	
<b>Third Year</b>		
Agricultural Economics 350 or 355	3	
Biosystems Engineering Technology 326, 412	6	
<sup>1</sup> Cultures and Civilizations Elective*	3	
English 360*	3	
Entomology and Plant Pathology 313, 321	6	
Environmental and Soil Sciences 301*, 324, 334	7	
Plant Sciences 457	2	
<b>Fourth Year</b>		
<sup>1</sup> Arts and Humanities Elective*	3	
Biosystems Engineering Technology 414, 432, 434, 462, 474	15	
Agricultural Economics 412	3	
Technical Electives	9	
<b>Total</b>	<b>124</b>	

\* Meets University General Education Requirement.

<sup>1</sup> Choose from the University General Education lists.

### ENVIRONMENTAL SCIENCE CONCENTRATION

The environmental science concentration is a blended program of science and technology that provides a strong, broad background in the natural sciences. The plan of study emphasizes human impacts on the long-term use and productivity of land and water resources. Emphasis is also placed on the tools used in the management of these resources. The curriculum provides a good foundation in the collection and analysis of the information required to characterize resource conservation problems and to make good resource use decisions. Directed technical electives allow the students to concentrate in an area of interest. Students in this program will gain the practical knowledge necessary to compete for career opportunities in government, environmental consulting firms, public health services, environmental research laboratories, and agricultural production, while also gaining the theoretical training necessary for continuing on for advanced degrees in a variety of environmentally related fields.

**Requirements for the Bachelor of Science in Environmental and Soil Sciences • Environmental and Soil Sciences Major • Environmental Science Concentration**

First Year	Hours Credit
Biology 130*, 140*	.8
Chemistry 120*, 130*	.8
English 101*, 102*	.6
Environmental and Soil Sciences 120*	.3
Mathematics 151*, 152*	.6
<b>Second Year</b>	
1Arts and Humanities Elective*	.3
Agriculture and Natural Resources 290	.3
Biology 250	.4
Economics 201*	.4
Environmental and Soil Sciences 210	.4
Geology 101*	.4
Microbiology 210*	.3
Statistics 201*	.3
Physics 221*	.4
<b>Third Year</b>	
English 295* or 360* or Agricultural and Extension Education 440*	.3
Biosystems Engineering Technology 326	.3
Chemistry 350 or 110*	.3-4
1Cultures and Civilizations Elective*	.3
Environmental and Soil Sciences 301*, 324, 334, 355	.10
1Social Sciences Elective*	.3
Philosophy 245*	.3
Technical Elective	.3
<b>Fourth Year</b>	
Agricultural Economics 470 or Economics 462 or Industrial Engineering 405	.3
Biosystems Engineering Technology 412 or 474	.3
Environmental and Soil Sciences 434, 444, 462	.9
Technical Electives	.9
Free Electives	.5-6
<b>Total 124</b>	

\* Meets University General Education Requirement.  
1 Choose from the University General Education lists.

**SOIL SCIENCE CONCENTRATION**

This concentration is a rigorous, science-based program for students interested in the field of soil science. The curriculum emphasizes soils and their long-term use and productivity, as well as surface and sub-surface water resources. Students will understand natural resource problems and their management, including soil and water conservation issues, land use problems, waste disposal, and reclamation of disturbed lands. Other areas of interest can be addressed through the appropriate selection of technical electives in the program. Students in this program will gain the practical knowledge necessary to compete for career opportunities in government, environmental consulting firms, public health services, environmental research laboratories, and agricultural production, while also gaining the theoretical training necessary for continuing on for advanced degrees in a number of environmentally related fields.

**Requirements for the Bachelor of Science in Environmental and Soil Sciences • Environmental and Soil Sciences Major • Soil Science Concentration**

First Year	Hours Credit
Biology 130*, 140*	.8
Chemistry 120*, 130*	.8
English 101*, 102*	.6
Environmental and Soil Sciences 120*	.3
Mathematics 151*, 152*	.6
<b>Second Year</b>	
Agriculture and Natural Resources 290	.3
1Arts and Humanities Elective*	.3
1Cultures and Civilizations Elective*	.3
Economics 201*	.4
Environmental and Soil Sciences 210	.4
Geology 101*	.4

Microbiology 210*	.3
Physics 221*	.4
Statistics 201*	.3
<b>Third Year</b>	
Biosystems Engineering Technology 326 or 412	.3
Chemistry 110* or 350	.3-4
Chemistry 310 and 319	.4
Environmental and Soil Sciences 301*, 324, 334, 355	.10
Philosophy 245*	.3
Plant Sciences 250	.3
Technical Electives	.3
English 295* or 360*, or Agricultural and Extension Education 440*	.3
<b>Fourth Year</b>	
Agricultural Economics 470 or Economics 462	.3
Environmental and Soil Sciences 434, 442, 444, 462	.12
1Social Sciences Elective*	.3
Technical Electives	.6
Free Electives	.5-6
<b>Total 124</b>	

\* Meets University General Education Requirement.  
1 Choose from the University General Education lists.

**Minor in Environmental and Soil Sciences**

Required Courses	Hours Credit
Environmental and Soil Sciences 210, 324, 334	.10
Electives in Environmental and Soil Sciences and/or Biosystems Engineering Technology at the 300 level or higher	.9
<b>Total 19</b>	

**DEPARTMENT OF ENTOMOLOGY AND PLANT PATHOLOGY**

<http://eppserver.ag.utk.edu>

Carl J. Jones, Head

**Professors**

Bernard, E.C., PhD	.Georgia
Bost, S.C., PhD	.North Carolina State
Burgess, E.E., PhD	.Tennessee
Gerhardt, R.R., PhD	.North Carolina State
Grant, J.F., PhD	.Clemson
Hale, F.A., PhD	.Ohio State
Jones, C.J., PhD	.Wyoming
Lambdin, P.L., PhD	.Virginia Tech
Newman, M.A., PhD	.Texas A&M
Patrick, C.R., PhD	.Mississippi State
Skinner, J.A., PhD	.California (Davis)
Trigiano, R.N., PhD	.North Carolina State
Windham, A.S., PhD	.North Carolina State
Windham, M.T., PhD	.North Carolina State

**Associate Professors**

Canaday, C.H., PhD	.Ohio State
Gwinn, K.D., PhD	.North Carolina State
Ownley, B.H., PhD	.North Carolina State
Stewart, S.D., PhD	.Auburn
Vail, K.M., PhD	.Florida

**Assistant Professors**

Hajimorad, M., PhD	.Adelaide (Australia)
Jurat-Fuentes, J.L., PhD	.Georgia
Lamour, K., PhD	.Michigan State
Moulton, J.K., PhD	.Arizona

**Advisor**

Gerhardt

Courses in economic entomology, diseases and insects of ornamental plants, forest protection, plant pathology, and veterinary entomology are available to undergraduate students. No undergraduate degree exists in the Department of Entomology and Plant Pathology, but a program leading to the Master of Science degree with a major in entomology and plant pathology and a PhD with a major in plants, soils and insects and concentrations in entomology, plant pathology, integrated pest management, and bioactive natural products are available (see *Graduate Catalog*). Instruction and training is provided in those disciplines which deal

with the natural hazards that are major causes of losses in agricultural production, namely, insects and plant diseases. Courses of study in entomology or plant pathology should give the student an appreciation of insects and microorganisms, their ecology, population dynamics, potential damage to plants and their products, and various considerations in control alternatives.

## Minor in Entomology and Plant Pathology

**Required Courses** **Hours Credit**

Choose from Entomology and Plant Pathology 201, 213,  
321, 325, 410, 411, 448, 451, 493 . . . . .16

**Total 16**

# DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

<http://foodscience.utk.edu>

*P.M. Davidson, Head*

### Professors

Davidson, P.M., PhD . . . . .Washington State  
Draughon, F.A., PhD . . . . .Georgia  
Goan, H.C., PhD . . . . .Michigan State  
Morris, W.C., PhD . . . . .Iowa State

### Associate Professors

Golden, D.A., PhD . . . . .Georgia  
Loveday, H.D., PhD . . . . .Kansas State  
Mount, J.R., PhD . . . . .Ohio State  
Zivanovic, S., PhD . . . . .Arkansas

### Assistant Professors

D'Souza, D., PhD . . . . .Georgia  
Harte, F.M., PhD . . . . .Washington State  
Zhong, Q., PhD . . . . .North Carolina State

### Emeriti Faculty

Brekke, C.J., PhD . . . . .Wisconsin  
Penfield, M.P., PhD . . . . .Tennessee

### Advisors

Draughon, Golden, Loveday, Mount, Zivanovic

The curriculum concentrations in food science and technology include a science concentration, a technology/business concentration, and a pre-professional concentration. They prepare students to apply basic scientific and business principles to manufacturing, processing, distribution, and utilization of food products that meet the needs and desires of consumers. Coursework emphasizes the basic principles of converting raw food materials into safe acceptable consumer products. Selected commodity courses detail processing of specific types of food materials. Students entering the program should have an interest in the sciences, such as chemistry, microbiology, and biology.

Career opportunities include positions in the food industry in quality assurance, production management, marketing, governmental inspection, etc. The science concentration of coursework conforms to the guidelines in the model curriculum of the Institute of Food Technologists. The technology/business concentration allows students to obtain an agribusiness or business minor or specialization in an area such as animal science or nutrition that strengthens the food science and technology major. A special problems course provides opportunity for practical training in food processing plants and laboratories or federal and state laboratories. The pre-professional concentration provides the science background necessary for medical, pharmacy, dental or veterinary medicine school and also allows the student to develop an understanding of food science principles that will apply to their chosen profession.

## FOOD SCIENCE AND TECHNOLOGY MAJOR PRE-PROFESSIONAL CONCENTRATION

The programs in pre-dental, pre-medicine, pre-pharmacy, and pre-veterinary medicine allow students to be awarded a Bachelor of Science in Food Science with a major in food science and technology after three years and the successful com-

pletion of the first year (two semesters) in UT-Memphis dental, medical, or pharmacy programs or the University of Tennessee College of Veterinary Medicine. The last 30 hours of the three-year curriculum must be taken at the University of Tennessee, Knoxville. A total of 124 hours must be completed by the end of the first year in professional school. No later than December 31 of the student's first year in professional school (s)he should contact the Department of Food Science and Technology to check on graduation procedures for this program.

Although a Bachelor of Science degree is not required for admission to the Colleges of Dentistry or Medicine, most of the students accepted into these programs have the baccalaureate degree before admission. Therefore, students are encouraged to plan to complete all requirements for Bachelor of Science degree before enrolling in either of these colleges. A Bachelor of Science degree can be obtained before enrolling in the Doctor of Pharmacy (PharmD) program.

### Requirements for the Bachelor of Science in Food Science • Food Science and Technology Major • Pre-Professional Concentration

First Year	Hours Credit
<sup>1</sup> English*	.6
<sup>2</sup> Mathematics 125* or 141* or 151*	.3-4
Biology 130*- 140*	.8
Chemistry 120*-130*	.8
Food Science and Technology 101	.3
Agriculture and Natural Resources 290	.3
<b>Second Year</b>	
Chemistry 350, 360-369	.8
Microbiology 210* or higher	.3
<sup>3</sup> Physics 221*	.4
<sup>4</sup> Social Sciences Electives*	.6
Food Science and Technology 340	.3
<sup>5</sup> Directed Science Requirements	.12
<b>Third Year</b>	
Food Science and Technology 301	.1
Food Science and Technology 410-419 and 420-429	.9
<sup>5</sup> Directed Science Requirements	.9
<sup>4</sup> Arts and Humanities Electives*	.6
Statistics 201* or Quantitative Reasoning Elective*	.3
<sup>4</sup> Cultures and Civilizations Electives*	.6
<b>Fourth Year</b>	
Food Science and Technology 401	.1
<sup>6</sup> Food Science and Technology Electives	.9
Nutrition 100*	.3
Communicating Orally Elective	.1-3
Electives	.6-9
<b>Total 124</b>	

\* Meets University General Education Requirement.

- Select either English 101 and 102 or English 118 and 102. Students who obtain a grade of A or B in 118 may complete their freshman requirement with 102, 355, or with a 200-level course in the English Department. The 200-level course may, if so listed, also be used toward the Arts and Humanities requirement.
- Mathematics placement depends on high school courses and grades and ACT scores.
- Physics 222 is taken as a directed science elective for pre-professional programs that require it.
- Choose from the University General Education lists. One of these courses must be a writing-intensive (WC) course.

- 5 Choose from Biochemistry and Cellular and Molecular Biology 230, 401, 402; Microbiology 430, Physics 222, Ecology and Evolutionary Biology 240; Biology 240, Food Science and Technology 415, 430, 441, 442, 445, 461, 490, 495 or 493 (maximum of 3 hours).
- 6 Choose from Food Science and Technology 150, 240, 415, 430, 441, 442, 445, 461, 462, 490, 495 or 493 (maximum of 3 hours).

### SCIENCE CONCENTRATION

#### Requirements for the Bachelor of Science in Food Science • Food Science and Technology Major • Science Concentration

First Year	Hours	Credit
1English*	6	6
2Mathematics 125*, 141* or 151*	3-4	3-4
3Biological Sciences	4	4
Chemistry 120*, 130*	8	8
Food Science and Technology 101	3	3
Agriculture and Natural Resources 290	3	3
4Arts and Humanities Elective*	3	3
<b>Second Year</b>		
Chemistry 350, 360-369	8	8
Microbiology 210* or higher	3	3
Physics 221*	4	4
4Social Sciences Electives*	6	6
4Arts and Humanities Elective*	3	3
Food Science and Technology 340	3	3
Nutrition 100* or 300	3	3
<b>Third Year</b>		
Food Science and Technology 301	1	1
Food Science and Technology 410, 419 and 430	7	7
Biochemistry and Cellular and Molecular Biology 310 or 401	4	4
Food Science and Technology 441 and 461 or 462	5-6	5-6
Statistics 201* or Quantitative Reasoning Elective*	3	3
4Cultures and Civilizations Electives*	6	6
4Communicating Orally Elective*	3	3
Electives	3-4	3-4
<b>Fourth Year</b>		
Food Science and Technology 401	1	1
Food Science and Technology 420, 429	5	5
Food Science and Technology 415 and 445	8	8
Food Science and Technology 490, 493 and 495	9	9
Electives	7-11	7-11
		<b>Total 124</b>

- \* Meets University General Education Requirement.
- 1 May select either English 101 and 102 or English 118 and 102. Students who obtain a grade of A or B in 118 may complete their freshman requirement with 102, 355, or with a 200-level course in the English Department. The 200-level course may, if so listed, also be used toward the Arts and Humanities (AH) requirement.
- 2 Mathematics placement depends on high school courses and grades and ACT scores.
- 3 May be chosen from Biology 101, 102, 111, 112 or 130.
- 4 Chosen from the University General Education lists. One of these courses must be an approved Communicating through Writing (WC) course.

### TECHNOLOGY/BUSINESS CONCENTRATION

#### Requirements for the Bachelor of Science in Food Science • Food Science and Technology Major • Technology/Business Concentration

First Year	Hours	Credit
1English*	6	6
2Mathematics 110* or 123* or 125* or higher	3	3
3Biological Sciences*	4	4
Chemistry 100* or 120*	4	4
4Arts and Humanities Electives*	6	6
Food Science and Technology 101	3	3
Agriculture and Natural Resources 290	3	3
<b>Second Year</b>		
Chemistry 110*	4	4
Microbiology 210* or higher	3	3
Food Science and Technology 240	3	3
4Social Sciences Electives*	6	6
5Directed Technology/Business Electives	9	9
Food Science and Technology 340	3	3
Nutrition 100* or Animal Science 381	3	3

### Third Year

Food Science and Technology 301	1
Food Science and Technology 410-419 and 430	7
4Cultures and Civilizations Electives*	6
5Directed Technology/Business Electives	9
Statistics 201* or Mathematics 115*	3
Communicating Orally Elective*	1-3
Electives	3-5

### Fourth Year

Food Science and Technology 401	1
Food Science and Technology 420, 429	5
Food Science and Technology 415, 445, 461 or 462, 490 and 495	16-17
5Directed Technology/Business Electives	3
Food Science and Technology 493	3
Electives	3-4

**Total 124**

- \* Meets University General Education Requirement.
- 1 May select either English 101 and 102 or English 118 and 102. Students who obtain a grade of A or B in 118 may complete their freshman requirement with 102, 355, or with a 200-level course in the English Department. The 200-level course may, if so listed, also be used toward the Arts and Humanities (AH) requirement.
- 2 Mathematics placement depends on high school courses and grades and ACT scores. Mathematics 125 needed for Statistics 201.
- 3 May be chosen from Biology 101, 102, 111, 112 or 130.
- 4 Choose from the University General Education lists. One of these courses must be an approved Communicating through Writing (WC) course.
- 5 Lists of appropriate courses are available at <http://foodscience.utk.edu/academics/undergraduate/curriculum.html> and should be selected in conference with academic advisor to match student's interests with concentrations needed in the food industry.

### Minor in Food Science and Technology

Required Courses	Hours	Credit
Food Science and Technology 101	3	3
Food Science and Technology 340	3	3
Food Science and Technology 410	3	3
Food Science and Technology 420	2	2
Food Science and Technology Electives	6	6
		<b>Total 17</b>

## DEPARTMENT OF FORESTRY, WILDLIFE AND FISHERIES

<http://fwf.ag.utk.edu/>

Keith L. Belli, Head

#### Professors

Belli, K.L., PhD	Minnesota
Buehler, D.A., PhD	Virginia Tech
Clatterbuck, W.W., PhD	Mississippi State
Dearden, B.L., PhD	Colorado State
Fly, J.M., PhD	Michigan
Hodges, D.G., PhD	Georgia
Houston, A.T., PhD	Tennessee
Ostermeier, D.M., PhD	Syracuse
Rials, T.G., PhD	Virginia Tech
Schlarbaum, S.E., PhD	Colorado State
Strange, R.J., PhD	Oregon State
Wilson, J.L., PhD	Tennessee

#### Associate Professors

Buckley, D.S., PhD	Michigan Tech
Bozell, J.J., PhD	Colorado State
Harper, C.A., PhD	Clemson
Hickling, G.J., PhD	Western Ontario (Canada)
Keyser, P.D., PhD	Clemson
Muller, L.I., PhD	Georgia
Wang, S., PhD	Nanjing Forestry (China)
Young, T.M., PhD	Tennessee

#### Assistant Professors

Eda, S., PhD	Japan
Franklin, J.A., PhD	Alberta (Canada)
Gray, M.J., PhD	Texas Tech
Harper, D.P., PhD	Washington State

Henning, J.G., PhD	Virginia Tech
Henry, T.B., PhD	Auburn
Labbe, N., PhD	Bordeaux (France)
Taylor, M.M., PhD	Oregon State
Van Manen, F., PhD	Tennessee

**Instructors**

Minser, W.G., MS	Tennessee
Moschler, W., MS	Virginia Tech

**Adjunct Faculty**

Albright, R., PhD	Southern Illinois
Clark, J.D., PhD	Arkansas
Franzreb, K., PhD	Arizona State
Lannom, K.O., PhD	Michigan Tech
Peine, J., PhD	Arizona

**Emeriti Faculty**

Dimmick, R.W., PhD	Wyoming
Hill, Sr., T.K., PhD	Auburn
Pelton, M.R., PhD	Georgia
Rennie, J.C., PhD	North Carolina State
Schneider, G., PhD	Michigan State
Speer, C.A., PhD	Utah State
Stumbo, D.A., PhD	Minnesota

**Forestry Advisors**

Buckley, Fly, Franklin, Henning, Hodges, Ostermeier, Scharbaum

**Wildlife and Fisheries Advisors**

Buehler, Gray, Hickling, Minser, Muller, Strange, Wilson

The mission of the Department of Forestry, Wildlife and Fisheries is to advance the management, utilization, and appreciation of natural resources in Tennessee, the region, and beyond through programs in teaching, research, and extension.

The department offers two majors. The major in forestry leads to the Bachelor of Science in Forestry and the major in wildlife and fisheries science leads to the Bachelor of Science in Wildlife and Fisheries Science. The forestry major has concentrations in forest resources management and wildland recreation. The wildlife and fisheries science major has concentrations in wildlife and fisheries management and wildlife health.

**Enrollment Management Plan**

All majors in the Department of Forestry, Wildlife and Fisheries must submit an application for progression with relevant career goals, names of three references, work experience (both volunteer and paid positions) related to natural resources and service and professional activities, and a transcript before registering for junior classes.

To be considered for progression into the upper division of the program, applicants must have submitted all required documents (application form, resume, and transcript) by a March 15 deadline late in the spring semester.

Those students who have met all preliminary requirements for progression, including having relevant career goals, will be ranked based on the combined score of their cumulative grade point average (GPA) and GPA in core courses. The combined score will be 50% cumulative GPA (minimum 2.20) and 50% cumulative GPA (minimum 2.20) in core courses. Applicants with the highest scores will be accepted into the programs. The number of applicants accepted into each program will be determined based on resources available. Applicants will be notified of their acceptance by the start of registration for summer semester.

Applicants who are not accepted into the program and who believe that extenuating circumstances prevented their acceptance into the program may appeal the decision to a faculty committee (i.e., S.A.C.). A written statement in which the case is made for acceptance is required for all applicants. It must be submitted within one week of the rejection notice.

Appellants receiving a positive response from the appeals committee will be accepted into programs on a provisional basis through the first semester of their junior year. The progress of provisional students will be reviewed at the end of the fall semester. At that time, they will either be fully admitted or released from the program.

**Core Courses**

Students must have completed or be enrolled in all core courses by the end of the semester in which they apply for acceptance into upper-division courses. They must complete all core courses before entering upper-division courses. They will also need the prerequisites to the individual upper-division courses.

**Forestry**

Two courses in English composition (English 101 and 102 or equivalent); calculus (Mathematics 125 or equivalent); general chemistry (Chemistry 100 or equivalent); two courses in general botany (Biology 111 and 112 or equivalent); general economics (Economics 201 or equivalent); public speaking (Communication Studies 210 or 240 or equivalent); statistics (Statistics 201 or equivalent); ecology (Forestry 215 or Biology 250 or equivalent).

**Wildlife and Fisheries Science**

Two courses in English composition (English 101 and 102 or equivalent); calculus (Mathematics 125 or equivalent); two courses in general chemistry (Chemistry 120/130 or 100/110 or equivalent); two courses in general biology (Biology 130/140 or 101/102 or equivalent); general economics (Economics 201 or equivalent); public speaking (Communication Studies 210 or 240 or equivalent); statistics (Statistics 201 or equivalent); microcomputer applications (Agriculture and Natural Resources 290 or equivalent); general ecology (Biology 250 or equivalent).

**FORESTRY MAJOR**

The profession of forestry is the science, the art, and the practice of managing and using for human benefit the natural resources that occur on and in association with forest lands. Benefits are derived from the multiple resources of the forest – wood, water, wildlife, recreation, forage, and environmental amenities. Foresters are managers of these resources. Thus, our principal instructional objective is to provide the broad education needed to deal effectively with the complex of forest resources.

**FOREST RESOURCES MANAGEMENT CONCENTRATION**

The forest resources management concentration provides an opportunity to obtain an education related to the management of the broad spectrum of wildland resources. In addition to the core of required courses, there are about 18 elective credit hours for broad studies or specialized training in one or more areas of forestry. These areas and examples of related fields of study are forest biology including plant physiology and morphology, ecology, genetics, tree nutrition, forest soils; forest business management including economics, accounting, finance, marketing, management science; forest economics including economics, business administration, social science; forest inventory including mathematics, statistics, computer science; wildland recreation including natural and social sciences; and wildlife management including ecology and botany.

The university has over 21,000 acres of forest land available for teaching, research, and demonstration. The Tennessee Valley Authority, Great Smoky Mountains National Park, and Cherokee National Forest provide additional land and facilities available to the teaching program. Contained within these areas is a wide variety of tree species and forest types ranging from elements of the boreal forest to southern pines and hardwoods.

Lumber, pulp and paper, and other wood-using industries cooperate in conducting tours and demonstrating industrial processes.

**Requirements for the Bachelor of Science in Forestry • Forestry Major • Forest Resources Management Concentration**

First Year	Hours	Credit
Forestry 100	3	
English 101*, 102*	6	
Mathematics 125*	3	
Biology 111*, 112*	8	
Chemistry 100*	4	
1Social Science Elective*	3	
Free Electives	3	

**Second Year**  
 Forestry 214, 215 .....6  
 Forestry, Wildlife and Fisheries 212 .....3  
 Economics 201\* .....4  
 Statistics 201\* .....3  
 Biosystems Engineering Technology 326 or Geography 411 .....3  
 Communication Studies 210\* or 240\* .....3  
 Environmental and Soil Science 210 .....4  
 3Cultures and Civilizations Elective\* .....3  
**Third Year**  
 Forestry, Wildlife and Fisheries 312\*, 313, 317 .....8  
 Forestry 305, 306, 314, 321, 322, 323, 326, 329 .....19  
 3Arts and Humanities Elective\* .....3  
**Fourth Year**  
 Forestry, Wildlife and Fisheries 412, 416 .....6  
 Forestry 331, 332, 420, 422 .....8  
 Wildlife and Fisheries Science 433, 443, 444, or 445 .....3  
 4Ethics Elective .....3  
 3Cultures and Civilization Elective\* .....3  
 3Arts and Humanities Elective\* .....0-3  
 2Communication Elective .....3  
 Free Electives .....2-5

**Total 120**

- \* Meets University General Education Requirement.  
 1 Choose from Anthropology 130\*, Political Science 102\*, Psychology 110\* or 117\*, Sociology 110\*, 117\*, or 120\*.  
 2 Electives are chosen in conference with advisor.  
 3 General Education Electives. Choose two courses from the Cultures and Civilizations list and two courses from the Arts and Humanities list for a total 12 credit hours. Forestry, Wildlife and Fisheries 312 meets the Communicating through Writing (WC) requirement.  
 4 Choose from Philosophy 110\* (AH), 130, 243\* (AH, WC), 245\* (AH), 290\* (AH, WC), or 340\* (WC). If the student selects an Ethics Elective that satisfies the Arts and Humanities General Education Requirement, then the student may select an additional Free Elective in lieu of the Arts and Humanities Elective listed in the Fourth Year.

**WILDLAND RECREATION CONCENTRATION**

The wildland recreation concentration is an interdisciplinary program that prepares students to work in natural resource based recreation settings on private and public lands, including local, state, and national parks, and other state and federal agencies and private or non-profit organizations providing outdoor recreational opportunities.

Students prepare for professional positions in the planning, development, interpretation, and management of private and public lands for recreational purposes. Students also learn the basic philosophy and principles associated with the use of leisure time and the relationship of natural resources to the constructive use of leisure time.

Elective credits may be used to obtain specializations in complementary areas such as education, cultural and natural history interpretation, forestry, wildlife, fisheries, communication and public relations, agricultural extension education, ornamental horticulture and landscape design, business and public administration; and the natural sciences, including ecology, and geology, as well as recreation and leisure studies.

Ten weeks of professional internship experience (6 credits) are required during the final 45 hours of credit in the program. The internship is a highly structured field experience guided by specific learning objectives pre-approved by the instructor and the field supervisor. The student receives one credit per two weeks of full-time field experience. Preparations for the internship should be made well in advance of actual placement. Summer employment or volunteer work in a related field prior to the internship is highly encouraged.

**Requirements for the Bachelor of Science in Forestry • Forestry Major • Wildland Recreation Concentration**

First Year	Hours Credit
Forestry 100	.....3
English 101*-102*	.....6
Mathematics 125*	.....3
Biology 111*-112*	.....8
Chemistry 100*	.....4

Psychology 110*, Sociology 120*, Political Science 102*, Sociology 110*, or Anthropology 130*	.....3
1Cultures and Civilizations* or Arts and Humanities* Elective	.....3
Elective	.....3

**Second Year**  
 Forestry, Wildlife and Fisheries 212 .....3  
 Forestry 214, 215 .....6  
 Economics 201\* .....4  
 Statistics 201\* .....3  
 Communication Studies 210\* or 240\* .....3  
 Environmental and Soil Sciences 210 .....4  
 Select one from Art Media Arts 231, 236;  
 Communication Studies 220, 270, 310, 320, 330, 420;  
 English 295\*; Journalism and Electronic Media 201\*, 290,  
 412, 450\*, 451\*, 488 .....3  
 1Cultures and Civilizations\* or Arts and Humanities\* Electives .....6

**Third Year**  
 Forestry, Wildlife and Fisheries 312\*, 313, 317 .....8  
 Forestry 321, 423 .....6  
 Forestry 314; Political Science 440, 441; Plant Sciences 427;  
 or Management 440 .....2-3  
 Recreation 310, 410, 415, 430, 470 .....3  
 Biosystems Engineering Technology 212, 326;  
 Geography 310, 410, 411, 413; Political Science 403;  
 Agriculture and Natural Resources 290 .....3  
 Select one course from Sociology 345, 360, 370, 464, 465;  
 Philosophy 245\*; Geography 320, 323, 345 .....3  
 Select one course from Plant Sciences 280, 350, 370, 421, 437 .....2-3  
 1Cultures and Civilizations\* or Arts and Humanities\* Elective .....3

**Fourth Year**  
 Forestry 422,495 .....9  
 Forestry, Wildlife and Fisheries 412, 416 .....6  
 Select one from Forestry, Wildlife and Fisheries 410;  
 Wildlife and Fisheries Science 443, 444, 445 .....3  
 Electives .....5-7

**Total 120**

- \* Meets University General Education Requirement.  
 1 General Education Electives. Choose two courses from the Cultures and Civilizations list and two from the Arts and Humanities list for a total of 12 credit hours. Forestry, Wildlife and Fisheries 312 meets the General Education Requirement for Communicating through Writing.

**Minor in Forestry**

Required Courses	Hours Credit
Forestry 100 or Forestry, Wildlife and Fisheries 250	.....3
Forestry, Wildlife and Fisheries 212, 312, 313, 412, 416, or any Forestry course	.....12

**Total 15**

NOTE: Prerequisites will not be waived.

**WILDLIFE AND FISHERIES SCIENCE MAJOR**

Wildlife and fisheries management is the science and art of maintaining populations of wild animals at levels consistent with the best interests of wild species and of the public. Management goals may be aesthetic, economic, or ecological. Success depends upon wildlife and fisheries biologists providing assistance; scholarly application of scientific information and methods to these goals; ecological perspective; and execution of programs to maintain past successes, to prevent repetition of past failures, and to prepare for future needs.

**Requirements for the Bachelor of Science in Wildlife and Fisheries Science • Wildlife and Fisheries Science Major • Wildlife and Fisheries Management Concentration**

First Year	Hours Credit
Forestry, Wildlife and Fisheries 250*	.....3
English 101*, 102*	.....6
Biology 130*-140* or 101*-102*	.....8
1Chemistry 120*-130* or 100*-110*	.....8
2Cultures and Civilizations* and Arts and Humanities Elective*	.....6

**Second Year**

Forestry, Wildlife and Fisheries 212	.3
Economics 201*	.4
Mathematics 125*	.3
Statistics 201* or Mathematics 115*	.3
Biosystems Engineering Technology 326 or Geography 411	.3
Animal Science 220 or Wildlife and Fisheries Science 431	.3-4
Biology 250	.4
Communications Studies 210* or 240*	.3
Environmental and Soil Sciences 210	.4
<sup>2</sup> Cultures and Civilizations* or Arts and Humanities Elective*	.3

**Third Year**

Wildlife and Fisheries Science 305, 323, 340, 341, 350, 440, 442	.16
Forestry, Wildlife and Fisheries 312*, 313, 317	.8
Ecology and Evolutionary Biology 470 or Environmental and Soil Sciences 324 or Wildlife and Fisheries Science 301	.3
<sup>2</sup> Cultures and Civilizations* or Arts and Humanities Elective*	.3

**Fourth Year**

Select three from Wildlife and Fisheries Science 433, 443, 444, 445	.9
Forestry, Wildlife and Fisheries 416	.3
Forestry, Wildlife and Fisheries 412, or Forestry 321* or Forestry 422	.3
Ecology and Evolutionary Biology 330 or 433	.3
Ecology and Evolutionary Biology 474	.4
<sup>3</sup> Science Elective	.6
<sup>1</sup> Social Science Elective*	.3

**Total 125-126**

\* Meets University General Education Requirement.

- 1 Chemistry 130 is a prerequisite/corequisite to Biology 140, therefore a student selects Chemistry 120-130 and Biology 130-140; otherwise the student must select Chemistry 100-110 and Biology 101-102.
- 2 Courses selected from the University General Education lists. One of the Cultures and Civilizations (CC) or Arts and Humanities (AH) or Social Sciences (SS) courses must be a Communicating through Writing course (WC); Forestry, Wildlife and Fisheries 312 and Forestry 321 are both designated as WC courses.
- 3 300-level and above from Animal Science; Biosystems Engineering Technology; Ecology and Evolutionary Biology; Entomology and Plant Pathology; Environmental and Soil Sciences; Forestry; Forestry, Wildlife and Fisheries; Plant Sciences; or Geography 410, 411, 412, 413, 436.

**Requirements for the Bachelor of Science in Wildlife and Fisheries Science • Wildlife and Fisheries Science Major • Wildlife Health Concentration**

First Year	Hours Credit
Wildlife and Fisheries 101	.1
Forestry, Wildlife and Fisheries 250	.3
Biology 130*-140*	.8
Chemistry 120*-130*	.8
Mathematics 125*	.3
Statistics 201* or Mathematics 115*	.3
English 101*, 102*	.6

**Second Year**

Animal Science 220	.3
Biology 240, 250	.8
Microbiology 310, 319	.5
Chemistry 350, 360, 369	.8
Physics 221*, 222*	.8

**Third Year**

Wildlife and Fisheries Science 301	.3
Forestry, Wildlife and Fisheries 317	.3
Animal Science 380	.3
Biochemistry and Cellular and Molecular Biology 401, 440	.7
Economics 201*	.4
Communications Studies 210 or 240*	.3
<sup>1</sup> Cultures and Civilizations* or Arts and Humanities Electives*	.6

**Fourth Year**

Select two from Wildlife and Fisheries Science 433, 443, 444, 445	.6
Wildlife and Fisheries Sciences 431	.3
Biochemistry and Cellular and Molecular Biology 411	.3
Biosystems Engineering Technology 326 or Geography 411	.3
<sup>2</sup> Science Elective	.3
<sup>1</sup> Social Science Elective*	.3
<sup>1</sup> Cultures and Civilizations* or Arts and Humanities Electives*	.6

**Total 120**

\* Meets University General Education Requirement.

- 1 General Education Electives: Choose two from the Cultures and Civilizations (CC) list, two courses from the Arts and Humanities (AH) list, one from the Social Sciences (SS) list for a total of 15 credit hours. One of the Cultures and Civilizations (CC) or Arts and Humanities (AH) or Social Sciences (SS) courses must be a Communicating through Writing course (WC).
- 2 300-level and above from Animal Science; Biosystems Engineering Technology; Ecology and Evolutionary Biology; Entomology and Plant Pathology; Environmental and Soil Sciences; Forestry; Forestry, Wildlife and Fisheries; Plant Sciences; or Geography 410, 411, 412, 413, 436.

**Minor in Wildlife and Fisheries Science**

Required Courses	Hours Credit
Forestry, Wildlife and Fisheries 250	.3
Forestry, Wildlife and Fisheries 317	.3
Select three from Forestry, Wildlife and Fisheries 416; Wildlife and Fisheries Science 433, 443, 444, 445	.9
<b>Total 15</b>	

**DEPARTMENT OF PLANT SCIENCES**<http://plantsciences.utk.edu/>

Robert N. Augé, Acting Head

**Professors**

Albrecht, M.L. (Associate Dean), PhD	Ohio State
Allen, F.L., PhD	Minnesota
Augé, R.M., PhD	Washington State
Bates, G.E., PhD	Georgia
Denton, H.P., PhD	North Carolina State
Deyton, D.E., PhD	North Carolina State
Hayes, R.M., PhD	Illinois
Lockwood, D.W., PhD	Purdue
Miller, R.D., PhD	Kentucky
Mueller, T.C., PhD	Georgia
Rhodes, G.N., PhD	North Carolina State
Samples, T.J., PhD	Oklahoma State
Sams, C.E. (Austin Distinguished Professor), PhD	Michigan State
Stewart, C.N. (Racheff Chair), PhD	Virginia Tech
West, D.R., PhD	Nebraska

**Associate Professors**

Armel, G.R., PhD	Virginia Tech
Cheng, Z.M., PhD	Cornell
Gwathmay, C.O., PhD	California (Riverside)
Hamilton, S.L., EdD	Tennessee
Klingeman, W.E., PhD	Georgia
Menendez, G.L., MS	Tennessee
Pantalone, V.R., PhD	North Carolina State
Rogers, S.M., MLA	Georgia
Stewart, C.E., MLA	Georgia

**Assistant Professors**

Bailey, W.A., PhD	Virginia Tech
Chen, F., PhD	California (Davis)
Main, C.L., PhD	Tennessee
Smith, B.R., PhD	Cornell
Sorochan, J.C., PhD	Michigan State
Steckel, L.E., PhD	Illinois
Thompson, M.A., PhD	Tennessee
Yin, X., PhD	Purdue
Wszelaki, A.L., PhD	California (Davis)
Zale, J.M., PhD	Saskatchewan (Canada)

**Instructors**

Flanagan, P.C., MS	Tennessee
Osburn, L.D., MS	Tennessee

**Adjunct Faculty**

Airhart, D.L., PhD	Georgia
Bentley, M.L., EdD	Virginia
Ott, R.J., MBA	Tennessee

**Emeriti Faculty**

Coffey, D.L., PhD	Purdue
McDaniel, G.L., PhD	Iowa State

**Advisors**

Augé, Hamilton, Menendez, Rogers, Sorochan, C. Stewart, C.N. Stewart

Academic programs in the Department of Plant Sciences span the art, science and technology of plant use in society. Students receive preparation for careers in horticulture and agronomy with-in four concentrations – landscape design and construction; plant science, biotechnology and horticulture; public horticulture; and turfgrass science and management. With increasing emphasis placed on plants in urban areas, extensive training is offered in landscape horticulture (planning, implementation and management for landscapes, turf and gardens). Comprehensive programs are also offered in plant biotechnology and plant production.

Upon entering the department, each student is assigned a faculty advisor for guidance in selection of career specialties and elective courses. The curriculum builds upon the University General Education Requirement with critical courses in botany, soils, and business and adds a set of required departmental courses specific to each concentration. Students are able to customize their program by selecting electives. Students in all concentrations are trained to work knowledgeably in general plant culture. Students are encouraged to earn a minor in a supportive field to further enhance their academic training and professional competitiveness. While firmly grounding students in the knowledge and skills of the plant sciences and arts, our curricula emphasize critical thinking and creative activity. Our students also gain the theoretical education necessary for continuing on for advanced degrees in plant-related fields.

Students should declare a concentration early in their undergraduate program and strictly follow the curriculum described for the concentration. Students who transfer into plant sciences from other colleges or programs must meet the same requirements as those entering the department as freshman. A minimum grade point average of 2.25 is required for all plant sciences courses taken in the major.

Internship or undergraduate research participation is required for each concentration. Full-time summer internships are available at selected local, regional, and national companies or institutions. Part-time summer or semester internships and research experiences are available from the Department of Plant Sciences, other university departments and laboratories, and local commercial firms.

Our graduates find employment in a wide variety of professions. In working for others or within their own businesses, graduates of the landscape concentration design residential landscapes, select proper woody and herbaceous plant materials for specific sites, restore native landscapes, specify specialty components dealing with landscape construction (irrigation, lighting, water features), prepare materials lists and cost estimates for landscape installations, and manage landscape crews. Turf majors have career opportunities in the industries involved with lawn management, athletic fields, golf courses, sales, and park and grounds maintenance. The public horticulture concentration prepares students for careers in botanic gardens, zoos and national parks; professional writing, television and radio; urban forestry; teaching; and municipal and university horticulture. Graduates in plant science, biotechnology and horticulture find employment in education, consulting, sales, agricultural extension, and research and development.

**Technical Electives**

**BIOENERGY CONCENTRATION**

Biochemistry and Cellular and Molecular Biology; Biosystems Engineering; Biosystems Engineering Technology; Chemistry; Ecology and Evolutionary Biology; Management; Marketing; Microbiology; Physics; Spanish; Statistics; 200-level and above from Biology, Business Administration; 300-level and above from Agricultural Economics, Environmental and Soil Science, Forestry, Financial Management, Plant Sciences; Accounting 200; Engineering Fundamentals 100; English 360\*; Finance 301; Information Management 341, 342; Journalism/Electronic Media 450, 451, 456; Materials Science and Engineering 101, 201; Public Relations 270; Rural Sociology 380.

**BIOTECHNOLOGY CONCENTRATION**

Biochemistry and Cellular and Molecular Biology, Biosystems Engineering, Biosystems Engineering Technology, Chemistry, Ecology and Evolutionary Biology, Management, Marketing, Microbiology, Physics, Spanish, Statistics; 200-level and above from Biology, Business Administration; 300-level and above from Agricultural Economics, Environmental and Soil Science, Forestry, Plant Sciences; Accounting 200; Business Law

301; English 295, 360; Finance 301; Geology 201, 202; Journalism/Electronic Media 450, 451, 456.

**HORTICULTURE SCIENCE AND PRODUCTION CONCENTRATION**

300-level and above from Agricultural Economics, Environmental and Soil Science, Forestry, Plant Sciences; 200-level and above from Biology, Business Administration; courses from Biochemistry and Cellular and Molecular Biology, Biosystems Engineering, Biosystems Engineering Technology, Chemistry, Ecology and Evolutionary Biology, Management, Marketing, Microbiology, Physics, Spanish, Statistics; and Accounting 200; Business Law 301; English 295, 360; Finance 301; Geology 201, 202; Journalism/Electronic Media 450, 451, 456.

**TURFGRASS SCIENCE AND MANAGEMENT CONCENTRATION**

LANDSCAPE DESIGN AND CONSTRUCTION CONCENTRATION  
Business Administration; Entomology and Plant Pathology; Plant Sciences; Statistics; Accounting 200, Advertising courses; Architecture 111, 180, 211, 232, 271; Art 101, 103; Art Drawing 211, 212; Art Media Arts 231, 331; Art Painting 213, 214, 215, 216; Biochemistry and Cellular and Molecular Biology 306; Biology 250; Biosystems Engineering Technology 202, 412; Business Law 301; Communication Studies 310; Ecology and Evolutionary Biology 304, 330, 433; English 295\*, 360\*; Environmental and Soil Science 324, 334; Forestry 321; Forestry Wildlife and Fisheries 211, 250, 311, 317; Geography 131, 365, 366; Geology 201, 202, 203; Philosophy 243\*, 244, 245\*; Political Science 402, 403, 446; Spanish 111, 112, 211, 212; University Studies 413.

**PUBLIC HORTICULTURE CONCENTRATION**

300-level and above for Environmental and Soil Sciences; Forestry; Art 481; Agriculture and Extension Education 345; Communication Studies 440; Ecology and Evolutionary Biology 309, 330, 433; Educational Psychology 210; English 295\*, 360\*; Philosophy 245\*; Public Relations 270; Recreation and Leisure Studies 201, 430.

**TURFGRASS SCIENCE AND MANAGEMENT CONCENTRATION**

300-level and above from Agricultural Economics; Biochemistry and Cellular and Molecular Biology; Biosystems Engineering; Biosystems Engineering Technology; Ecology and Evolutionary Biology; Entomology and Plant Pathology; Environmental and Soil Sciences; Forestry; Plant Sciences; and English 295\*, 360\*.

*Courses marked with an \* meet the University General Education Requirement.*

**PLANT SCIENCES MAJOR**

**BIOENERGY CONCENTRATION**

The bioenergy concentration is intended for students who are interested in pursuing careers in the quickly-expanding biofuels and bioenergy fields. The graduate will have the background and internship experience to enter directly into the bioenergy workforce. The bioenergy industry primarily is concerned with converting plant feedstocks into liquid fuels such as ethanol and biodiesel. The great resurgence of industry and public support for research and development in this field will require a modern and multidisciplinary workforce. The student will have the opportunity to explore branch disciplines of bioenergy such as agronomy, biotechnology, business and economics, chemistry, engineering or microbiology. In addition, the need for scholars and scientists with advanced degrees (MS and PhD) will also grow exponentially in bioenergy as billions of dollars of federal funds is channeled towards new bioenergy solutions. The bachelor's degree will also prepare students for entrance into graduate programs.

**Requirements for the Bachelor of Science in Plant Sciences • Plant Sciences Major - Bioenergy Concentration**

<b>First Year</b>	<b>Hours Credit</b>
1Agriculture and Natural Resources 100 or First Year Studies 101 . . . . .	1
Biology 111*, 112* . . . . .	.8
Chemistry 120* and 130* . . . . .	.8
English 101*, 102* . . . . .	.6
Plant Sciences 250 . . . . .	.3
2,3Quantitative Reasoning Electives* . . . . .	.6
<b>Second Year</b>	
Agriculture and Natural Resources 290 . . . . .	.3
3Arts and Humanities Electives* . . . . .	.6

Communication Studies 210* or 240*	3
<sup>3</sup> Cultures and Civilizations Elective*	3
<sup>4</sup> Economics Elective*	3-4
Environmental and Soil Sciences 210	4
<sup>3,4</sup> Social Sciences Elective*	3
Technical Electives	5-6
<b>Third Year</b>	
Agricultural Economics 212	3
Biochemistry and Cellular and Molecular Biology 321	4
<sup>3</sup> Cultures and Civilizations Elective*	3
<sup>5</sup> Agricultural and Extension Education 440* or English 295* or 360* or Journalism and Electronic Media 201*	3
Plant Sciences 353, 435	5
Technical Electives	13
Third Year Summer	
Plant Sciences 492	3
<b>Fourth Year</b>	
<sup>2</sup> Specialty Area	9-11
Environmental and Soil Sciences 334	3
Plant Sciences 331, 465, 475, 497	9
Technical Electives	3
Unrestricted Electives	4-6
<b>Total</b>	<b>124</b>

\* Meets University General Education Requirement.

- 1 Required of freshmen only; requirement is waived for transfer students.
- 2 Choose one Specialty Area. Select Quantitative Reasoning Electives General Education courses based on prerequisites for courses in the Specialty Area.
- 3 Choose from the University General Education lists. Selection should be made in conference with academic advisor.
- 4 Economics 201 (4) Principles of Economics satisfies the University General Education-Social Science requirement and the major requirement for economics. If the student transfers ECON LD for 3 credits, it will satisfy the major requirement for economics but will not satisfy the General Education-Social Science requirement. In these cases, the student should take two courses from the approved General Education-Social Sciences list.
- 5 Meets the University General Education Requirement for Communicating through Writing (WC).

## SPECIALTY AREAS

Specialty electives are grouped into specialty areas. Students must complete one specialty area, consisting of three courses (9-11 credit hours). Students wishing to expand on a specialty or complete more than one specialty area are welcome to do so, using Technical Electives for this purpose. A course may be counted in one specialty area only and may not be used to fulfill any other elective requirement. Check the *Undergraduate Catalog* for any prerequisites required for these courses.

### Agronomy

Plant Sciences 457, 459; and select 6 hours from Environmental and Soil Sciences 300-level and above.

### Biosystems Engineering

Biosystems Engineering 231; Biosystems Engineering Technology 326, 432, 434, 462.

### Biotechnology

Biology 240; Plant Sciences 454 or Biochemistry and Cellular and Molecular Biology 404; Biochemistry and Cellular and Molecular Biology 401 or Microbiology 210.

### Business

Accounting 200; Agricultural Economics 355, 470; Business Administration 201, Marketing 300; Statistics 201.

### Chemistry

Chemistry 230 or 310; Chemistry 350, 360, 369; Food Science and Technology 410, 419.

### Forestry and Wildlife

200-level and above from Forestry; 200-level and above from Forestry, Wildlife and Fisheries.

### Microbiology

Microbiology 210 and above; Food Science and Technology 420, 429.

## BIOTECHNOLOGY CONCENTRATION

The biotechnology concentration is designed for students wishing to pursue advanced degrees in plant molecular biology and biotechnology and/or careers in the plant biotechnology industry. For example, the curriculum will prepare students to be competitive for entrance into MS and PhD degree programs, which in turn, prepare students for life as professional scientists. Alternatively, the plant biotechnology industry and biotechnology-affiliated industries have recurrent demand for competent BS-level scientists. One hallmark of the degree is requirement for students to participate in research directly in an affiliated faculty member's lab. This hands-on experience is reported by students to be a highlight of their degree program.

### Requirements for the Bachelor of Science in Plant Sciences • Plant Sciences Major • Biotechnology Concentration

First Year	Hours	Credit
<sup>1</sup> Agriculture and Natural Resources 100 or First Year Studies 101	1	1
<sup>2</sup> Arts and Humanities Elective*	3	3
Biology 111*, 112*	8	8
Chemistry 120* and 130*	8	8
English 101*, 102*	6	6
<sup>2</sup> Quantitative Reasoning Electives*	6	6
<b>Second Year</b>		
Agriculture and Natural Resources 290	3	3
Agricultural Economics 212	3	3
<sup>2</sup> Arts and Humanities Elective*	3	3
Communication Studies 210* or 240*	3	3
<sup>2</sup> Cultures and Civilizations Elective*	3	3
Environmental and Soil Sciences 210	4	4
<sup>3</sup> Economics Elective*	3-4	3-4
Plant Sciences 210	3	3
<sup>2,3</sup> Social Sciences Elective*	3	3
Unrestricted Electives	2-3	2-3
<b>Third Year</b>		
Biochemistry and Cellular and Molecular Biology 321	4	4
<sup>2</sup> Cultures and Civilizations Elective*	3	3
Chemistry 350	3	3
Entomology and Plant Pathology 313 or 321 or 410	3	3
Environmental and Soil Sciences 334	3	3
<sup>4</sup> Plant Sciences Electives	9	9
Plant Sciences 457-458 or 457-459	3	3
Technical Electives	3	3
<b>Fourth Year</b>		
Plant Sciences 353, 454, 461 and 470	9	9
Plant Sciences 454 or Biochemistry and Cellular and Molecular Biology 404	3-4	3-4
Plant Sciences 492 or 497	3	3
Technical Electives	14-15	14-15
<b>Total</b>	<b>124</b>	

\* Meets University General Education Requirement.

- 1 Required of freshmen only; requirement is waived for transfer students.
- 2 Choose from the University General Education lists. Selection should be made in conference with academic advisor.
- 3 Economics 201 (4) Principles of Economics satisfies the University General Education-Social Science requirement and the major requirement for economics. If the student transfers ECON LD for 3 credits, it will satisfy the major requirement for economics but will not satisfy the General Education-Social Science requirement. In these cases, the student should take two courses from the approved General Education-Social Sciences list.
- 4 Select any Plant Sciences courses beyond those that are required.

NOTE: Students must meet the University General Education Requirement for Communicating through Writing by selecting a course with a (WC) designation. This course may be in the major or from another discipline. Plant Sciences 410 and 448 satisfy the Communicating through Writing requirement.

## HORTICULTURE SCIENCE AND PRODUCTION CONCENTRATION

The horticulture science and production concentration is designed to provide students with the knowledge and skills needed for production, management and marketing of horticultural crops. This concentration also prepares students with strong interests in science and/or technology to pursue opportunities in research-related fields, including graduate studies. Careful selection of departmental courses and other electives in consultation with the assigned academic advisor will prepare graduates for the career of their choice. Employment prospects range from managing nursery and greenhouse businesses, to consulting and education, to marketing fruits and vegetables for healthier lifestyles.

### Requirements for the Bachelor of Science in Plant Sciences • Plant Sciences Major • Horticulture Science and Production Concentration

First Year	Hours Credit
1Agriculture and Natural Resources 100 or First Year Studies 101 . . .	.1
2Arts and Humanities Elective* . . . . .	.3
Biology 111*, 112* . . . . .	.8
Chemistry 100 and 110*, or 120* and 130* . . . . .	.8
English 101*, 102* . . . . .	.6
2Quantitative Reasoning Electives* . . . . .	.6
<b>Second Year</b>	
Agriculture and Natural Resources 290 . . . . .	.3
2Arts and Humanities Elective* . . . . .	.3
Communication Studies 210* or 240* . . . . .	.3
2Cultures and Civilizations Elective* . . . . .	.3
Environmental and Soil Sciences 210 . . . . .	.4
3Economics Elective* . . . . .	.3-4
Plant Sciences 210 . . . . .	.3
Physics 101 . . . . .	.3
2,3Social Sciences Elective* . . . . .	.3
<b>Third Year</b>	
Biochemistry and Cellular and Molecular Biology 321 or Forestry 414 . . .	.3-4
2Cultures and Civilizations Elective* . . . . .	.3
English 295* or 360* . . . . .	.3
Entomology and Plant Pathology 313 or 321 or 410 . . . . .	.3
Environmental and Soil Sciences 334 . . . . .	.3
Plant Sciences 220, 230, 290 or 291 . . . . .	.3
Plant Sciences 457-458 or 457-459 . . . . .	.3
4Plant Sciences Electives . . . . .	.6
Technical Electives . . . . .	.4-5
<b>Fourth Year</b>	
Plant Sciences 331, 353, 410*, 430, 470 . . . . .	.13
Plant Sciences 492 or 497 . . . . .	.3
4Plant Sciences Electives . . . . .	.6
Technical Electives . . . . .	.4-5
Unrestricted Electives . . . . .	.5
<b>Total 124</b>	

- \* Meets University General Education Requirement.
- 1 Required of freshmen only; requirement is waived for transfer students.
- 2 Choose from the University General Education lists. Selection should be made in conference with academic advisor.
- 3 Economics 201 (4) Principles of Economics satisfies the University General Education-Social Science requirement and the major requirement for economics. If the student transfers ECON LD for 3 credits, it will satisfy the major requirement for economics but will not satisfy the General Education-Social Science requirement. In these cases, the student should take two courses from the approved General Education-Social Sciences list.
- 4 Select any Plant Sciences courses beyond those that are required.

NOTE: Students must meet the University General Education Requirement for Communicating through Writing by selecting a course with a (WC) designation. This course may be in the major or from another discipline. Plant Sciences 410 and 448 satisfy the Communicating through Writing requirement.

## LANDSCAPE DESIGN AND CONSTRUCTION CONCENTRATION

Landscape designers create aesthetic concepts and practical designs for improved outdoor living. Students study fundamental and advanced landscape design, landscape design graphics, computer-aided landscape design, surveying, art, socio-economic impact of plants, field botany, professional practices, contracting, basic woody plant identification, landscape construction and maintenance methods. The development of comprehensive design projects helps students prepare for careers in landscape design or advanced studies in landscape architecture. Graduates in design and construction are prepared for employment in several professions in ornamental horticulture. Careful selection of departmental courses and other electives in consultation with the assigned academic advisor will allow graduates to pursue suitable career paths.

### Requirements for the Bachelor of Science in Plant Sciences • Plant Sciences Major • Landscape Design and Construction Concentration

First Year	Hours Credit
1Agriculture and Natural Resources 100 or First Year Studies 101 . . .	.1
2Arts and Humanities Elective* . . . . .	.3
Biology 111*, 112* . . . . .	.8
Chemistry 100* or 120* . . . . .	.4
Computer Science 100* . . . . .	.3
English 101*, 102* . . . . .	.6
2Quantitative Reasoning Elective* . . . . .	.3
2,3Social Sciences Elective* . . . . .	.3-6
<b>Second Year</b>	
Communication Studies 210* or 240* . . . . .	.3
3Economics Elective* . . . . .	.3-4
Environmental and Soil Sciences 210 . . . . .	.4
Plant Sciences 210, 220, 280 . . . . .	.9
Technical Electives . . . . .	.8
Unrestricted Elective . . . . .	.2-4
<b>Third Year</b>	
1Cultures and Civilizations Elective* . . . . .	.3
Plant Sciences 350, 380 . . . . .	.6
Select from Plant Sciences 226, 230, 240, 330, 348, 360, or 370 . . .	.5-6
Plant Sciences 290 or 291 . . . . .	.3
Technical Electives . . . . .	.6
Unrestricted Electives . . . . .	.3-8
<b>Third Year – Summer</b>	
Plant Sciences 492 . . . . .	.3
<b>Fourth Year</b>	
2Arts and Humanities Elective* . . . . .	.3
2Cultures and Civilizations Elective* . . . . .	.3
Plant Sciences 421, 460, 480, 485 . . . . .	.13
Select from Plant Sciences 348, 410*, 427, 429, 430, 434, 436, 437, 441, 446, 448*, 450, 469, 470, 493, or 497 . . . . .	.5-6
Technical Electives . . . . .	.4-5
<b>Total 124</b>	

- \* Meets University General Education Requirement.
- 1 Required of freshmen only; requirement is waived for transfer students.
- 2 Choose from the University General Education lists. Selection should be made in conference with academic advisor.
- 3 Economics 201 (4) Principles of Economics satisfies the University General Education-Social Science requirement and the major requirement for economics. If the student transfers ECON LD for 3 credit hours, it will satisfy the major requirement for economics but will not satisfy the University General Education-Social Science requirement. In these cases, the student should take two courses from the Social Sciences list.

NOTE: Students must meet the University General Education Requirement for Communicating through Writing by selecting a course with a (WC) designation. This course may be in the major or from another discipline.

## PUBLIC HORTICULTURE CONCENTRATION

The public horticulture concentration is intended for students interested in professional careers that promote horticulture and emphasize people, their education and their enjoyment of plants. Such careers include director of a botanical garden or park; city or urban horticulturist; extension agent, teacher, educational director, or program coordinator; professional garden writer/editor or publication manager; horticulture therapist; public garden curator; and plant collections manager. Technical electives allow students to concentrate in specialties of their interest while encouraging the development of strong communication skills. Students are encouraged to earn a minor degree in a supportive field such as education, communications or journalism, or earn a Non-Profit Management Certificate.

### Requirements for the Bachelor of Science in Plant Sciences • Plant Sciences Major • Public Horticulture Concentration

First Year	Hours Credit
<sup>1</sup> Agriculture and Natural Resources 100 or First Year Studies 101 . . . . .	.1
<sup>2</sup> Arts and Humanities Elective* . . . . .	.3
Biology 111*, 112* . . . . .	.8
Chemistry 100* or 120* . . . . .	.4
Computer Science 100* or 102* . . . . .	.3
English 101*, 102* . . . . .	.6
Environmental and Soil Sciences 210 . . . . .	.4
<sup>2</sup> Quantitative Reasoning Elective* . . . . .	.3
<b>Second Year</b>	
<sup>2</sup> Arts and Humanities Elective* . . . . .	.3
Communication Studies 240* . . . . .	.3
<sup>2</sup> Cultures and Civilizations Elective* . . . . .	.3
Plant Sciences 210 . . . . .	.3
Select from Plant Sciences 220, 226, 280, 290, or 291 . . . . .	.12
<sup>2,3</sup> Social Sciences Elective* . . . . .	.3-6
<sup>3</sup> Economics Elective* . . . . .	.3-4
Technical Electives . . . . .	.0-3
<b>Third Year</b>	
<sup>2</sup> Cultures and Civilizations Elective* . . . . .	.3
Plant Sciences 230, 240, 328, 330, 370, 410*, 434, 436 . . . . .	.21
Technical Electives . . . . .	.3-4
<b>Third Year - Summer</b>	
Plant Sciences 492 . . . . .	.3
<b>Fourth Year</b>	
Entomology and Plant Pathology 313 or 321 . . . . .	.3
Entomology and Plant Pathology 410 . . . . .	.3
Plant Sciences 448*, 470 . . . . .	.6
Select from Plant Sciences 427, 430, 437, 439, 446, or 469 . . . . .	.10
Technical Electives . . . . .	.3
Plant Sciences 421 or Unrestricted Electives . . . . .	.3
<b>Total 124</b>	

\* Meets University General Education Requirement.

- Required of freshmen only; requirement is waived for transfer students.
- Choose from the University General Education lists. Selection should be made in conference with academic advisor.
- Economics 201 (4) Principles of Economics satisfies the University General Education-Social Science requirement and the major requirement for economics. If the student transfers ECON LD for 3 credit hours, it will satisfy the major requirement for economics but will not satisfy the University General Education-Social Science requirement. In these cases, the student should take two courses from the Social Sciences list.

NOTE: Students must meet the University General Education Requirement for Communicating through Writing by selecting a course with a (WC) designation. This course may be in the major or from another discipline.

## TURFGRASS SCIENCE AND MANAGEMENT CONCENTRATION

The turfgrass science and management concentration is designed for the student desiring to pursue professions that include growing and managing turfgrasses used for golf courses, parks, athletic fields, sports complexes, and residential and commercial lawns. This concentration also prepares students for graduate studies in turfgrass science. Students are encouraged to earn a minor degree in a supportive field such as agricultural economics or environmental and soil sciences. Careful selection of departmental courses and other electives in consultation with the assigned academic advisor will prepare graduates for the career of their choice.

### Requirements for the Bachelor of Science in Plant Sciences • Plant Sciences Major • Turfgrass Science and Management Concentration

First Year	Hours Credit
<sup>1</sup> Agriculture and Natural Resources 100 or First Year Studies 101 . . . . .	.1
<sup>2</sup> Arts and Humanities Elective . . . . .	.3
Chemistry 120* and 130* . . . . .	.8
<sup>2</sup> Cultures and Civilizations Elective* . . . . .	.3
English 101*, 102* . . . . .	.6
<sup>2</sup> Quantitative Reasoning Electives* . . . . .	.6
<sup>2,3</sup> Social Sciences Elective* . . . . .	.3-6
<b>Second Year</b>	
Agriculture and Natural Resources 290 . . . . .	.3
Biology 111*, 112* . . . . .	.8
Communications Studies 210* or 240* . . . . .	.3
<sup>3</sup> Economics Elective* . . . . .	.3-4
Environmental and Soil Sciences 210 . . . . .	.4
Plant Sciences 240, 241 . . . . .	.4
Select from Plant Sciences 210, 220, 280, or 290 . . . . .	.3
Unrestricted Electives . . . . .	.2-3
<b>Third Year</b>	
<sup>2</sup> Cultures and Civilizations Elective* . . . . .	.3
Select from Plant Sciences 210, 220, 280, 290 or 291 . . . . .	.3
Plant Sciences 330, 331, 341, 343, 348, 442, and 457-458 . . . . .	.13
Technical Electives . . . . .	.3
Unrestricted Electives . . . . .	.8
<b>Third Year - Summer</b>	
Plant Sciences 492 . . . . .	.3
<b>Fourth Year</b>	
<sup>1</sup> Arts and Humanities Elective* . . . . .	.3
Biology 250 or Biochemistry and Cellular and Molecular Biology 321 . . . . .	.4
Entomology and Plant Pathology 313 . . . . .	.3
Environmental and Soil Sciences 334 . . . . .	.3
Select from Plant Sciences 353, 360, 410, 421, 427, 429, 430, 434, 435, 436, 437, 446, 448*, 449, 451, 461, 469, or 494 . . . . .	.6
Plant Sciences 441, 470 . . . . .	.5
Technical Electives . . . . .	.4-5
<b>Total 124</b>	

\* Meets University General Education Requirement.

- Required of freshmen only; requirement is waived for transfer students.
- Choose from the University General Education lists. Selection should be made in conference with academic advisor.
- Economics 201 (4) Principles of Economics satisfies the University General Education-Social Science requirement and the major requirement for economics. If the student transfers ECON LD for 3 credit hours, it will satisfy the major requirement for economics but will not satisfy the University General Education-Social Science requirement. In these cases, the student should take two courses from the Social Sciences list.

NOTE: Students must meet the University General Education Requirement for Communicating through Writing by selecting a course with a (WC) designation. This course may be in the major or from another discipline.

## Minor in Plant Sciences

Required Courses	Hours Credit
A minimum of 18 semester hours of upper-division plant sciences courses . . . . .	.18
<b>Total 18</b>	