The College of Agricultural Sciences and Natural Resources began in 1869 when the university was designated as Tennessee's Federal Land-Grant Institution. As such, the university was enabled for the first time to offer instruction in agriculture. Graduate instruction began as early as 1889. The college is not only an academic unit of the University of Tennessee, Knoxville, but is (with the Agricultural Experiment Station, UT Extension and the College of Veterinary Medicine) one of the four units of the University of Tennessee's Institute of Agriculture.

There are many shared resources and positive interactions between various units of the Institute. Most of the faculty in the College of Agricultural Sciences and Natural Resources hold joint appointments in the Agricultural Experiment Station and are actively involved in significant basic and applied research in agriculture and the associated natural resources. On campus and field research laboratories are utilized in the instructional programs of the college; extension and research activities provide many students excellent opportunities. The Agricultural Experiment Station provides graduate research assistantships to support graduate students.

The unique association the college has with the University of Tennessee and the other units of the Institute of Agriculture makes it possible for the college to offer comprehensive, high-quality graduate programs.

The graduate student is expected to demonstrate a thorough knowledge of the subject matter in his/her specialized field of study and its relationship to the sociological, economic, and environmental impact on society. The student must demonstrate the ability to plan, conduct, analyze, and report original research. Emphasis is given to intellectual growth and the development of scholarly habits of study, reasoning, and analysis so that the graduate will continue to grow and develop professionally throughout his/her career.

Master of Science Programs

Programs of graduate study leading to the Master of Science degree are offered through all departments in the College of Agricultural Sciences and Natural Resources. The graduate program may be entirely in one major subject or may include subject matter areas related to the major.

Both majors and minors are available in agricultural economics, agricultural and extension education, animal science, biosystems engineering, biosystems engineering technology, entomology and plant pathology, environmental and soil sciences, food science and technology, and plant sciences. Majors only are available in forestry and wildlife and fisheries science, and minors are available in general agriculture. The minor in general agriculture requires 12 hours of coursework. A complete listing of majors is shown on the Graduate Degrees, Majors, and Certificate Programs Chart.

Doctoral Programs

Graduate study leading to the Doctor of Philosophy degree with majors in animal science; biosystems engineering; food science and technology; natural resources; and plants, soils, and insects is offered in the college.

AGRICULTURAL AND EXTENSION EDUCATION PROGRAM

http://aee.tennessee.edu
 Randol G. Waters, Graduate Program Director
 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 (Champaign)

MAJOR DEGREE
Agricultural and Extension Education MS
Agricultural education concentration
Agricultural extension education concentration

The agricultural and extension education program is designed primarily for teachers of agricultural education and staff employed by UT Extension. However, due to the flexibility of the program, it would be of value to any student interested in agriculture or adult and continuing education. The program may be completed under a thesis or non-thesis option. Candidates for the master's degree must meet the general requirements of the Graduate Council and those stipulated by the department.
MASTER OF SCIENCE
AGRICULTURAL AND EXTENSION EDUCATION MAJOR

Requirements

Thesis Option
A candidate for the master’s degree who elects the thesis option must successfully complete the following requirements.

• A minimum of 30 hours of graduate credit in courses approved by the student’s advisory committee. Six hours of thesis may be counted toward this requirement.
• A minimum of 20 hours of graduate credit in courses numbered at or above the 500 level.
• A minimum of 12 hours of graduate credit in courses appropriate to the area of concentration taught in the department and a minimum of 6 hours taught from outside the department.
• A minimum of 3 hours of graduate credit in coursework in either research methodology or statistics.
• A final oral examination.

Non-Thesis Option
A candidate for the master’s degree who elects the non-thesis option must successfully complete the following requirements.

• A minimum of 36 hours of graduate credit in courses approved by the student’s advisory committee.
• A minimum of 24 hours of graduate credit in courses numbered at or above the 500 level.
• A minimum of 12 hours of graduate credit in courses appropriate to the area of concentration taught in the department and a minimum of 6 hours taught from outside the department.
• A minimum of 3 hours of graduate credit in coursework in either research methodology or statistics.
• A creative component designed by the student and approved by the student’s advisory committee for 3 hours of graduate credit.
• A written and oral comprehensive examination.

DEPARTMENT OF AGRICULTURAL ECONOMICS

http://economics.ag.utk.edu

Dan L. McLemore, Head
John R. Brooker, Graduate Program Director

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

MAJOR DEGREE
Agricultural Economics MS

Agricultural economics concentration
Natural Resource Economics concentration

MASTER OF SCIENCE
AGRICULTURAL ECONOMICS MAJOR

Requirements

The master’s program may be completed under a thesis option with a concentration in agricultural economics or natural resource economics. A non-thesis option is available with concentrations in agribusiness or agricultural economics. For specific information, contact the department head.

AGRIBUSINESS CONCENTRATION

The agribusiness concentration is designed to prepare students to succeed in the public or private sectors of agriculture, including product manufacturing and marketing, natural resource management, farm management, and financial analysis. A candidate must complete a minimum of 31 hours of graduate credit in courses approved by the student’s master’s committee. At least 28 hours must be earned in courses numbered at or above the 500 level. Sixteen hours of agricultural economics; 3 hours of economic theory; 6 hours of quantitative methods; 6 hours of business, statistics, or communications electives; and 3 hours of internship are required. Each student must pass both written and oral comprehensive examinations.

AGRICULTURAL ECONOMICS CONCENTRATION

Thesis Option

The thesis option in agricultural economics is designed to prepare students for analytical and research careers in the public and private sectors. A candidate must complete a minimum of 36 hours of graduate credit in courses approved by the student’s master’s committee. At least 33 hours must be earned in courses numbered at or above the 500 level. In the thesis option, 16 hours of agricultural economics; 3 hours of economic theory; 6 hours of quantitative methods; and 6 hours of thesis are required. Each student must pass a final oral examination.

Non-Thesis Option

The non-thesis option in agricultural economics is designed to prepare students for analytical and research careers in the public and private sectors. A candidate must complete a minimum of 36 hours of graduate credit in courses approved by the student’s master’s committee. At least 33 hours must be earned in courses numbered at or above the 500 level. In the non-thesis option, 27 hours of agricultural economics courses and 9 hours of directed electives are required. Each student must pass both written and oral comprehensive examinations.

NATURAL RESOURCE ECONOMICS CONCENTRATION

The natural resource economics concentration is designed to prepare students for analytical and research careers in the public and private sectors with emphasis on natural resource economics and to prepare students interested in entering a PhD program. A candidate must complete a minimum of 31 hours of graduate credit in courses approved by the student’s master’s committee. At least 25 hours of graduate credit must be earned at or above the 500 level. Thirteen hours of agricultural economics; 3 hours of economic theory; 6 hours of quantitative methods,
Demonstrate competence in:

- Economics 520 (1 hour) or similar graduate-level course.
- 521 and 610 (2 hours), 612 (1 hour); and Agricultural Economics coursework approved by the student's doctoral committee beyond the bachelor's degree. Forty-eight hours must be in graduate coursework.

Requirements

- Complete 72 semester hours of graduate coursework beyond the bachelor's degree. Forty-eight hours must be in graduate coursework approved by the student's doctoral committee. Up to 24 hours of coursework completed for a master's degree may be applied to the 48-hour requirement. A minimum of 12 of the remaining 24 (or 30 of the 48 if no master's degree) hours must be graded A-F. A minimum of 6 hours must be taken in UT courses at the 600-level, exclusive of dissertation hours. Students are required to complete a minimum of 24 hours of Agricultural Economics 600, Doctoral Research, and Dissertation.
- Successfully complete Forestry, Wildlife, and Fisheries 601 (3 hours), 610 (2 hours), 612 (1 hour); and Agricultural Economics 520(1 hour) or similar graduate-level course. Demonstrate competence in:
  - Microeconomic Theory by qualifying examination. Students must take this examination in the summer prior to their second year of study. Prior to taking the examination, students must complete Economics 511 and Economics 512 for graduate credit or petition the Agricultural Economics faculty for exemption from these courses.
  - Macroeconomic Theory by the completion of a three or more hour graduate-level course in Macroeconomics with a grade of B or better.
  - Quantitative Methods by completion of Economics 581, Economics 582 and Economics 583 with grades of B or better, or by qualifying examination.
  - Natural Resource Economics by comprehensive examination. Preparation for this comprehensive examination will require completion of Agricultural Economics 570, or equivalent, and Agricultural Economics 670.
  - Environmental Economics by comprehensive examination or by comprehensive examination in another field related to natural resources, economics or agricultural economics approved by the student's doctoral committee. Preparation for this comprehensive examination will normally require completion of a sequence of two or more courses in the field of specialization.
  - All coursework by oral comprehensive examination. The examination is scheduled by the student and administered by the student's doctoral committee when the student has completed all or nearly all of the coursework. Written qualifying and comprehensive examinations will be given in August (during the week prior to the start of fall semester) and in January (during the week prior to the start of spring semester). Students must take the oral comprehensive examination during the first semester after passing all written qualifying and comprehensive examinations. Students are expected to take the required courses that prepare them for the written examinations and must take these examinations on their first offering after completing the recommended coursework. Students failing any qualifying or comprehensive examination must retake the examination the next time it is offered or they will receive a failing grade. Failing a qualifying or comprehensive examination for the second time will ordinarily result in dismissal from the program. A qualifying or comprehensive examination may be taken a third time with approval of the Agricultural Economics faculty. Students must file a petition with the Graduate Coordinator who will submit the petition to the faculty. Generally, extenuating circumstances are needed to warrant approval to take an examination a third time. Failing a qualifying or comprehensive examination for a third time will result in dismissal from the doctoral program.
- Following formation of the student's doctoral committee, submit a written dissertation proposal to all members of the committee. The student's major professor will then arrange an oral defense of the proposal. The proposal should be submitted and defended no later than one semester after the student takes the Microeconomic Theory qualifying examination.
- Complete a doctoral dissertation and pass an oral examination on the dissertation. The dissertation, in the form approved by the major professor, must be distributed to the committee at least two weeks before the examination. The examination must be scheduled through the Graduate School at least one week prior to the examination and must be conducted in university-approved facilities. The examination is announced publicly and is open to all faculty members. The defense of dissertation will be administered by all members of the doctoral committee after completion of the dissertation and all course requirements. This examination must be passed at least two weeks before the date of submission and acceptance of the dissertation by the Graduate School. The major professor must submit the results of the defense by the dissertation deadline.

DEPARTMENT OF ANIMAL SCIENCE

http://animalscience.ag.ukl.edu

Alan G. Mathew, Head
J. Lannett Edwards, Graduate Program Director

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
Moustaid-Moussa, N., PhD ...................................... Paris

DEPARTMENT OF ANIMAL SCIENCE
The Department of Animal Science offers graduate programs leading to the Master of Science and Doctor of Philosophy with a major in animal science. Areas of emphasis are animal physiologiy (ruminant and monogastic nutrition, reproduction and stress) and animal health and well-being (immunology, genetics, microbiology, and pre-harvest food safety) with orientation towards agriculturally-important species. See the department’s Web site for specific research programs. For additional information contact the graduate director.

Admission
For admission to the program, a student must have obtained a 3.00 grade point average on a 4.00 scale (or a 3.00 each term during the junior and senior years) in a completed undergraduate degree program in animal science or in a related area. Applicants to the PhD program normally should have completed a master’s degree prior to beginning the doctoral program. In addition, applicants must submit:

- Scores from the general section of the Graduate Record Exam.
- A completed animal science academic and personal information form highlighting educational and career goals and relevant work experience.
- Completed animal science rating forms submitted by at least three individuals familiar with the applicant’s scholastic ability and professional potential.

Admission to the program will be contingent upon faculty evaluation of the applicant’s undergraduate or graduate grade point average, Graduate Record Examination scores, rating forms, educational and career goals, relevant work experience, and scores from the Test of English as a Foreign Language (TOEFL), if applicable. PhD students must be accepted by a major professor, chosen by consulting with the department head and faculty, before being admitted. Prerequisite courses may be required if the student has insufficient undergraduate background. If the student has an unsatisfactory grade point average, acceptance may be on a probationary (non-degree) basis and a minimum of 9 hours of graduate coursework must be completed the first term with a minimum grade point average of 3.00 for admission to the program.

M A S T E R  O F  S C I E N C E  
A N I M A L  S C I E N C E  M A J O R

Requirements
The program requires the writing of a thesis based on original research, a minimum of 24 hours of graduate coursework, plus at least 6 hours of thesis research. Coursework must include:

- At least 14 hours in courses numbered at or above the 500 level.
- 1 hour of Agriculture and Natural Resources 512.
- At least 3 hours in statistics chosen from courses approved for use in the intercollegiate graduate statistics program (IGSP).
- All first- and second-year Master of Science students are required to enroll in Animal Science 596 each spring term.

The remainder of coursework will be selected jointly by the student and the major professor depending on the student’s area of emphasis and professional objectives. Student’s graduate committee will approve the student’s coursework and research proposal, as well as conduct the final oral examination, which consists of a comprehensive written examination and a defense of the thesis.

D O C T O R  O F  P H I L O S O P H Y
A N I M A L  S C I E N C E  M A J O R

Requirements
The program requires a written dissertation based on original research, at least 48 hours of graduate coursework beyond the Bachelor of Science degree, plus at least 24 hours of doctoral research. Coursework must include the following:

- At least 24 hours credit at the 500 and 600 level, of which a minimum of 6 hours must be at the 600 level.
- A minimum of 16 hours in related fields outside of animal science.
- A minimum of 1 hour of Agriculture and Natural Resources 512 in addition to that required at the Master of Science level.
- Animal Science 696 each spring term for first- and second-year doctoral students.
- At least 6 hours of statistics courses approved for the Intercollegiate Graduate Statistics Program (IGSP).

The student and major professor select the program of study depending on the student’s area of emphasis and professional goals. The student’s graduate committee approves the program of study and dissertation research proposal, as well as conducts the comprehensive written and oral examination and the dissertation defense examination.


http://bioeengr.ag.utk.edu
George F. Grandle, Interim Head
Paul D. Ayers, Graduate Program Director

Professors
Ammons, J.T., PhD ........................................... West Virginia
Ayers, P.D., PhD, PE ........................................ North Carolina State
Buchermohle, 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
Tomkins, F.D. (Associate Vice President for Research), PhD, PE ........................................ Tennessee
Tyler, D.D., PhD ............................................. Kentucky
whether they are registered for seminar credit.

...italy rewarding activities of the community. Accordingly, all graduate students are encouraged to participate in Biosystems Engineering 503 and other departmental seminars regardless of whether they are registered for seminar credit.

MAJORS DEGREES
BioSystems Engineering MS
BioSystems Engineering PhD
BioSystems Engineering Technology MS
Environmental and Soil Sciences MS
Plants, Soils, and Insects PhD

Environmental and soil sciences concentration

Graduate programs leading to the Master of Science and Doctor of Philosophy with a major in biosystems engineering are available to graduates of a recognized curriculum in engineering, mathematics, or one of the physical or biological sciences. A graduate program leading to the Master of Science with a major in Biosystems Engineering Technology is available to graduates in a recognized curriculum in agriculture or other related fields. These programs emphasize the application of engineering and environmental engineering technology to agricultural and other biological systems. Major focus areas of the program are machinery systems; environmental quality and resource conservation; instrumentation, sensor, and control systems; and bioprocessing. Depending upon the applicant’s academic background and interest area within the program, prerequisite courses may be required.

A graduate program leading to a Master of Science with a major in environmental and soil sciences is offered to graduates of recognized curricula in physical or biological sciences. The department also participates in the plants, soils, and insects doctoral program that is administered jointly by the Departments of BioSystems Engineering and Soil Science, Plant Sciences, and Entomology and Plant Pathology. For concentrations offered by these other departments, please see their sections in this catalog. Faculty in the BioSystems Engineering and Soil Science Department administer the environmental and soil sciences major’s program and the environmental and soil sciences concentration in the plant, soils, and insects PhD program. The master’s and doctoral programs are broad-based, emphasizing the application of chemical, biological, and physical principles to understand, manage, and manipulate the terrestrial environment. In the concentration, students may select an agricultural or non-agricultural focus area in soil and water chemistry; nutrient and elemental cycling; land management and reclamation; pedology; climatology; soil biology and biochemistry; contaminant transport; and soil physical processes.

A significant aspect of graduate education beyond formal courses and thesis projects is active participation in the professional community which exists within academic departments at universities. Student/faculty seminars are one of the professionally rewarding activities of the community. Accordingly, all graduate students are encouraged to participate in Biosystems Engineering 503 and other departmental seminars regardless of whether they are registered for seminar credit.

Admission
A completed departmental data sheet and three completed Graduate Rating Forms are required in addition to the Application for Graduate Admission. Students must submit scores from the Graduate Record Examination. Each applicant will be advised about any prerequisite courses before entering a program. The student’s program of study must be approved by his/her advisory committee and must comply with the requirements of the Graduate Council.

MASTER OF SCIENCE
BIOSYSTEMS ENGINEERING MAJOR

The Master of Science degree, biosystems engineering major, has both thesis and non-thesis options. Students are required to choose between these options in their first semester of study, in consultation with their major professor. Once an option is selected, it may only be changed with written approval of both the major professor and department head.

Requirements
Thesis Option

Applicants accepted into the program must complete at least 30 hours to earn a degree. Of these 30 hours, 20 must be in courses numbered 500 or above (6 hours of thesis plus 14 hours of other courses). Biosystems Engineering 503 must be taken three times during the course of the program, the last of which must be in the student’s final semester before graduation. Other specific requirements for the 30 hours are:

<table>
<thead>
<tr>
<th>Hours Credit</th>
<th>Coursework in special emphasis area</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours Credit</td>
<td>Coursework in computational methods</td>
<td>6</td>
</tr>
<tr>
<td>Total 30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department.

In addition to completing the 30 hours, master’s students must pass a final oral examination covering the thesis, related areas, and graduate coursework.

Non-Thesis Option

A non-thesis option in biosystems engineering is available to qualified students. Applicants accepted into the program must complete at least 33 hours to earn a degree. Of these 33 hours, 22 must be in courses numbered above 500. Biosystems Engineering 503 must be taken three times during the course of the program, the last of which must be in the student’s final semester before graduation. Other specific requirements for the 33 hours are listed below:

<table>
<thead>
<tr>
<th>Hours Credit</th>
<th>Coursework in special emphasis area</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department.

In addition to completing the 33 hours, non-thesis students must pass a comprehensive written final examination covering the graduate program, including the capstone experience. At the discretion of the candidate’s committee, an oral examination may also be required.
The advisory committee approves the research problem. Satisfactory completion of this requirement requires a written, original research report that is acceptable to the student’s committee.

**MASTER OF SCIENCE**  
**BIOSYSTEMS ENGINEERING TECHNOLOGY MAJOR**

**Requirements**

**Thesis Option**

Applicants accepted into the program must complete at least 30 hours to earn a degree. Of these 30 hours, 20 must be in courses numbered 500 or above (6 hours of thesis plus 14 hours of other courses). Biosystems Engineering Technology 503 must be taken three times during the course of the program, the last of which must be in the student’s final semester before graduation. Other specific requirements for the 30 hours are listed below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosystems Engineering Technology 503 (3 times -1 hour), 506, and other major subject coursework</td>
<td>12</td>
</tr>
<tr>
<td>Coursework in computational methods</td>
<td>6</td>
</tr>
<tr>
<td>Program electives</td>
<td>6</td>
</tr>
<tr>
<td>Thesis 500</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total 30</strong></td>
<td></td>
</tr>
</tbody>
</table>

1. Mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department.

In addition to completing the 30 hours, master’s students must pass a final oral examination covering the thesis, related areas, and graduate coursework.

**Non-Thesis Option**

A non-thesis option in biosystems engineering technology is available to qualified students. Applicants accepted into the program must complete at least 33 hours to earn a degree. Of these 33 hours, 22 must be in courses numbered above 500. Biosystems Engineering Technology 503 must be taken three times during the course of the program, the last of which must be in the student’s final semester before graduation. Other specific requirements for the 33 hours are listed below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosystems Engineering Technology 503 (3 times -1 hour), 506, and other major subject coursework</td>
<td>12</td>
</tr>
<tr>
<td>Coursework in computational methods</td>
<td>6</td>
</tr>
<tr>
<td>Program electives</td>
<td>6</td>
</tr>
<tr>
<td>Coursework in special emphasis are</td>
<td>6</td>
</tr>
<tr>
<td>Capstone Experience (project and report, typically 508)</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total 33</strong></td>
<td></td>
</tr>
</tbody>
</table>

1. Mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department.

In addition to completing the 33 hours, non-thesis students must pass a comprehensive written final examination covering the graduate program, including the capstone experience. At the discretion of the candidate’s committee, an oral examination may also be required.

**MASTER OF SCIENCE**  
**ENVIRONMENTAL AND SOIL SCIENCES MAJOR**

Students seeking the Master of Science degree with a major in environmental and soil sciences will generally concentrate their studies in one of the environmental and soil sciences focus areas. The focus areas include soil and water chemistry; nutrient and elemental cycling; land management and reclamation; pedology, genesis, and classification; environmental climatology; soil biology; and soil physical processes. Both thesis and non-thesis options are available. For additional information, see the environmental and soil sciences master’s concentration homepage http://bioengr.ag.utk.edu/graduate/ or contact the environmental and soil sciences program’s graduate program director.

**Admission**

Applicants having a bachelor’s degree in fields that are related or unrelated to environmental and soil sciences may apply although acceptance may be contingent upon the completion of prerequisite coursework. Submit application, official transcripts, scores from the general portion of the Graduate Record Examination, and fee to the Office of Graduate and International Admissions. Submit curriculum vitae, three letters of reference (or three Graduate Rating Forms), and a short statement of professional goals and reasons for applying to Environmental and Soil Sciences Master’s Program Coordinator, Biosystems Engineering and Soil Science Department, The University of Tennessee, 2506 E.J. Chapman Drive, Knoxville, Tennessee 37996-4531.

**Requirements**

To obtain a Master of Science degree, the student must meet the following requirements in addition to those of the Graduate Council (as specified in the Master’s Degree section at the front of this catalog).

**Thesis Option**

Upon consultation with the department head, the student will be assigned a major professor who acts as chair of the student’s advisory committee. The student and the major professor will assemble a graduate advisory committee consisting of the major professor and a minimum of two additional faculty, each holding the rank of assistant professor or above. At least one-half of the committee members must hold teaching appointments. The advisory committee must be formalized by the end of the second semester of graduate study.

An approved program of study must be developed and submitted by the end of the second semester of graduate study. A minimum of 24 hours of graduate coursework is required in the program of study, exclusive of 6 hours of 500 Thesis. The program of study is subject to the approval of the student’s advisory committee, and must meet the following requirements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental and Soil Sciences 503 (3 times -1 hour)</td>
<td>3</td>
</tr>
<tr>
<td>Courses numbered above 503</td>
<td>12</td>
</tr>
<tr>
<td>Courses within the major (excluding 500-level courses numbered 500, 502, and 503)</td>
<td>9</td>
</tr>
<tr>
<td>500 Thesis</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total 30</strong></td>
<td></td>
</tr>
</tbody>
</table>

1. Must be taken three times during the course of the program, the last of which must be in the student’s final semester before graduation.

2. Courses that are in the major include those in environmental and soil sciences, Geology 510, and Environmental Engineering 535. The student’s committee may require additional coursework beyond the 24 hours if the student’s progress or background indicates a need or deficiency.

During the first two semesters of graduate study, the student must develop a research problem and present the written proposal to his/her committee. This must be done prior to enrollment in 500.

The student must pass a final oral exam (administered by the advisory committee) that integrates the student’s thesis and coursework. The student is expected to be conversant in the soil and environmental sciences, particularly in the thesis and allied areas.

A student who has started a degree program under the thesis option is not eligible to transfer to the non-thesis option after the end of the first semester of graduate study or after receiving a graduate assistantship stipend for more than one semester.

**Non-Thesis Option**

A student desiring the non-thesis option must declare his/her
intention before the beginning of the second semester of study. The student must meet the following requirements, in addition to those of the Graduate Council (as specified in the Master’s Degree section at the front of this catalog).

Upon consultation with the department head, the student will be assigned a major professor who acts as chair of the student’s advisory committee. The student and the major professor will assemble a graduate advisory committee consisting of the major professor and a minimum of two additional faculty, each holding the rank of assistant professor or above. At least one-half of the committee members must hold teaching appointments. The advisory committee must be formalized by the end of the second semester of graduate study.

An approved program of study must be developed and submitted by the end of the second semester of graduate study. A minimum of 33 hours of graduate coursework is required. The program of study is subject to the approval of the student’s advisory committee and must meet the following requirements.

<table>
<thead>
<tr>
<th>Hours Credit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1Environment and Soil Sciences 503 (3 times -1 hour)</td>
<td>3</td>
</tr>
<tr>
<td>593 Special Problems in Environmental and Soil Sciences</td>
<td>3</td>
</tr>
<tr>
<td>Courses numbered above 503 (exclusive of 593)</td>
<td>18</td>
</tr>
<tr>
<td>2Courses within the major (excluding 500 and 502)</td>
<td>12</td>
</tr>
</tbody>
</table>

1 Must be taken three times during the course of the program, the last of which must be in the student’s final semester before graduation.
2 Courses that are in the major include those in environmental and soil sciences, Geology 510, and Environmental Engineering 535. The student’s committee may require additional coursework beyond the 33 hours if the student’s progress or background indicates a need or deficiency.

In lieu of a thesis, students are required to complete 3 hours of 593 by participating in a single research program for a period of twelve weeks. The advisory committee approves the research problem. Satisfactory completion of this requirement requires a written, original research report that is acceptable to the student’s committee.

A comprehensive written examination that integrates the student’s coursework and research problem must be passed. The exam is developed and administered by the advisory committee.

A student who has started a degree program under the non-thesis option may transfer to the thesis option upon approval of a potential major professor and the department head.

DOCTOR OF PHILOSOPHY
PLANTS, SOILS, AND INSECTS MAJOR
ENVIRONMENTAL AND SOIL SCIENCES CONCENTRATION

A doctorate with a major in plants, soils, and insects and a concentration in environmental and soil sciences is offered under a multi-departmental doctoral program. Three departments participate—Plant Sciences, Entomology and Plant Pathology, and the soils faculty in Biosystems Engineering and Soil Science. Other concentrations within the plants, soils, and insects doctoral program include bioactive natural products, crop sciences, entomology, horticulture, integrated pest management, plant breeding, plant molecular genetics, plant pathology, and weed biology. Focus areas in the environmental and soil sciences concentration include soil and water chemistry; nutrient management; pedology, genesis and classification; environmental climatology; soil biology and biochemistry; and soil physical processes. See the environmental and soil sciences doctoral concentration home page for additional information, http://bioengr.ag.utk.edu/graduate/, or contact a faculty member in the area of interest.

Admission

Submit application, fee, official transcripts, and scores from the general portion of the Graduate Record Examination to the Office of Graduate and International Admissions. Submit résumé, three letters of reference (or three Graduate Rating Forms), photocopy of Graduate Record Examination scores, and a short statement of professional goals and reasons for applying to Environmental and Soil Sciences Doctor of Philosophy Program Coordinator, Biosystems Engineering and Soil Science Department, The University of Tennessee, Knoxville, 2506 E.J. Chapman Drive, Knoxville, Tennessee 37996-4531. In the statement letter and application, interest in the environmental and soil sciences concentration should be indicated.

Requirements

The student and the major professor will select a minimum of three additional faculty, holding the rank of assistant professor or above, to serve on the student’s doctoral committee. The major professor and two committee members must be approved to direct doctoral research by the Graduate Council. At least one member of the committee must be from outside the department. The doctoral committee must be formalized by the end of the second semester of graduate study.

An approved program of study must be submitted by the end of the second semester of graduate study. A candidate for the doctoral degree must complete a minimum of 24 hours of graduate coursework beyond the master’s degree. Candidates not having a master’s degree must complete a minimum of 48 hours of graduate coursework beyond the baccalaureate degree, 24 hours of which must be numbered 503 or higher. A minimum of 12 of the 24 hours, or 30 of the 48 hours, must be graded A-F. At least 9 hours of the student’s coursework must be from outside the plants, soils, and insects major and a minimum of 6 hours of courses numbered 601 or higher must be taken at University of Tennessee, Knoxville. In addition, 24 hours of course 600 Doctoral Research and Dissertation are required.

Satisfactory preparation of a written dissertation proposal and an oral defense to the student’s committee are required. These must be completed during the first two semesters of graduate study and before enrollment in 600.

Both written and oral sections of the comprehensive examination must be passed. The candidate will be tested on his/her knowledge of the proposed dissertation and related fields. The student is expected to be conversant in the wide area of soil and environmental sciences.

Environmental and Soil Sciences 603 must be taken three times during the course of the program, the last of which must be in the student’s final semester before graduation.

Preparation of a written dissertation and its oral defense to the student’s doctoral committee are required.

Please see the Degree Program Requirements/Doctoral Degree section at the front of this catalog for additional information.

DOCTOR OF PHILOSOPHY
BIOSYSTEMS ENGINEERING MAJOR

Admission

Students applying for admission into the doctoral program must submit evidence of ability to perform and report independent research to the satisfaction of the faculty of the department. An approved master’s thesis will usually be acceptable for this purpose.

Requirements

To earn a degree, each doctoral student must complete at least 75 hours of approved graduate credit (beyond the baccalaureate degree) in biosystems engineering and supporting areas (engineering, computational methods, agricultural and biological sciences, and other related areas). Of the 75 hours, 48 must be in courses numbered greater than 500 (including 24 hours of course 600) and 6 hours of courses at the University of Tennessee, Knoxville, numbered greater than 600. Other specific requirements for the minimum 75 hours are listed below.
Biosystems Engineering 619 and other major subject courses 18
1Coursework in computational methods 9
Program electives 21
2Biosystems Engineering 603 Seminar (1) 3
600 Dissertation 24
Total 75

1 Mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department.
2 Must be taken three times during the course of the program, the last of which must be in the student’s final semester before graduation.

In addition to completing the minimum 75 hours of graduate credit required for a degree, each doctoral student must also pass a comprehensive examination as required by the Graduate Council.

DEPARTMENT OF ENTOMOLOGY AND PLANT PATHOLOGY

http://eppserver.ag.utk.edu

Carl J. Jones, Head
Reid R. Gerhardt, Graduate Program Director

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
Owney, 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

MAJOR DEGREES

Entomology and Plant Pathology

Entomology concentration
Plant pathology concentration

Plants, Soils, and Insects

Bioactive natural products concentration
Entomology concentration
Integrated pest management concentration
Plant pathology concentration

MAJOR CONCENTRATIONS

Entomology and Plant Pathology

Entomology concentration
Plant pathology concentration

Plants, Soils, and Insects

Bioactive natural products concentration
Entomology concentration
Integrated pest management concentration
Plant pathology concentration

The Department of Entomology and Plant Pathology offers a graduate program leading to the Master of Science with a major in entomology and plant pathology and the Doctor of Philosophy through the interdisciplinary plants, soils, and insects program. Students in the entomology concentration may specialize in crop entomology, medical and veterinary entomology, insect biology, insect pest management, or biological control. Students in the plant pathology concentration may specialize in foliar and stem fungus diseases, soilborne pathogens, disease physiology, biocontrol, plant nematology, or virology. For specific information, contact the department head.

MASTER OF SCIENCE

ENTOMOLOGY AND PLANT PATHOLOGY MAJOR

Admission

For admission to the Master of Science program, a student must meet all requirements of the University of Tennessee, Knoxville, Graduate Council and must have completed (1) general botany or biology, 8 hours; (2) advanced biological sciences, 8 hours; (3) general inorganic chemistry, 6 to 8 hours; (4) organic chemistry, 3 hours. In addition, three completed rating forms and a written statement of career goals and interest in entomology or plant pathology should be submitted to the department. Submit application, fee, official transcripts, and scores from the general portion of the Graduate Record Examination to the Office of Graduate and International Admissions.

Requirements

The program requires a written thesis based on original research and the completion of a minimum of 24 hours of coursework for graduate credit, approved by the student’s advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be passed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor includes at least 6 hours and not more than 10 hours of graduate-level credit in the minor department. The student’s committee must include a member of the faculty from the minor department to assist in designing courses required for the minor.

DOCTOR OF PHILOSOPHY

PLANTS, SOILS, AND INSECTS MAJOR

BIOACTIVE NATURAL PRODUCTS CONCENTRATION

ENTOMOLOGY CONCENTRATION

INTEGRATED PEST MANAGEMENT CONCENTRATION

PLANT PATHOLOGY CONCENTRATION

A Doctor of Philosophy degree with a major in plants, soils, and insects and concentrations in bioactive natural products, entomology, integrated pest management, and plant pathology is offered under a multi-departmental doctoral program. Three departments participate – Plant Sciences, Entomology and Plant Pathology, and the soils faculty in Biosystems Engineering and Soil Science. Other concentrations within the plants, soils, and insects major include crop sciences, environmental and soil sciences, horticulture, plant improvement, and weed biology. Please see the doctoral program links on the homepage of the Department of Entomology and Plant Pathology for additional information, http://eppserver.ag.utk.edu/, or contact a faculty member in the area of interest.

Admission

Submit application, fee, official transcripts, and scores from the general portion of the Graduate Record Examination to the Office of Graduate and International Admissions. Submit resume, three letters of reference (or three Graduate Rating Forms), photostopy of Graduate Record Examination scores, and a short statement of professional goals and reasons for applying to Entomology and Plant Pathology Doctor of Philosophy Program Coordinator, Department of Entomology and Plant Pathology, 2431 Joe Johnson Drive, 205 Plant Sciences Building, The University of Tennessee, Knoxville, Tennessee, 37996-4560. In the statement letter and application, the concentration of interest and intended major professor should be indicated.
Requirements

The student and the major professor will select a minimum of three additional faculty, holding the rank of assistant professor or above, to serve on the student’s doctoral committee. The major professor and two committee members must be approved to direct doctoral research by the Graduate Council. At least one member of the committee must be from outside the department. The doctoral committee must be formalized by the end of the second semester of graduate study.

Submission of an approved program of study by the end of the second semester of graduate study is required. A candidate for the doctoral degree must complete a minimum of 24 hours of graduate coursework numbered 503 or higher beyond the master’s degree. Candidates not having a master’s degree must complete a minimum of 48 hours of graduate coursework beyond the baccalaureate degree, 24 hours of which must be numbered 503 or higher. A minimum of 12 of the 24 hours, or 30 of the 48 hours, must be graded A-F. At least 9 hours of the student’s coursework must be from outside the plants, soils, and insects major, and a minimum of 6 hours of courses numbered 601 or higher must be taken at the University of Tennessee, excluding Entomology and Plant Pathology 603. In addition, 24 hours of course 600 Doctoral Research and Dissertation are required.

Satisfactory preparation of a written dissertation proposal and an oral defense to the student’s committee are required. These must be completed during the first two semesters of graduate study and before enrollment in 600.

Both written and oral sections of the comprehensive examination must be passed. The candidate will be tested on his/her knowledge of the proposed dissertation and related fields.

Presentation of at least two departmental seminars (2 hours of Entomology and Plant Pathology 540) and an exit seminar (no credit) are required.

Satisfactory preparation of a written dissertation and an oral defense to the student’s doctoral committee are required.

See the Degree Program Requirements/Doctoral Degree section at the front of this catalog for additional information.

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

http://foodscience.utk.edu

P. Michael Davidson, Head
David A. Golden, Graduate Program Director

Professors

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

Associate Professors

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

MAJOR DEGREES

Food Science and Technology MS
Food Science and Technology PhD

Students in the doctoral program may choose research in the concentration areas of food chemistry, food microbiology, food processing, or sensory evaluation of foods. Commodity interests (meats, dairy, fruits, vegetables, bakery products) can be emphasized in any of the areas by careful selection of courses and the research topic. Minors are available in cognate fields. For detailed information, contact the department head.

Admission

Admission requirements of the Graduate Council of the University of Tennessee, Knoxville, apply. In addition, applicants must submit scores from the general section of the Graduate Record Exam, a written statement of educational and career goals, and Graduate Rating Forms or letters of recommendation from at least three people familiar with the applicant’s scholastic ability and professional potential. Admission to the program is contingent upon faculty evaluation of the applicant’s undergraduate/graduate grade point average, Graduate Record Examination scores, rating forms, relevant work experience, and scores from the Test of English as a Foreign Language (TOEFL), if applicable.

MASTER OF SCIENCE

FOOD SCIENCE AND TECHNOLOGY MAJOR

Applicants must have a Bachelor of Science in food technology, food science, or a related scientific field.

Requirements

Thesis Option

• Prior to research for the thesis, the student must develop a detailed written research plan. Registration for 6 hours of 500 Thesis is required.
• In addition to the thesis requirement, a minimum of 24 hours of graduate coursework is required. This work must be approved by the student’s committee and a minimum of 14 hours must be courses numbered above 500. The student’s progress or background indicates such need.
• All students are required to take 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their master’s program.
• An oral final examination covering the thesis and coursework is required.

Non-Thesis Option

• In lieu of a thesis, students are required to complete a problem in cooperation with their employer (company or governmental agency) and their faculty committee. Students working on a problem must register for 6 hours of 503.
• In addition to the requirement for 6 hours of 503, a minimum of 24 hours of graduate coursework is required. This work must be approved by the student’s committee and a minimum of 14 hours must be in courses numbered above 500. The committee may require additional coursework if the student’s progress or background indicates such need.
• All students are required to take 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their master’s program. Completion of 510 or equivalent is also required.
• Students will be required to take a written comprehensive examination covering their coursework. In addition, an oral final examination covering the problem and coursework is required. The oral examination will be held on the Knoxville campus.
DOCTOR OF PHILOSOPHY
FOOD SCIENCE AND TECHNOLOGY MAJOR

Requirements

• Completion of a master’s degree in the field, or a closely related field, or passing a special qualifying examination is required for admission.
• A dissertation is required for the Doctor of Philosophy degree. Each student must develop a detailed written plan for the dissertation research.
• A minimum of 72 hours beyond the bachelor’s degree, excluding credit for the master’s thesis, is required. Of this, 24 hours must be 600 Doctoral Research and Dissertation.
• At least 24 hours of coursework numbered above 500, exclusive of doctoral research and dissertation, are required. At least 6 of the 24 hours must be courses numbered above 600.
• A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Science and Technology.
• All candidates must complete 601 (2 hours) and are expected to attend 601 during their PhD program.
• Each candidate must pass both written and oral comprehensive examinations prior to admission to candidacy. Major professors will advise candidates on competencies expected. A final oral examination is required that includes a defense of the dissertation and subject matter that the student’s committee considers appropriate.

DEPARTMENT OF FORESTRY,
WILDLIFE AND FISHERIES

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

Keith L. Belli, Head
D.A. Buehler, Graduate Program Director

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.P., 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.L., 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., PhD ................................. Washington State
Hening, 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

Emeritus Faculty
Dimmick, R.W., PhD ............................ Wyoming
Hill, Sr., T.K., PhD ............................. Auburn
Petlon, 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

MAJORS AND DEGREES

Forestry ................................. MS
Natural Resources ............................... PhD
Natural Resource Economics concentration
Wildlife and Fisheries Science ............................... MS

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.

MASTER OF SCIENCE
FORESTRY MAJOR
WILDLIFE AND FISHERIES SCIENCE MAJOR

Admission

For admission, the student must have a bachelor’s degree from an accredited institution in forestry, wildlife, fisheries, or another natural resource area. Applicants must take the general Graduate Record Examination with minimum scores required. Graduate Rating Forms or letters of recommendation from three individuals familiar with the applicant’s academic ability are required. The department also has an application that must be submitted at the time of application to the Office of Graduate and International Admissions.

Requirements

Both thesis and non-thesis options are available for the major in forestry; a thesis is required in the wildlife and fisheries science major.

Thesis Option

• Prior to research for the thesis, the student is required to develop a detailed written research proposal. Registration for 6 hours of thesis (Forestry 500 or Wildlife and Fisheries Science 500) is required.
• A graduate committee of no fewer than three faculty members must be selected by the second semester of residence. At least one member must be from outside the department. In addition to the thesis requirement, a minimum of 24 hours of graduate coursework is required. This work must be approved by the student’s committee and no more than 10 hours of the minimum 30 can be below the 500 level. The committee may require additional coursework if the student’s progress or background indicates such need.
• All students are required to include Forestry 512 or Wildlife and Fisheries Science 512 Seminar, in their programs. This is required of each graduate student in residence fall semester.
• An oral examination covering the thesis and coursework is required.

Non-Thesis Option (Forestry major only)

• 35 hours of graduate coursework of which 23 must be at the 500 level or above is required.
DOCTOR OF PHILOSOPHY
NATURAL RESOURCES MAJOR

The doctoral program with a major in natural resources emphasizes interdisciplinary research approaches toward the understanding and management of natural resources in a broad context. Areas of study include forest, wildlife, and fisheries biology; ecosystem function and structure; natural resource economics and policy; human dimensions of natural resource management; wildlife recreation; natural resource organization administration and management; wood sciences; and multidisciplinary natural resource management. An optional, formal concentration in natural resource economics is also available for interested students.

Admission

Applicants to the PhD program normally should have completed a master's degree prior to beginning the doctoral program. Specific admission requirements include:

- A minimum grade point average of 3.00 on a 4.00 scale.
- A minimum composite score from the general Graduate Record Examination on the verbal, quantitative, and analytical sections of 1650, with a minimum of 1100 on the verbal and quantitative sections.
- A statement of professional goals, natural resource management philosophy, and reasons for applying to the program.
- Three letters of reference from individuals capable of evaluating the applicant's potential for graduate work in interdisciplinary natural resource management.

Requirements

A candidate for the doctoral degree must complete 72 hours of coursework beyond the bachelor's degree. Forty-eight hours must be in graduate coursework approved by the student's doctoral committee. Up to 24 hours of master's-level coursework may be applied to the 48-hour requirement. A minimum of 6 hours must be taken in university courses at the 600 level, exclusive of dissertation hours. Specific requirements are listed below.

Research Methods and Analysis (9 hours in at least two of the subject areas)

- Research/Experimental Design.
- Statistics/Econometrics/Biometrics.

Core Subject areas (33 hours to be determined by doctoral committee)

Professional Development (7 hours)

- Teaching – All students will be expected to complete Forestry, Wildlife and Fisheries 601 and assist in teaching a course during their tenure in the program.
- Problem Solving – Forestry, Wildlife and Fisheries 610 will be required of all doctoral students. This course will include participation in an interdisciplinary team to address a significant national or regional natural resource issue.

- Professional Communication – All students will be required to complete Forestry, Wildlife and Fisheries 612 two times as part of their program of study. Part of the seminar requirement will consist of assisting in the development and conduct of Forestry 512 and Wildlife and Fisheries 512.

Forestry, Wildlife and Fisheries or Agricultural Economics 600 Doctoral Research and Dissertation (24 hours)

A doctoral committee consisting of at least four faculty members must be identified by the student and major professor. At least one of the committee members must be from the Department of Forestry, Wildlife and Fisheries and one member must be from an academic unit other than Forestry, Wildlife and Fisheries. Three of the committee members, including the major professor, must be approved by the Graduate Council to direct doctoral research. The committee should be formed during the first year of the student's program.

All students are required to successfully complete an oral and written examination on all coursework completed as part of the Doctor of Philosophy requirements. The exam is scheduled when the student has completed all or nearly all of the coursework. The doctoral committee will determine the content, nature, and schedule of the comprehensive exam and will certify the results.

During the first year, the student should develop a research prospectus that outlines the research problem to be addressed as part of his/her doctoral research. The prospectus is presented to the student's committee and the committee will approve the research topic and approach.

All students are required to complete, present, and defend a dissertation. The student should provide each member of the committee with a copy of the dissertation at least two weeks prior to the scheduled defense. All students are required to present a seminar on their dissertation as part of the degree requirements. The seminar can be part of the dissertation defense or presented before the formal defense.

NATURAL RESOURCE ECONOMICS CONCENTRATION

Students interested in pursuing doctoral studies in the area of natural resource economics may do so with a concentration in natural resource economics. The student's doctoral committee will assist the student in developing a program of graduate coursework that will meet the requirements for the concentration under the natural resources PhD major, while drawing heavily from the Department of Agricultural Economics and the Department of Economics. (See Department of Agricultural Economics catalog entry for detailed information).

Environmental Policy Minor

The department participates in a program designed to give graduate students an opportunity to develop an interdisciplinary specialization in environmental policy. See Department of Political Science for program description.

DEPARTMENT OF PLANT SCIENCES

http://plantsciences.utk.edu/

G. Neil Rhodes, Head
Dennis R. West, Graduate Program Director

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 ................................................................. Illinois
Hayes, R.M., PhD ................................................................. Purdue
Lockwood, D.W., PhD ............................................................. Purdue
of disciplines as well as self-directed research in alternative areas provides opportunities for research-oriented studies located in sub-disciplines to prepare students as critically engaged and well-trained curriculums. The first professional degree (MLA Track I) is largely dedicated to preparing students for work in plant sciences, and related colleges and disciplines. Faculty in the College of Architecture and Design, the College of Agricultural Sciences and Natural Resources, and the Department of Plant Sciences offer two graduate departments – the Master of Landscape Architecture and the Doctor of Philosophy with a major in plants, soils, and insects. Students may specialize in one or more disciplines, including plant protection, molecular biology, breeding, genetics, biotechnology, physiology, ecology, culture, and management.

Admission

Students should have a bachelor’s degree from an accredited college or university with evidence of ability to do work of graduate quality. Applicants are expected to have a minimum cumulative grade point average of 2.70 on a 4.00 scale.

Application must be made to both the Office of Graduate and International Admissions and the Department of Plant Sciences. The departmental application requires three letters of reference (or three Graduate Rating Forms) from persons capable of assessing the applicant’s suitability for graduate work in plant science, resume, and a statement of professional goals and reasons for applying to the program. Applicants are also required to submit scores from the general Graduate Record Examination to Graduate and International Admissions (send photocopy to department). Successful applicants will usually score above the 50th percentile on the verbal, quantitative, and analytical writing sections of the Graduate Record Examination. Prior undergraduate coursework in mathematics, biology, and chemistry is recommended.

Requirements

- Approval of the academic program by the master’s committee.
- Successful completion of 12 hours of coursework in the major at the graduate level (400 or above), exclusive of Plant Sciences 502 and 503. Two of these hours must be Plant Sciences 504 and 505. With agreement of the graduate student’s committee, six of these hours may be satisfied by Art 481; Biochemistry and Cellular and Molecular Biology 404, 522, 523; Cultural Studies in Education 560; Ecology and Evolutionary Biology 414, 433, 560; Environmental and Soil Sciences 434, 544, 511, 516; Geography 439; Information Sciences 560; or Sociology 633.
- Presentation of at least two departmental seminars.
- Please see the Degree Program Requirements/Master’s Degree section at the front of this catalog for additional information.

Thesis Option

- Satisfactory preparation of a written thesis proposal and its oral defense to the student’s committee.
- Successful completion of 30 hours of graduate credit, which must include 6 hours of 500. At least 14 of these hours must be numbered 501 or above.
- Preparation of a written thesis and its oral defense.

Non-Thesis Option

- Successful completion of 34 hours of graduate credit, which must include 2-4 hours of Plant Science 503. At least 14 of these hours must be at the 500 level or above.
- Completion of a project and preparation of a written report summarizing the project.
- Passing written and oral examinations covering the project and coursework.
The Doctor of Philosophy with a major in plants, soils, and insects and concentrations in crop sciences, horticulture, plant breeding, plant molecular genetics, and weed science is offered under a multi-departmental doctoral program. Three departments participate – Plant Sciences, Entomology and Plant Pathology, and the soils faculty in Biosystems Engineering and Soil Science. Other concentrations within the plants, soils, and insects major include bioactive natural products, entomology, environmental and soil sciences, integrated pest management, and plant pathology. Please see the Plant Sciences homepage for additional information, http://plantsciences.utk.edu, or contact a faculty member in the area of interest.

Students may select a formal concentration as a focus of study but this is not a requirement. We recognize that modern research approaches in plant sciences often overlap. Students may specialize in one or more approaches, including plant biotechnology, molecular biology, breeding, genetics, physiology, ecology, culture and management. Research may feature fruits, vegetables, turfgrass, weeds, woody ornamentals, cereals, grains, fiber, public horticulture or model plant systems.

Admission
Submit application, fee, official transcripts, and scores from the general portion of the Graduate Record Examination to the Office of Graduate and International Admissions. Submit resume, three letters of reference (or three Graduate Rating Forms), photocopy of Graduate Record Examination scores, and a short statement of professional goals and reasons for applying to Plant Sciences Doctor of Philosophy Program Coordinator, Department of Plant Sciences, 2431 Joe Johnson Drive, 252 Plant Sciences Building, The University of Tennessee, Knoxville, Tennessee 37996-4561. In the statement letter and application, the concentration of interest and the intended major professor should be indicated.

Requirements
The student and the major professor will select a minimum of three additional faculty, holding the rank of assistant professor or above, to serve on the student’s doctoral committee. The major professor and two committee members must be approved to direct doctoral research by the Graduate Council. At least one member of the committee must be from outside the department. The doctoral committee must be formalized by the end of the second semester of graduate study.

An approved program of study must be submitted by the end of the second semester of graduate study. A candidate for the doctoral degree must complete a minimum of 24 hours of graduate coursework beyond the master's degree. Candidates not having a master’s degree must complete a minimum of 48 hours of graduate coursework beyond the baccalaureate degree. A minimum of 12 of the 24 hours, or 30 of the 48 hours, must be graded A-F. At least 9 hours of the student’s coursework must be from outside the plants, soils and insects major, and a minimum of 6 hours of courses numbered 601 or higher must be taken at the University of Tennessee, excluding Plant Sciences 602. In addition, 24 hours of course 600 Doctoral Research and Dissertation are required.