PhD program offers areas of emphasis in animal genetics, animal health and well-being, animal nutrition, and animal physiology. For specific information, contact the department head.

All first- and second-year MS students are required to enroll in 596 each spring term and all first- and second-year PhD students are required to enroll in 696 each spring term.

MASTER OF SCIENCE
Animal Science Major

ADMISSION

For admission to the MS program, a student must have obtained a 3.0 grade point average on a 4.0 scale (or a 3.0 each term during the junior and senior years) in a completed undergraduate degree program in one of the animal sciences or in a related area. The student must submit evidence (letters of recommendation, personal interview, etc.) that indicates ability to complete requirements for the MS. 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 3.0 for admission to the MS program.

REQUIREMENTS

The program requires the writing of a thesis based on original research; the completion of a minimum of 24 hours of graduate coursework, of which at least 14 hours must be taken in courses numbered at or above the 500 level; and 6 hours of thesis. Included in the course requirement are 1 hour of Agriculture 512 and a minimum of 3 hours in statistics. These statistics courses must be chosen from the 400, 500, or 600 level of courses approved for use in the Intercollegiate Graduate Statistical Program (ICGSP). The remainder of the coursework will be selected jointly by the student and the major professor depending on the student’s area of concentration and professional objectives.

The advisory committee will consist of the major professor, a faculty member of Animal Science, who will act as chairperson of the committee, and a minimum of two other faculty members, one of whom may be outside of the Animal Science Department. The advisory committee approves the student’s coursework and research problem and conducts the final oral examination, which consists of a comprehensive oral examination and a defense of the thesis.

DOCTOR OF PHILOSOPHY
Animal Science Major

REQUIREMENTS

The doctoral program requires a minimum of 48 semester hours of coursework beyond the BS and a minimum of 24 hours of doctoral research and dissertation. The 48 hours of coursework must include:

• A minimum of 16 hours in related fields outside of animal science.
• At least 24 hours credit at the 500- and 600- level, exclusive of doctoral research and dissertation, of which a minimum of 6 hours must be at the 600-level. Students in the nutrition, breeding, physiology, or anatomy concentration must complete at least 12 hours at the 500- and 600-level in the respective concentration or closely related area. Students in the management concentration must complete 12 hours at the 500- or 600-level in two non-management concentrations.
• A minimum of 1 hour of Agriculture 512 in addition to that required at the MS level.
• A minimum of 6 hours in 400-, 500-, or 600-level statistics courses approved for the ICGSP.

A minimum of five faculty members will constitute the student’s advisory committee, of which at least one must be outside animal science. The major professor will be the chairperson. The student and the major professor select a program of study depending on the student’s area of concentration and professional goal. The advisory committee approves the coursework and the dissertation research proposal and determines if there is to be a foreign language requirement. The advisory committee conducts the comprehensive written and oral examination and the final dissertation defense examination.

GRADUATE COURSES
Animal Science (113)

420 Advanced Reproduction (3) Collection, evaluation, and preservation of ova, spermatozoa and embryos; application of methods of natural breeding and techniques of artificial insemination and embryo transfer; herd sire and dam evaluation; pregnancy determination; gestation and parturition; infertility; recent advances in theriogenology. 1 hour and 2 labs. Prereq: 320 or equivalent.

430 Nutrient Evaluation and Ration Formulation (3) Ration nutrient analysis and formulation for beef and dairy cattle, sheep, horses, swine, poultry, laboratory, zoo, and companion animals. Mathematical and computer solutions and applications to formulating complex rations with constraints. 2 hours and 1 lab. Prereq: 330 or equivalent and introductory computer science course.

481 Beef Cattle Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production response and economic returns. Comparisons made to small ruminant, forage-based production systems. 2 hours and 1 lab. Prereq: Completion of Animal Science sophomore and junior core courses or consent of instructor.

482 Dairy Cattle Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production responses and economic returns. 2 hours and 1 lab. Prereq: Completion of 300-level core courses or equivalent or consent of instructor.

483 Pork Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production responses and economic returns. 2 hours and 1 lab. Prereq: Completion of 300-level core courses or equivalent or consent of instructor.

484 Poultry Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production responses and economic returns. 2 hours and 1 lab. Prereq: Completion of 300-level core courses or equivalent or consent of instructor.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

507 Professional Development Seminar (1) (Same as Agriculture and Natural Resources 507; Entomology and Plant Pathology 507; Food Science and Technology 507; Plant Sciences 507).
511 Special Problems in Animal Science (1-4) Prereq: Consent of instructor and department head. May be repeated. Maximum 9 hours.

520 Animal Physiology (4) Major body systems and interrelationships: nervous, muscle, endocrine, cardiovascular, kidney, respiratory, gastrointestinal, and adrenal. Concepts of metabolism, temperature regulation, and acid-base balance. Prereq: General undergraduate anatomy and physiology, biochemistry, or consent of instructor.

523 Advanced Mammalian Reproduction (3) Current topics and new frontiers in reproductive biology. Prereq: 520.

530 Animal Nutrition and Metabolism (4) Comparative digestive physiology, absorption, and metabolism of nutrients in ruminant and nonruminant species. Concepts and methodologies of animal growth and nutrient requirements; interrelationships, availability, and deficiencies of nutrients. Prereq: Animal Nutrition, Feeds, and Ration Formulation or consent of instructor.

535 Ruminology (2) Anatomy, physiology, and microbiology of ruminant system: microbial fermentation and metabolism of polysaccharides, lipids and nitrogen. Prereq: 530 or consent of instructor.

571 Design and Analysis of Biological Research (3) Experimental design and procedures; selection of experimental units; analysis and interpretation of data; statistical models and contrasts; analyses of variance; covariates, treatment arrangements, mean separation and regression. Prereq: Plant Sciences 471 or equivalent; knowledge of software package on micro- or mainframe computer. (Same as Plant Sciences 571.)

572 Least Squares Analysis (3) Least squares estimation and hypothesis testing procedures for linear models; mixed model methodology; full rank and non-full rank situations; covariance structures; estimation of variance components. 2 hours and 1 lab. Prereq: 571 or equivalent.

596 Seminar on Advanced Topics in Animal Science (1) Required of all first- and second-year MS students. May be repeated. Maximum 2 hours.

600 Doctoral Research and Dissertation (3-15) P/NP only.

621 Advanced Topics in Animal Physiology (1-4) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hours.

631 Advanced Topics in Animal Nutrition (1-4) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hours.

651 Advanced Topics in Animal Anatomy (1-4) Current and future research methodology, laboratory situation, recent advances in quantitative techniques for gross and microscopic anatomy. Prereq: Consent of instructor. May be repeated. Maximum 6 hours. (Same as Comparative and Experimental Medicine–Veterinary Medicine 651.)

652 Disorders of the Endocrine System (2) Pathological and physiological aspects of diseases; endocrine glands of various animal species. Prereq: 520 or consent of instructor. (Same as Comparative and Experimental Medicine–Veterinary Medicine 652.)

681 Advanced Topics in Animal Health and Well-Being (1-4) Recent advances and concepts, research techniques, and current problems associated with animal health and behavior. May be repeated. Maximum 6 hours.

696 Seminar (1) Advanced topics in animal science. Required of all first- and second-year PhD students. May be repeated. Maximum 2 hours.

Department of
Biosystems Engineering and Environmental Science
http://bioeng.ca.utk.edu

Ronald E. Yoder, Head
D. Raj Raman, Graduate Liaison

Professors
Ammons, J.T., PhD .............................................. West Virginia
Ayers, P.D., PhD, PE .................................................. North Carolina State
Buschmore, 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. (Vice President for Research, UTK), PhD, PE ........................................ Tennessee
Tyler, D.D., PhD ....................................................... Kentucky
Wilhelm, L.R. (Associate Dean, College of Engineering), PhD, PE ........................................ Tennessee
Wills, J.B., MS ......................................................... Tennessee
Yoder, D.C., PhD ..................................................... Purdue
Yoder, R.E., PhD, PE ................................................... Colorado State

Associate Professors
Burns, R.T., PhD, PE ................................................. Tennessee
Grandle, G.F., Ph.D .................................................... Tennessee
Hart, W.E., PhD ....................................................... Purdue
Hayes, D.G., PhD ....................................................... Michigan
Logan, J., PhD ........................................................... Nebraska
Radesovich, M., PhD ................................................... Ohio State
Raman, D.R., PhD, PE ............................................... Cornell
Savoy, H.J., PhD ....................................................... Louisiana State
Walker, F.R., PhD ...................................................... North Carolina State
Wilkerson, J.B., PhD .................................................. Purdue
Womac, A.R., PhD, PE .............................................. Tennessee

Assistant Professors
Buchanan, J.R., PhD, PE ............................................. Iowa State
Eash, N.S., PhD .......................................................... Iowa State
Lee, J., PhD .............................................................. Penn State
Leib, B.G., PhD ......................................................... Oklahoma State

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

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 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 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. Prerequisite courses may be required depending upon the applicant’s academic background and interest area within the program.

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 Doctor of Philosophy program which is administered jointly by the departments of Biosystems Engineering and Environmental 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 Environmental Science Department administer the environmental and soil sciences major’s program and the environmental and soil sciences concentration in the plant, soils, and insects Doctor of Philosophy 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. Within 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 GRE general 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**

**REQUIREMENTS**

Applicants accepted into the program must complete at least 30 semester hours to earn a degree. Of these 30 hours, 20 must be in courses numbered 500 or greater (6 hours of thesis plus 14 hours of other courses). Biosystems Engineering 503 Seminar (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. Other specific requirements for the 30 hours are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosystems Engineering 503 (3 times 1 hour) and other major subject coursework</td>
<td>12</td>
</tr>
<tr>
<td>1 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>Total 30</td>
<td></td>
</tr>
</tbody>
</table>

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

**MASTER OF SCIENCE**

**Biosystems Engineering Technology Major**

**REQUIREMENTS**

**Thesis Option**

Applicants accepted into the program must complete at least 30 semester hours to earn a degree. Of these 30 hours, 20 must be in courses numbered 500 or greater (6 hours of thesis plus 14 hours of other courses). Biosystems Engineering Technology 503 Seminar (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. Other specific requirements for the 30 hours are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosystems Engineering Technology 503 (3 times 1 hour) and other major subject coursework</td>
<td>12</td>
</tr>
<tr>
<td>1 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>Total 30</td>
<td></td>
</tr>
</tbody>
</table>

In addition to completing the 30 semester 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 semester hours to earn a degree. Of these 33 hours, 20 must be in courses numbered greater than 500. Biosystems Engineering Technology 503 Seminar (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. Other specific requirements for the 33 hours are:

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

In addition to completing the 33 semester 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 a 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 biochemistry; and soil physical processes. Both thesis and non-thesis options are available. Please see the environmental and soil sciences master’s concentration homepage for additional information: http://bioengr.ag.utk.edu/graduate/, or contact the environmental and soil sciences program’s graduate liaison.
**ADMISSION**

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

**REQUIREMENTS**

**Thesis Option**

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).

- 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.

- Develop and submit an approved program of study 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 six 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>Hours</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>503 Seminar</td>
<td>3</td>
</tr>
<tr>
<td>Courses numbered above 503</td>
<td>12</td>
</tr>
<tr>
<td>Courses within the major (excluding courses numbered 503 and below)</td>
<td>9</td>
</tr>
<tr>
<td>500 Thesis</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
</tr>
</tbody>
</table>

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

- Develop a research problem and presentation by means of a written proposal to the student’s committee. This must be completed during the first two semesters of graduate study and before enrollment in 500.

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

- Environmental and Soil Sciences 503 Seminar (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.

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 Degrees 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.

- Develop and submit an approved program of study by the end of the second semester of graduate study. A minimum of 33 hours of graduate coursework is required in the program of study. 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</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>503 Seminar</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>Courses within the major (excluding 500 and 502)</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
</tr>
</tbody>
</table>

  Courses that are in the major include those in environmental and soil sciences. In addition, Geology 510 and Environmental Engineering 535 are in the major. 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 three hours of 593 by participating in a single research program for a period of 12 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.

- Pass a comprehensive written examination that integrates the student’s course work and research problem. The exam is developed and administered by the advisory committee.

- Environmental and Soil Sciences 503 Seminar (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.

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, with 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 Environmental Sciences. Other concentrations within the PSI doctoral program include horticulture, crop sciences, weed biology, plant improvement, entomology, plant pathology, integrated pest management and plant bioactive compounds. 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. Please 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 Graduate Admissions Office. In your application, indicate that you are applying to the plants, soils, and insects doctoral program. Submit resume, three letters of reference (or three Graduate Rating Forms), photocopy of GRE scores and a short statement of professional goals and reasons for applying to: Environmental and Soil Sciences PhD Program Coordinator, Biosystems Engineering and Environmental Sciences Department, the University of Tennessee, Knoxville, 2506 E.J. Chapman Drive, Knoxville, Tennessee 37996-4531. In your statement letter and application, please indicate your interest in the environmental and soil sciences concentration.

REQUIREMENTS

To obtain the doctorate, the student must meet the following 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, and at least half of the committee must hold teaching appointments. 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. A candidate for the doctoral degree must complete a minimum of 24 hours of graduate coursework numbered 503 or higher by 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 PSI major, and a minimum of 6 semester hours must be taken in University of Tennessee, Knoxville, courses numbered 601 or higher. In addition, 24 hours of course 600 Doctoral Research and Dissertation are required.

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

- Passing both written and oral sections of the comprehensive examination. 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 Seminar (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.

- Satisfactory preparation of a written dissertation and its oral defense to the student’s doctoral committee.

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

DOCTOR OF PHILOSOPHY
Biosystems Engineering

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:

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major subject courses</td>
<td>18</td>
</tr>
<tr>
<td>Coursework in computational methods</td>
<td>9</td>
</tr>
<tr>
<td>Program electives</td>
<td>21</td>
</tr>
<tr>
<td>Environmental and Soil Sciences 603 Seminar (1)</td>
<td>3</td>
</tr>
<tr>
<td>600 Dissertation</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
</tr>
</tbody>
</table>

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.
GRADUATE COURSES
Biosystems Engineering (196)

411 Mechanical Systems Engineering (3) Fundamentals of power delivery systems and simple mechanisms; selection and design of mechanical, hydraulic, and tractive power transmission systems. Off-road vehicles and bioprocessing systems. 2 hours and 1 lab. Prereq: Mechanical Engineering 231, 321. Coreq: 321.

416 Hydrologic and Water Quality Engineering (3) An introduction to hydrology including: hydrologic variability, precipitation, evapotranspiration, infiltration, runoff, erosion, water quality and non-point pollution, energy dissipation, streamflow measurement, hydrographs, routing, open channel flow, and urban hydrology. Prereq: Civil Engineering 390 or Aerospace Engineering 341.

431 Bioprocessing Engineering (3) Application of basic engineering principles to processing and handling of biological materials: physical, chemical, biological properties; materials handling; material conversion operations; drying; heat processing; and bioprocessing. 2 hours and 1 lab. Coreq: 321 or equivalent.

441 Life Systems Engineering (3) Design of controlled environments to optimize conditions for organism growth and development: growth equations and population dynamics; plant growth systems; microbial growth systems; animal growth systems; biotechnological applications. 2 hours and 1 lab. Prereq: Mathematics 231; Coreq: 321.

451 Electronic Systems (4) Basic electronics with biological applications. Analog and digital electronics; sensing and controlling physical and environmental parameters; sensor selection and interfacing; signal conditioning; process control. Laboratory experiments and design projects. 3 hours and 1 lab. Prereq: Electrical Engineering 301.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

503 Seminar (1) (Same as Biosystems Engineering Technology 555; Environmental and Soil Sciences 503.)

510 Similitude in Design and Research (3) Dimensional analysis: governing equations; theory of models: true, distorted, dissimilar models; prediction equations; interpretation of data; applications to machinery, soil and water structures, agricultural buildings and other agricultural engineering related problems. 2 hours and 1 lab. Prereq: Engineering Science 321, 341.

525 Soil Erosion and Sediment Yield (3) (Same as Environmental Engineering 525.)

530 Research Problems in Biosystems Engineering (1-3) Theoretical and experimental studies relating to current problems in agricultural engineering. May be repeated. Maximum 6 hours.

532 On-Site Domestic Wastewater Treatment, Disposal and Reuse (3) Design, and management of domestic on-site wastewater treatment and disposal systems, use of the soil as a medium for final treatment and for wastewater dispersal, concepts of the decentralization of domestic wastewater management, and reuse of treated water for irrigation. 2 hrs and 1 lab. Prereq: Civil Engineering 395 or consent of instructor. (Same as Biosystems Engineering Technology 532.)

541 Principles of Compost Engineering (3) Comprehensive study of composting: survey of installed systems; thermodynamics of composting; biology of composting; kinetics of heat inactivation; feed conditioning; aeration; substrate characteristics; process kinetics; and odor control. Design component. Prereq: Thermodynamics, heat and mass transfer.

543 Instrumentation and Measurement (3) Modern instrumentation techniques. Static and dynamic response of instrumentation; signal conditioning; temperature, moisture, optical radiation, displacement, strain, pressure, velocity, acceleration, and flow transducers; digital data acquisition and control. 2 hours and 1 lab. Prereq: 451 or Electronics and Computer Circuits or equivalent. (Same as Environmental Engineering 543.)

545 Monitoring Hydrologic Phenomena (3) Application of instrumentation theory to monitoring hydrologic phenomena; strengths and weaknesses of current equipment and strategies; equipment operation and solution of environmental monitoring problems. 2 hours and 1 lab. Prereq: 543 and knowledge of basic hydrology. (Same as Environmental Engineering 545.)

550 Selected Topics (1-3) Lecture/group discussion on specialized topics. May be repeated. Maximum 6 hours.

552 Biological Treatment Theory (3) (Same as Environmental Engineering 552.)

555 GIS and GPS Applications to Biosystems (3) Theory and applications of Geographical Information Systems (GIS) and Global Positioning Systems (GPS); acquiring, managing, and analyzing spatially-variety data. Site-specific agriculture, environmental site assessment, natural resource management, and hydrology. 2 hours and 1 lab. Prereq: Graduate standing in engineering, biological or physical sciences. (Same as Biosystems Engineering Technology 555.)

575 Applied Microbiology and Bioengineering (3) (Same as Chemical Engineering 575; Environmental Engineering 575; Microbiology 575.)

600 Doctoral Research and Dissertation (3-15) P/NP only.

650 Selected Topics (1-3) Lecture, group discussion, and individual study on specialized developments. May be repeated. Maximum 6 hours.

Biosystems Engineering Technology (194)

422 Food and Process Engineering Technology (3) Application of basic engineering principles to agricultural and food processes. Fluid handling, drying, evaporation, thermal processing, heating and cooling, refrigeration systems, and materials handling. 2 hours and 1 lab. Prereq: Physics 101 or 221.

432 Agricultural Machinery and Tractors (3) Functions, selection, matching, and management of agricultural machinery systems. Tractor power ratings, engine and transmission systems, hydraulic systems, hitching, and ballasting. Field and material capacity, field efficiency, cost analysis, and machinery replacement strategies. Functional analyses of tillage operations, planters and drills, no-tillage systems, hay harvest systems, forage and small grain harvesting, and cotton harvesting. Crop drying processes, off-road machinery safety considerations, and operator ergonomics. 2 hours and 1 lab. Prereq: Mathematics 123, 125 or consent of instructor.

442 Agricultural Waste Management and Pollution Control (3) Waste management fundamentals; characteristics of animal manure; techniques for collection, transportation, storing, and utilizing livestock waste. 2 hours and 1 lab. Prereq: Mathematics 123, 125 or equivalent.

452 Small Internal Combustion Engines (3) Theory, concepts, and mechanics of small internal combustion engines; theoretical cycles; selection, operation, adjustment, troubleshooting and repair of single-cylinder engines. 2 hours and 1 lab. Prereq: Mathematics 123 or 125 or equivalent or consent of instructor.

462 Agricultural Chemical Application Technology (3) Equipment for application of liquid, solid, and gaseous agricultural chemicals; system components; operational characteristics; calibration; selection and management; safety considerations; materials handling and disposal methods. 2 hours and 1 lab. Prereq: Mathematics 123, 125 or equivalent or consent of instructor.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

503 Seminar (1) (Same as Biosystems Engineering 503; Environmental and Soil Sciences 503.)

506 Physical Phenomena (3) Properties of materials, fundamentals of hydraulics, principles of electricity, thermal phenomena, applications in biological systems. 2 hours and 1 lab. Prereq: Consent of instructor.

508 Special Problems in Biosystems Engineering Technology (1-3) Individual studies of current problems. May be repeated. Maximum 6 hours.
514 CAD Applications to Biosystems Engineering Technology (3) Computer Aided Drafting (CAD) applications in agriculture and environmental science. Essentials of CAD software to create drawings of components, systems, flow charts, and process diagrams. Applications in mechanical, structural, and biosystems. 2D applications with limited exposure to 3D applications. Computer intensive course. Hands-on experience. Two 2 hour labs. Prereq: Computer proficiency and admission to graduate program. (Students cannot receive credit for both 414 CAD Applications to Biosystems Engineering and 514.)

522 Processing and Environmental Systems (3) Environmental systems in plant and animal production; application of electric power, mechanical equipment, structures, crop processing and materials handling. 2 hours and 1 lab. Prereq: 506.

523 On-Site Domestic Wastewater Treatment, Disposal, and Reuse (3) (Same as Biosystems Engineering 532.)

542 Simulation of Agricultural Systems (3) Synthesis and analysis of agricultural systems using computer simulation, philosophy of system simulation, critical path, discrete and continuous systems. 2 hours and 1 lab. Prereq: 506 and scientific computer programming.

546 Automation Devices and Applications (3) Basic electronics as applied to simple automation systems, programmable controllers, data acquisition, digital logic and transducers. 2 hours and 1 lab. Prereq: 506 or consent of instructor.

555 GIS and GPS Applications to Biosystems (3) (Same as Biosystems Engineering 555.)

562 Selected Topics in Biosystems Engineering Technology (1-3) Lecture/group discussion on specialized topics. May be repeated. Maximum 6 hours.

574 Environmental Instrumentation and Monitoring (3) Equipment and techniques commonly used to measure all aspects of hydrologic cycle: precipitation, runoff, streamflow, subsurface water movement. Sampling of all flows for contaminants. Design of monitoring systems. Analysis of data. 2 hours and 1 lab. Prereq: Environmental and Soil Sciences 324, Statistics 201, Mathematics 152 or consent of instructor. (Students cannot receive credit for both 474 and 574.)

Environmental and Soil Sciences (345)

434 Environmental Soil Chemistry (3) Composition and chemical properties of soils and processes that govern fate and behavior of chemicals in soil environment: clay mineralogy; soil organic matter; mineral weathering and stability; aqueous speciation; surface chemistry; ion exchange, adsorption and molecular retention; oxidation-reduction; and soil acidity, alkalinity, and salinity. Prereq: 210; Chemistry 110 or 350.

442 Soil Genesis and Classification (3) Soil genesis and formation; observing and describing morphology of agricultural and forest soils; chemical and physical properties, classification. 3 weekend field trips. 2 hours and 1 lab. Prereq: 210.

444 Transport Processes in Soil (3) Basic understanding of soil physical properties and processes; influence of soil physical properties on water and chemical movement in soil; practical experience in the measurement and analysis of soil physical properties, water flow, and chemical movement in soil. Prereq: 210 and Physics 221 or equivalent.

462 Environmental Climatology (3) Study of atmosphere as environment. Physical, chemical and biological factors affecting climates of various earth environments; meteorological process affecting biosystems. Climatic change and the human impact on the atmosphere, consequences of climatic change and mitigation policies, microclimates and urban climates, atmospheric pollution, extreme events and ozone depletion. Design and operation of weather information systems; automated weather stations. Prereq: Agriculture and Natural Resources 290 or equivalent.

481 Capstone in Environmental and Soil Sciences (3) Integrative course in which students work individually and collaboratively to develop solutions for soil and water related environmental problems. Writing and oral communication emphasis course. Prereq: 434 and senior standing.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

503 Seminar (1) Presentations and discussions of current scientific material. May be repeated. Maximum 3 hours. (Same as Biosystems Engineering 503; Biosystems Engineering Technology 503.)

511 Soil-Plant Relationships (3) Principles of mineral nutrition of higher plants: plant physiological characteristics that influence uptake of water and nutrients; functions of nutrient elements in plants; soil factors influencing nutrient availability to plants; important relationships at soil-plant root interface; and responses to adverse soil environmental conditions. 3 hours and 1 rec. Prereq: 445 or Integrated Plant Systems 431 or Plant Sciences 431 or General Plant Physiology.

512 Pedology (3) Physical and chemical weathering processes, factors of soil formation, soil forming processes. 2 hours and 1 lab. Prereq: 442 or consent of instructor.

513 Advanced Soil Chemistry (3) Chemical properties and processes that operate in soil environment: thermodynamics of soil solutions and surface chemistry of soils; soluble complex formation, mineral solubility, electrochemical equilibria, geochemical modeling, ion exchange equilibria, surface functionality and reactivity, adsorption phenomena, and surface complexation modeling. Prereq: 434 or consent of instructor.

514 Environmental Soil Physics (3) Principles of water, gas, heat, and solute movement in soil/water systems; application of appropriate models for the description of these processes; methods for characterizing hydraulic and chemical transport properties of soil; applications of the science of soil physics to solution of contemporary problems in water conservation, prevention of surface/ground water contamination, and management of plant water status. Prereq: 444 or equivalent.

516 Soil Biology and Biochemistry (3) Soil organisms and their activities in soils: soil ecology, biogeochemical cycling of important elements, organic matter dynamics, and applications of agricultural and environmental biology and biochemistry. 2 hours and one 3 hour lab. Prereq: 210 or consent of instructor.

593 Special Problems in Plant and Soil Science (1-3) May be repeated. Maximum 6 hours.

600 Doctoral Research and Dissertation (3-15)

601 Special Topics in Soil Science (1-3) Thermodynamics of soil solutions, clay structure and surface chemistry, soil mineralogy, plant mineral nutrition, soil microbiology, water movement and use by plants, soil structure, soil thermal properties, interaction in the soil-plant environment. May be repeated. Maximum 6 hours.

603 Seminar (1) Presentations and discussion of current scientific material. May be repeated. Maximum 3 hours. (Same as Biosystems Engineering 603.)

613 Advanced Topics in Soil Chemistry and Fertility (2) Topics of current significance; scientific literature. Prereq: 513 or equivalent.

614 Advanced Topics in Soil Biology and Biochemistry (2) Topics of current significance; scientific literature. Prereq: 516 or equivalent.

615 Advanced Topics in Soil Physics, Genesis, and Morphology (2) Topics of current significance; scientific literature.

Department of ENTOLOGICAL AND PLANT PATHOLOGY

http://epserverag.utk.edu

Carl J. Jones, Head
Reid R. Gerhardt, Graduate Liaison

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
James, 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
Camaday, C.H., PhD ...................................................... Ohio State
Gwinn, K.D., PhD ...................................................... North Carolina State
Lentz, G., PhD .......................................................... Iowa 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)
Lamour, K., PhD ........................................... Michigan State
Moulton, J.K., PhD ......................................... Arizona

MAJOR DEGREES
Entomology and Plant Pathology ........................ MS
Plants, Soils, and Insects ................................. PhD

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 MS 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, 6-8 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 Graduate Admissions Office.

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 one 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 will include at least six hours and not more than 10 hours of graduate-level credit in the minor department. The student’s committee shall include a member of the faculty from the minor department to assist in designating courses required for the minor.

DOCTOR OF PHILOSOPHY
Plants, Soils, and Insects Major · Entomology, Plant Pathology, Integrated Pest Management, Bioactive Natural Products Concentrations

A PhD with a major in plants, soils and insects (PSI), with concentrations in entomology, plant pathology, integrated pest management, and bioactive natural products, 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 Environmental Sciences. Other concentrations within the PSI major include horticulture, crop sciences, weed biology, plant improvement, and environmental and soil sciences. 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 Graduate Admissions Office. In your application, indicate that you are applying to the plants, soils and insects doctoral program. Submit resume, three letters of reference (or three Graduate Rating Forms), photocopy of GRE scores and a short statement of professional goals and reasons for applying to EPP PhD Program Coordinator, Department of Entomology and Plant Pathology, 2431 Joe Johnson Drive, 205 PSB, University of Tennessee, Knoxville, Tennessee, 37996-4560. In your statement letter and application, please indicate your concentration of interest and intended major professor.

REQUIREMENTS

To obtain the doctorate, the student must meet the following 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, and at least half of the committee must hold teaching appointments. 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. 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 nine hours of the student’s coursework must be from outside the PSI major, and a minimum of six semester hours must be taken in University of Tennessee courses numbered 601 or higher. In addition, 24 hours of course 600 Doctoral Research and Dissertation are required.

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

• Passing both written and oral sections of the comprehensive examination. The candidate will be tested on his/her knowledge of the proposed dissertation and related fields.
• Presentation of at least two departmental seminars (two hours of EPP 640), in addition to an exit seminar (no credit).

• Satisfactory preparation of a written dissertation and its oral defense to the student’s doctoral committee.

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

GRADUATE COURSES

Entomology and Plant Pathology (341)

410 Diseases and Insects of Ornamental Plants (3) Symptoms, identification and management of diseases and insect pests that affect plants in greenhouse, nursery, and landscape environments. Prereq: 313 or 321 or consent of instructor.

451 Plant Tissue Culture (3) Methods for the culture of cells, tissues, and organs including media preparation and maintenance of cultures. Lecture and lab. Prereq: 110-120 or Biology 130-140 or equivalent and Chemistry 120-130 or equivalent. Recommended: 310, 321, 412; Microbiology 310 or 319; Plant Sciences 330. (Same as Botany 451; Plant Sciences 451.)

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

507 Professional Development Seminar (1) (Same as Agriculture and Natural Resources 507; Animal Science 507; Food Science and Technology 507; Plant Sciences 507.)

510 Plant Disease Fungi (4) Morphology, taxonomy, biology, and genetics of plant pathogenic fungi. Isolation and identification of plant pathogenic fungi. 2 hours and 2 labs. Prereq: 313 or consent of instructor. (Same as Plant Sciences 511.)

512 Soilborne Plant Pathogens (3) Causal agents; host-parasite-soil environment interactions; epidemiology; detection and identification of soilborne plant pathogens; biological, cultural, and chemical control. MS students only. Students who receive credit for 612, may not enroll in 512. Prereq: 313 or consent of instructor.

514 Bacterial Plant Diseases (2) Morphology, taxonomy, ecology, physiology, and genetics of bacterial plant pathogens; infection and disease development, pathogenesis and resistance; diagnosis, detection, effect of environment, and management of bacterial plant diseases; beneficial plant-bacterial interactions. 3 hours and 1 lab for 7 weeks. Prereq: 313 or consent of instructor.

515 Physiology of Plant Disease (3) Biochemical and physiological events involved in host-pathogen interactions. Mechanisms of disease resistance. Prereq: Introductory plant physiology and pathology, or consent of instructor.

520 Plant Parasitic Nematodes (2) Morphology, physiology, taxonomy, ecology, and management of plant parasitic nematodes, host-parasite relationships. 2 hours and 2 labs weekly for 7 weeks. Prereq: 6 hrs biological science or consent of instructor.

521 Plant Virology (3) Symptomatology, epidemiology, and management of virus infection; structure, morphology, replication, transmission, purification, characterization, and classification of plant viruses; serology; plant pathogenic viroids, mycoplasmas and spiroplasmas. 2 hours and 1 lab. Prereq: 313 or consent of instructor.

523 Field Crop and Vegetable Insects (2) Identification, biology and management of insects affecting commercial vegetable and home garden crops. 1 hour and 1 lab. Prereq: 321 or basic entomology course.

525 Medical and Veterinary Entomology (3) Morphology, taxonomy, biology, and control of arthropod parasites and vectors of pathogens of humans and animals. Ecology and behavior of vectors in relation to pathogen transmission and control. 2 hours and 1 lab. Prereq: 321 or 325, or consent of instructor.

530 Integrated Pest Management (3) Principles and application of biological, cultural, genetic, behavioral, and chemical methods of control to maintain pest-populations below economic threshold levels. Prereq: 321, or consent of instructor. (Same as Plant Sciences 530.)

531 Special Problems in Entomology (1-3) Comprehensive individual study of current problems. May be repeated. Maximum 6 hours.

532 Special Problems in Plant Pathology (1-4) Comprehensive individual study of current problems. May be repeated. Maximum 6 hours.

533 Concentrated Study in Entomology (1-3) Selected subjects in entomology for advanced students, concentrated in time and subject matter. Prereq: 321 or basic entomology course. May be repeated. Maximum 6 hours.

541 Seminar (1) Review of literature and current research in entomology and plant pathology. May be repeated. Maximum 2 hours. MS students only.

544 Protein Gel Electrophoresis (1) Practical experience with isolating native and denatured proteins from plants and fungi, determining protein concentrations, PAGE of proteins including total proteins and assays for specific enzymes (isozyme) analyses. 1 hour and 4 labs weekly for 5 weeks. Prereq: 8 hours biological/botanical sciences, 8 hours chemistry, consent of instructor. (Same as Plant Sciences 544.)

545 Plant Microtechnique (1) Practical light and scanning electron microscopy methods for investigating aspects of plant development, histochemistry and pathological structures in ornamental forest and crop species. 1 hour and 4 labs weekly for 5 weeks. Prereq: 8 hours biological/botanical sciences and consent of instructor. (Same as Plant Sciences 545.)

600 Doctoral Research and Dissertation (3-15) Doctoral Research and Dissertation. P/NP only.

602 Advanced Topics in Entomology (1-3) Morphology, systematics, physiology, ecology and genetics of arthropods, apiculture, medical and veterinary entomology, insect biodiversity, and insect pathology. May be repeated. Maximum 12 hours.

604 Advanced Topics in Plant Pathology (1-3) Biological control, disease diagnosis and management, epidemiology, fungal plant pathogens, integrated pest management, molecular plant-microbe interactions, nematology, plant pathogenesis, plant pathogenic bacteria, soil- and seed-borne pathogens, and virology. May be repeated. Maximum 12 hours.

606 Advanced Topics in Bioactive Natural Products (1-3) Bioactive pesticides, ethnobotany and paleoethnobotany, ethnomedicine, biocontrol of plant pathogens, bioprospecting, natural product diversity, alternative bioactive crops, organic agriculture, allelopathy in agriculture, regulatory issues in natural product development, and bioactivity-guided isolation. May be repeated. Maximum 12 hours.

608 Advanced Topics in Integrated Pest Management (1-3) Selected issues and topics of current significance to integrated pest management: transgenics in agriculture, issues in biological control, pesticide resistance management, ethics in pest management, environmental manipulations, epidemiology of plant diseases, biological control of plant pests, induced plant resistance, plant-microbe interactions, and new pesticide chemistries. Prerequisite: 530 or consent of instructor. May be repeated. Maximum 12 hours.

612 Soilborne Plant Pathogens (3) Causal agents; host-parasite-soil environment interactions; epidemiology; detection and identification of soilborne plant pathogens; biological, cultural, and chemical control. MS students only. Students who have received credit for 512, may not enroll in 612. Prereq: 313 or consent of instructor.

620 Advanced Topics in Plant Pathology (1-3) Principles and application of biological, cultural, genetic, behavioral, and chemical methods of control to maintain pest-populations below economic threshold levels. May be repeated. Maximum 12 hours.

640 Seminar (1) Review of literature and current research in entomology and plant pathology. May be repeated. Maximum 2 hours. PhD students only.

643 DNA Analysis (2) Practical experience in isolating genomic DNA from prokaryotic and eukaryotic organisms, amplification of DNA using arbitrary nucleotide primers. DNA profiling techniques (DAF, ASAP, ITS ribosomal RNA) isolation and purification of amplified products. Data collection and analysis of relationships between organisms. 1 hr and 4 labs weekly for 7 weeks. Prereq: 12 hrs biological sciences, 8 hrs chemistry, written consent of instructor. (Same as Plant Sciences 643.)

Department of

FOOD SCIENCE AND TECHNOLOGY

http://foodscience.utk.edu

H.C. Goan, Head
David A. Golden, Graduate Liaison

Professors

Brekke, C.J., PhD ................................................. Wisconsin
Davidson, P.M., PhD ........................................... Washington State
Draughon, F.A., PhD ............................................. Georgia
Goan, H.C., PhD .................................................. Michigan State
Morris, W.C., PhD .............................................. Iowa State
Penfield, M.P., PhD .............................................. Tennessee

Associate Professors

Golden, D.A., PhD .............................................. Georgia
Loveday, H.D., PhD ............................................. Kansas State
Mount, J.R., PhD ................................................ Ohio State
The Department of Food Science and Technology offers the Master of Science and Doctor of Philosophy degrees with a major in food science and technology. Students in the doctoral program may choose research in the concentration areas of food processing, food chemistry, food microbiology 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 (GRE), 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 GPA, GRE 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 BS 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 semester 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 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.
• 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 semester 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 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 PhD 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 semester hours must be 600 Doctoral Research and Dissertation.
• At least 24 hours of coursework numbered above 500 are required exclusive of doctoral research and dissertation. 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.
GRADUATE COURSES
Food Science and Technology (390)

410 Food Chemistry (4) Reactions of water, proteins, lipids, carbohydrates, minerals, enzymes, vitamins, and additives in foods. 3 hours and 1 lab. Prereq: Chemistry 110, Biochemistry and Cellular and Molecular Biology 310.

420 Food Microbiology (2) Physical, chemical and environmental factors moderating growth and survival of foodborne microorganisms; pathogenic and spoilage microorganisms affecting quality of foods and their control. Prereq: Microbiology 210. Coreq: 429.


430 Sensory Evaluation of Food (3) Principles and methods of sensory evaluation of foods. 2 hours and 1 lab. Prereq: Basic statistics.

445 Application of Food Chemistry and Processing Principles (4) Interactions and functions of dairy, egg, cereal and other plant based ingredients during the production and storage of processed food products. 3 hours lecture and 1 lab. Prerequisite: 340 and 410 or consent of instructor.

460 Meat Science (3) Carcass characteristics of meat animals, muscle structure and composition, cut identification, curing, freezing and cookery. Prereq: 140 or consent of instructor.

469 Meat Science Lab (1) Slaughter and processing methods for beef, pork, lamb and poultry. Coreq: 460.

490 Food Laws and Regulations (3) Laws and regulations designed to preserve safety, wholesomeness, and nutritional quality of United States food supply; precedent case studies and their impacts on laws and regulations. Prereq: 140: consent of instructor for non-majors.

495 Quality Assurance and Sanitation Practices (3) Design and evaluation of food processing operation to produce safe and acceptable quality food product. Prereq: 320 and 340 or consent of instructor.

500 Thesis (1-15) P/NP only.

501 Seminar (1) Individual reports and discussion on topics from current literature. May be repeated. Maximum 3 hours. Satisfactory/No Credit grading only.

502 Registration for Use of Facilities (1-15) For the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

503 Problems in Lieu of Thesis (2-3) May be repeated. Satisfactory/No Credit grading only.

507 Professional Development Seminar (1) Satisfactory/No Credit grading only. (Same as Agriculture and Natural Resources 507; Animal Science 507; Entomology and Plant Pathology 507; Plant Sciences 507.)

510 Instrumental Analysis of Food (3) Modern instrumental methods for control of food manufacturing processes. Prereq: 410. 2 hours and 1 lab.

512 Flavor of Foods (2) Chemical basis, measurements, and reactions involved in flavor changes in foods. Manufacture and application of flavorings in foods. 1 hour and 1 lab. Prereq: 410 or equivalent.

515 Food Carbohydrates, Proteins and Lipids (4) Advanced study of chemical and physical attributes of carbohydrate, protein, and lipid components of foods: effects of components on production of safe and consistent quality food products; and changes during processing and/or distribution of food products. 3 hours and 1 lab. Prereq: 410 or equivalent.

521 Advanced Food Microbiology (3) Extrinsic and intrinsic factors associated with food and food processing that relate to growth, survival, inhibition, detection, and recovery of foodborne pathogens and spoilage organisms; traditional and current approaches to microbiological food safety and quality. Prereq: 420, 429 or equivalent.

540 Food Product Development (3) Art, science and technology of developing and marketing new food products. 2 hours and 1 lab. Prereq: 340.

560 Advanced Meat Science (3) Physical and chemical changes that occur in conversion of muscle to meat; effect of postmortem treatments on meat quality, composition and palatability; packaging, preservation and quality control. 2 hours and 1 lab. Prereq: 460.

590 Special Topics in Food Technology and Science (1-3) Critical reviews of current research and production concerns of food industry. May be repeated. Maximum 9 hours.

593 Directed Studies (1-3) Research on non-thesis topics chosen by student and major professor. Supervised experience in food industry or governmental laboratories. May be repeated. Maximum 6 hours.

600 Doctoral Research and Dissertation (3-15) P/NP only.

601 Seminar (1) Reports and directed discussion on research topics from current literature. May be repeated. Maximum 3 hours. Satisfactory/No Credit grading only.

620 Food Toxicology (3) Basic and applied concepts in food toxicology; toxicological aspects of processed foods. Mode of action, prevention and control of food toxicants in food supply. Prereq: 410, 521, or consent of instructor.

640 Advanced Food Processing (3) Role of processing treatments in modification of food properties; texture, flavor and color characteristics. Prereq: Food Preservation, 510, 511, 512 or consent of instructor.

Department of FORESTRY, WILDLIFE AND FISHERIES

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

George M. Hopper, Head and Graduate Liaison

Professors
Buehler, D.A., PhD ......................................................... Virginia Tech
Dearden, B.L., PhD ......................................................... Colorado State
Hill, Jr., T.K., PhD ............................................................... Auburn
Hopper, G.M., PhD ............................................................ Virginia Tech
Ostermeier, D.M., PhD ......................................................... Syracuse
Pelow, M.R., PhD .............................................................. Georgia
Rials, T.G., PhD ............................................................... Virginia Tech
Schlarbaum, S.E., PhD ......................................................... Colorado State
Speer, C.A., PhD ............................................................... Utah State
Strange, R.J., PhD ............................................................. Oregon State
Wilson, J.L., PhD .............................................................. Tennessee

Associate Professors
Clatterbuck, W.W., PhD .................................................. Mississippi State
Fly, J.M., PhD ................................................................. Michigan
Hay, R.L., PhD ................................................................. Duke
Hodges, D.G., PhD ............................................................ Georgia

Assistant Professors
Buckley, D.S., PhD ........................................................... Michigan Tech
Franklin, J.A., PhD ............................................................ Alberta (Canada)
Gray, M.J., PhD ............................................................... Texas Tech
Harper, C.A., PhD ............................................................ Clemson
Muller, L.I., PhD ................................................................. Georgia

Wang, S., PhD ............................................................... Nanjing Forestry (China)

Young, T.M., MS ............................................................... Tennessee

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

Adjunct Faculty
Albright, R., PhD ............................................................ Southern Illinois
Clark, J.D., PhD ............................................................. Arkansas

Eda, S., PhD ................................................................. Japan
Franzreb, K., PhD ............................................................ Arizona State
Van Manen, F., PhD ........................................................... Tennessee

Emeritus Faculty
Buckner, E.R., PhD ......................................................... North Carolina State
Dimmick, R.W., PhD .......................................................... Wyoming
Rennie, J.C., PhD ............................................................. North Carolina State
Schneider, G., PhD ........................................................... Michigan State
Stumbo, D.A., PhD ............................................................ Minnesota

MAJORS

DEGREES

MAJORS

Degree Programs

Forestry ................................................................. MS
Wildlife and Fisheries Science ........................................ MS
Natural Resources .................................................. PhD

Graduate study leading to the Master of Science with majors in forestry and in wildlife and fisheries science and the Doctor of Philosophy with a major in natural resources is offered by the Department of Forestry, Wildlife and Fisheries.
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 other natural resource area. Applicants must take the general Graduate Record Examination (GRE) 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 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 3 faculty members must be selected by the second semester of residence. At least one member shall 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)**

- Thirty-five hours of graduate coursework of which 23 must be at the 500 level or above is required.
- A graduate committee of no fewer than 3 faculty members will be selected. At least one member shall be from outside the department. The committee will meet and schedule the student’s program during the first semester in residence.
- Three hours of Forestry 511 are required.
- Nine hours of coursework in the department must be at the 500 level or above, exclusive of Forestry 511.
- Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 28 hours of approved study.

**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; natural resource organization administration and management; wood sciences; and multidisciplinary natural resources management.

**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 3.0 on a 4.0 scale.
- A minimum composite score from the general Graduate Record Examination (GRE) 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 semester 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:

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

- Research/Experimental Design
- Statistics/Econometrics/Biometrics
- GIS/Remote Sensing

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

**Professional Development (6 credits)**

- 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 Communications: All students will be required to complete Forestry, Wildlife and Fisheries 612 as part of their program of study. Part of the seminar requirement will consist of assisting in the development and conduct of Forestry, Wildlife and Fisheries 512.
Forestry, Wildlife and Fisheries 600 Doctoral Research and Dissertation (24 credits)

A doctoral committee consisting of at least four faculty members must be identified by the student and major professor. At least two 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 PhD requirements. The exam is scheduled when the student has completed all or nearly all of the coursework. The PhD committee will determine the content, nature, and schedule of the comprehensive exam and 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 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.

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 Economics for program description.

GRADUATE COURSES

Forestry (396)

421 Forest and Wildland Resource Economics (3) Production functions; supply-demand and market analysis; non-market programs and projects; economic analysis and decision models; investment and financial analysis; managerial economics; taxes; forest products marketing. Prereq: 324 or consent of instructor.

422 Forest and Wildland Resource Policy (3) Policy formulation; criteria for policy determination; forest and wildland law and regulation; theory of conflict resolution; formal and informal resolution. Prereq: Senior standing or consent of instructor.

423 Wildland Recreation Planning and Management (3) Planning processes, master and site planning, site design projects; management strategies, methods of visitor and recreation site management; case studies. Weekend field trips. 2 hours and 1 lab. Prereq: 321 or consent of instructor.

433 Wood Adhesives and Glued Wood Products (2) Theory and practice of adhesive bonding of wood; wood substrate-adhesive interface for bonding; principles of adhesion; wood adhesives; gluing of solid wood and composite wood manufacturing practices; laboratory manufacture and/or testing of adhesives, adhesive bond strength and glued-wood product performance; day field trips. 1 hour and 2 labs. Prereq: 331 and 332, or consent of instructor.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

511 Problem Analysis in Forest Resources (3) Problem identification, analysis and solution in forest resources management. Identify, analyze and prepare written report. Topic and report must have approval of graduate committee. Available only to students in non-thesis option for MS in Forestry.

512 Seminar (1) Current developments in forestry. Required of all graduate students in residence in fall. May be repeated. Maximum 2 hours. Satisfactory/No Credit grading only.

515 Forest Conservation Workshop (1-3) Relation of forest biology, ecology and management to conservation issues; integration of current conservation issues into classroom work and student projects; environmental education strategies. Not available to students in forestry or wildlife and fisheries science. May be repeated. Maximum 3 hours.

520 Advanced Forest Ecology (3) Physiological ecology and adaptations of trees; relationships between overstory structure, microclimate, and understory response; regeneration ecology; competition and effects of natural and human disturbance regimes at multiple scales; forest succession and stand dynamics. Prereq: Graduate standing in forestry or biological science, or consent of instructor.

525 Woodlot Management (3) Current technologies and management strategies concerning wise use of forest resources for private, non-industrial forest landowners necessary for decision-making and implementation. 6.5 hours and 1 lab weekly for 6 weeks. Prereq: 6 hrs of biological sciences or consent of instructor. Not available to students in forestry or wildlife and fisheries science.

530 Advanced Forest Resource Management (3) Analysis of forest management problems in public and private organizations. Classical forest regulation; linear and goal programming, as applied to resource management problems; advanced forest investment analysis; decision making methods for primary forest management activities; and methodologies for incorporating non-timber values in forest management operations. Prereq: Senior-level forest management or consent of instructor.

540 Genetics in Forestry (3) Genetic improvement of forest trees, selection of superior phenotypes; field testing for genetic variability; tree breeding; development of seed orchards; hybridization; tree cytology and tissue culture; use of biochemical variation; planning and conducting forest genetics research. Prereq: Silvicultural methods and Biology 220 or consent of instructor.

550 Recreation Planning for Forests and Associated Lands (3) Planning process for recreation development on forests and associated lands; analysis and critique of specific contemporary alternatives. Overnight field trips. Prereq: Senior level in forest recreation or consent of instructor.

570 Management and Policy of Forest Resource Organization (3) Theory and application of management as applied to natural resource organizations: institutional direction and culture, and strategic management. Development of policy as planning tool and as results from conflict resolution. Linkage between policy development and execution, and structure and management of organizations. Prereq: Forest administration and policy or consent of instructor.

580 Advanced Silviculture (3) Silvical characteristics, silvicultural practices and systems applied to commercially important hardwoods and softwoods. In-depth analyses of silvicultural principles involved and tools used, prescribed fire, pesticides, in regeneration and management; computer modeling of stand dynamics, structure, growth/yield. 2 hrs and 1 lab. Prereq: Undergraduate silviculture course or consent of instructor.

585 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory; fixed and variable plot sampling; list sampling; Poisson sampling; regression estimators; multistage and multiphase sampling. Growth and yield predictors for even-aged and uneven-aged forests. Prereq: 326 and 329 or consent of instructor.

590 Advanced Topics in Forestry (1-3) Recent advances and concepts; research techniques and analysis of current problems. Prereq: Consent of instructor. May be repeated. Maximum 6 hours.

593 Independent Study in Forestry (1-4) May be repeated. Maximum 6 hours.

630 Forest Growth and Development (3) Forest stand dynamics, analysis of changes in species composition and forest stand structure (physical and temporal) during forest succession, response of stands to disturbances (anthropogenic and natural), modeling techniques to make predictions of future stand development. 2 hours and 1 lab. Prereq: Undergraduate silviculture course or consent of instructor.

Forestry, Wildlife and Fisheries (398)

410 Wildlife Habitat Evaluation and Management (3) Ecological relationships between wildlife and habitat. Evaluation, modeling, and management of wildlife habitat. Effects of land-use practices on wildlife habitat. Weekend field trips. 2 hours and 1 lab. Prereq: 317 or consent of instructor. Applicable to majors in Forestry and in Wildlife and Fisheries Science.
416 Planning and Management of Forest, Wildlife and Fisheries Resources
(3) Integrated forest and wildlife resource management through developing
land management plans and analyzing case studies including conflict resolution.
Applicable to majors in Forestry and in Wildlife and Fisheries Science. 1 hour
and 2 labs. Prereq: Senior standing.

520 Natural Resource Issues at International Level (2) Identification and
analyses of issues regarding forestry, wildlife, fisheries and wildland park
resources beyond U.S. borders. Political, economic, social, and biological
characteristics of natural resources in different parts of world: Northern
Europe, Latin America, Asia, Africa, and South America. In-depth case study
and class presentation required by student teams. Not available for students
who have taken 420.

535 Environmental Impacts to Natural Ecosystems (3) Current environmental
problems concerning natural ecosystems: climatic change, acidic deposition, air
pollution, species declines, and introductions of exotic species. Management
methodologies to mitigate environmental problems. Overnight field trips. Prereq:
416 or equivalent or consent of instructor. Applicable to majors in Forestry and
in Wildlife and Fisheries Science.

540 Seminar on Integrated Resources Management in Biosphere Reserves
(2) MAB program, UNESCO-sanctioned global conservation initiative. Analysis
of integrated resources management practices that demonstrate concept of
sustainable development. Environmental policy and application of science to
management practice. Applicable to majors in Forestry and in Wildlife and
Fisheries Science.

590 Advanced Topics in Forestry, Wildlife and Fisheries (1-3) Recent advances
and concepts, research techniques, and analysis of current problems. Prereq:
Consent of instructor. May be repeated. Maximum 6 hours.

600 Doctoral Research and Dissertation (3-15) P/NP only.

601 Teaching Methods in Natural Resources (3) Review of teaching and
learning methods in natural resources education at collegiate level. Methods for
conducting lectures and laboratories in natural resources. Methods for student
evaluation. Practicum in teaching. Prereq: Consent of instructor.

610 Seminar in Natural Resources (2) Selected issues in natural resources
and natural resource management at regional, national, or international level.
Development of interdisciplinary approach to addressing problems: evaluating
current state of knowledge, developing alternative actions to address problems,
and identifying criteria for evaluation of alternative actions.

612 Seminar in Forestry, Wildlife and Fisheries (1) Current issues and
developments in forestry, wildlife and fisheries. Required of all doctoral students
in residence during fall. May be repeated. Maximum 3 hours.

Wildlife and Fisheries Science (993)

440 Wildlife Techniques (3) Methods of wildlife damage control, forest,
farmland, wetland wildlife habitat management, identification of wildlife field
sign, wildlife capturing techniques and management plan preparation. Weekend
field trips. 1 hour and 1 lab or field. Prereq: Forestry, Wildlife and Fisheries
317 or consent of instructor.

442 Fisheries Techniques (3) Active and passive sampling techniques for fish and
aquatic organisms; population estimation methods; fish handling and transport;
food habits analysis; marking and tagging techniques; age determination and
incremental growth analysis; stream assessment; equipment and instrumentation
usage and maintenance; safety in sampling methods. Weekend field trip. 1 hour
and 1 lab or field. Prereq: Forestry, Wildlife and Fisheries 317 or consent of
instructor.

443 Fisheries Science (3) Quantification and management of freshwater
fisheries: population estimation, age and growth, biological assessment, and
stocking. 2 hours and 1 lab. Prereq: Forestry, Wildlife and Fisheries 317 or
consent of instructor.

444 Ecology and Management of Wild Mammals (3) Biological and ecological
characteristics of game mammals and endangered mammals. Current principles
and practices of wild mammal management. 2 hours and 1 lab. One weekend
field trip required. Prereq: Forestry, Wildlife and Fisheries 317 or consent of
instructor.

445 Ecology and Management of Wild Birds (3) Biological and ecological
coloristics of game birds, endangered birds, and bird pests. Current principles
and practices of wild bird management. 2 hours and 1 lab. Prereq: Forestry,
Wildlife and Fisheries 317 or consent of instructor.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not
otherwise registered during any semester when student uses university facilities
and/or faculty time before degree is completed. May not be used toward degree
requirements. May be repeated. Satisfactory/No Credit grading only.

512 Seminar in Wildlife and Fisheries Science (1) Current developments in
wildlife and fisheries science. Required of all graduate students in residence in fall.
May be repeated. Maximum 2 hours. Satisfactory/No Credit grading only.

515 Seminar in Avian Ecology and Management (1-2) Readings and
discussion based on current literature on contemporary topics in avian ecology
and management. Additional credit awarded for writing review paper on
contemporary topic of interest to student. Prereq: Consent of instructor.

525 Endangered Species Management and Conservation of Biodiversity
(2) Status, ecology and management of endangered wildlife and plant species.
Historic aspects, policy implications and philosophical issues surrounding
recovery efforts. Approaches to monitor and manage for biodiversity. Prereq:
Graduate standing or consent of instructor.

530 Wildlife Diseases (2) Necropsy of birds and mammals. Recognition of
various diseases and methods of preparing pathological materials in field and
lab. Investigative procedures concerning wildlife diseases. Prereq: 1 yr biology,
444 or 445, or consent of instructor. (Same as Comparative and Experimental
Medicine–Veterinary Medicine 530.)

535 Floodplain Ecosystems (3) Ecology, restoration and management of
floodplain ecosystems: biotic and abiotic processes, social considerations,
and wildlife and forest management; Lower Mississippi River Alluvial Valley.
Prereq: Consent of instructor.

540 Predator Ecology (2) Dynamics of terrestrial vertebrate predator populations
in human-altered and relatively unaltered environments. Prereq: 444 or 445 or
consent of instructor.

545 Advanced Population Analysis (2) Detail characteristics, assumptions,
goals, methods, and current technologies for fish and wildlife population
analysis. Use of computers. Prereq: Animal Science 571 or Statistics 538 or
consent of instructor.

546 Advanced Habitat Analysis (2) Habitat analysis as tool to evaluate habitat
use and predict occurrences of animal and plant species: principles and goals of
modeling, habitat analysis theory, GIS and statistical techniques. Use of
computer programs. Prereq: Forestry, Wildlife and Fisheries 410 or Geography
411 or consent of instructor.

550 Fish Physiology (3) Mechanisms of gas transfer, circulation, excretion,
osmoregulation, locomotion, and neural/hormonal control of these systems in
fishes. Comparisons and contrasts with physiology of terrestrial animals.
Practical applications of fish physiology to aquaculture, pollution assessment, and
fisheries management. Prereq: Senior or graduate standing in life sciences.

555 Fish Culture (3) Principles, concepts and techniques of culturing
economically important fish and shellfish species. 2 hours and 1 lab. Prereq:
443 or consent of instructor.

556 Recirculating Aquaculture (3) Growing fish in intensive, indoor systems
with reconditioned water. Techniques of solids removal, nitrification, and gas
balance. Practical experience with operating system. Prereq: 443 or consent
of instructor.

560 Advanced Topics in Wildlife and Fisheries Science (1-3) Recent advances
and concepts, research techniques and analysis of current problems. Prereq: 443,
444, 445, or consent of instructor. May be repeated. Maximum 6 hours.

593 Independent Study in Wildlife and Fisheries Science (1-4) May be
repeated. Maximum 6 hours.

Department of
PLANT SCIENCES
http://plantsciences.uitk.edu/

G. Neil Rhodes, Head
Dennis R. West, Graduate Liaison

Professors
Albrecht, M.L. (Associate Dean), PhD ........................................ Ohio State
Allen, E.L., PhD ........................................................................ Minnesota
Augé, R.M., PhD ................................................................. Washington State
Denton, H.P., PhD ................................................................. North Carolina State
Deyton, D.E., PhD ................................................................. North Carolina State
Hayes, S.C., PhD ................................................................. Illinois
Lockwood, D.W., PhD ............................................................ Purdue
McDaniel, G.L., PhD ............................................................... Iowa State
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., PhD ................................................................. Michigan State
Stewart, C.N., PhD (Racheff Chair) ........................................ Virginia Tech
West, D.R., PhD ................................................................. Nebraska

F. L. (Associate Dean), PhD .................................................. North Carolina State

Purdue University
statement of professional goals and reasons for applying to the program. Applicants are also required to submit scores from the general Graduate Record Examination (GRE) to Graduate Admissions (please send photocopy to department). Successful applicants will usually have a composite score on the verbal, mathematical and analytical sections of the GRE of at least 1400. Prior undergraduate course work in mathematics, biology and chemistry is recommended.

**REQUIREMENTS**

- Approval of the academic program by the master’s committee.
- Successful completion of 12 hours of course work in the major at the graduate level (400 or above), exclusive of Plant Sciences 500, 502, and 503. Two of these hours must be Plant Sciences 504. Six of these hours may be satisfied by Botany 404, 412, 521, 522, Animal Science 571, Environmental and Soil Sciences 434, 444, 516, Ecology and Evolutionary Biology 431, 520, 560, Information Sciences 560, Art 481, or Geography 439.
- Presentation of at least two departmental seminars.

Please see the Degree Program Requirements/Master’s Degrees 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 22 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 course work.

**DOCTOR OF PHILOSOPHY**

**Plants, Soils, and Insects Major · Horticulture, Crop Sciences, Weed Biology, Plant Improvement**

**Concentrations**

A PhD in plants, soils and insects, with concentrations in horticulture, crop sciences, weed biology, and plant improvement, 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 Environmental Sciences. Other concentrations within the PSI major include environmental and soil sciences, entomology, plant pathology, integrated pest management and bioactive natural products. Please see the Plant Sciences homepage for additional information, http://psls.ag.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 Graduate Admissions Office. In your application, indicate that you are applying to the Plants, Soils and Insects doctoral program. Submit resume, three letters of reference (or three Graduate Rating Forms), photocopy of GRE scores and a short statement of professional goals and reasons for applying to: Plant Science PhD Program Coordinator, Department of Plant Sciences, 2431 Joe Johnson Drive, 252 PSB, the University of Tennessee, Knoxville, Tennessee 37996-4561. In your statement letter and application, please indicate your concentration of interest and intended major professor.

**REQUIREMENTS**
To obtain the doctorate, the student must meet the following 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, and at least half of the committee must hold teaching appointments. 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. 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 PSI major, and a minimum of 6 semester hours must be taken in University of Tennessee courses numbered 601 or higher. In addition, 24 hours of course 600 Doctoral Research and Dissertation are required.
- Satisfactory preparation of a written dissertation proposal and its oral defense to the student’s committee. This must be completed during the first two semesters of graduate study and before enrollment in 600.
- Passing both written and oral sections of the comprehensive examination. 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 PS 504), in addition to an exit seminar (no credit).
- Satisfactory preparation of a written dissertation and its oral defense to the student’s doctoral committee.

**GRADUATE COURSES**

**Plant Sciences (791)**

- 410 Nursery Management and Production (3) Modern management methods as applied to retail and wholesale nurseries and landscape contracting firms. Methods of producing liners, container and field-grown woody ornamental plants. 2 hours and 1 lab. Prereq: 220, 330, and Environmental and Soil Sciences 210, or consent of instructor.

- 427 Management and Administration of Public Horticulture Institutions (3) Management of resources in non-profit institutions, support organizations and communities. Theoretical framework and institutional mission; strategic planning and programming; financial accounting and budgeting; development and fund raising; personnel policies; volunteer development; marketing and publicity; legal issues; relationships between staff and governing boards; the use of information technology in management and governance systems; and conservation/preservation roles in community development. Prereq: 326.

- 429 Field Study of Public Horticulture Institutions (3) Extended 10 -12 day field study of various public horticulture institutions: botanical gardens, arboreta, historical grounds, zoos, conservatories, cemeteries, and nature preserves. Travel journal and course portfolio required. Application and travel fee required. Prereq: 326.

- 431 Physiology and Ecology in Agroecosystems (3) Plant physiology and ecology applied to crop production and management. Plant physiology and ecology principles related to crop production practices from seedling to harvesting and handling. Interaction of crops with environment and sustainable agroecosystems. 2 hours and one 2 hour lab. Prereq: 230.

- 433 Agricultural Pesticides (3) Regulation of pesticide development, manufacture, transportation, marketing and use. Structure, use, mode of action, degradation and environmental impact of pesticides used in agriculture, forestry and related areas. 2 hours and 1 lab. Prereq: 1 year biological sciences and 1 semester chemistry.

- 434 Fruit and Vegetable Crops (3) Principles of production systems to counter environmental stresses and to increase productivity of warm and cool season vegetable crops, small fruit crops, and deciduous tree fruit crops. Storage of crops after harvest. 2 hours and one 2 hour lab. Prereq: 230.

- 435 Field and Forage Crops (3) Agronomic principles of crop production and management. Crop improvement, cropping systems, tillage, fertilization, pest management, harvest and utilization of major field and forage crops. 2 hours and 1 lab. Prereq: 230.

- 436 Plant and Garden Photography (2) Principles and techniques of photography related to plants and gardens. Equipment options and field shooting under various weather conditions and in different seasons. Prereq: Senior standing and consent of instructor.

- 437 Public Garden Operations and Management (3) Analysis of year-round operations and management of public gardens. Case studies: time and labor management, budget development and management, implementation of volunteer programs, information dissemination methods for public outreach, management of grounds and facilities using the University of Tennessee Institute of Agriculture Gardens as model. Prereq: 326.

- 440 Advanced Turfgrass Management (4) Principles and scientific basis of turfgrass culture: adaptation, ecology, physiology, soil fertility, and grass nutrition, climatic influences on grass culture; physiology of clipping and water management; design, construction, and management of golf courses; and physiological influences of pest infestation and control measures. Prereq: 340 or consent of instructor. 3 hours and 1 lab.

- 446 Horticultural Therapy (3) Application of horticulture as therapy for treatment, rehabilitation and/or training of individuals with disabilities. Prereq: Senior standing and consent of instructor.

- 450 Specialty Landscape Construction (3) Methods of design, materials, and construction techniques for specialized components of landscape industry. Irrigation systems, outdoor lighting, garden ponds and water features.

- 451 Plant Tissue Culture (3) (Same as Botany 451; Entomology and Plant Pathology 451.)

- 453 Principles of Plant Breeding (3) Genetic principles and techniques used in crop improvement. Consideration of breeding methods for various types of plant reproduction systems and application. Discussion of heritability estimation, genetic advances through selection and theory upon which breeding methods are based. Prereq: 471 and Biology 240. 2 hours and one 2 hour lab.

- 460 Professional Practices in Landscape Construction and Management (2) Professionalism, salesmanship, proposals, bidding, estimating, specification, and contract management in landscape services industry. Interaction with industry representatives through special presentations. Prereq: 350 or consent of instructor.
471 Statistics for Biological Research (3) Application of statistics to interpretation of biological research. Notation, descriptive statistics, probability, distributions, confidence intervals, t and chi-square tests, analysis of variance, mean separation procedures, linear regression and correlation. Prereq: Mathematics 125 or equivalent.

480 Advanced Landscape Design (3) Comprehensive application of landscape design skills to variety of project experiences: landscape planning and analysis, planting design, and materials estimating. Two 3-hour labs. Prereq: 280 and 380.

485 Computer Aided Landscape Design (3) Computer Aided Design (CAD) related to landscape design and construction. Site planning and construction of related landscape plan view and 3-D drawings. Operating system, use of Autocad and LANDCADD software. Two 3-hour labs. Prereq: 280, 380, Agriculture and Natural Resources 290.

494 Professional Horticultural Communications (3) Communication for public horticulturists through written, oral and visual media. Communication skills using proper writing techniques and grammar for print media, brochure design using desktop publishing, slide show development, oral presentations, and video use for educational and informational presentations in ornamental horticulture. Prereq: Agriculture and Natural Resources 290 and senior standing.

500 Thesis (1-15) P/NP only.

501 Special Topics in Plant Sciences (1-3) Topics to be assigned. May be repeated. Maximum 6 hours. Prereq. Consent of instructor.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

503 Non-Thesis Project (1-2) Library, field, or laboratory project under supervision of faculty member. Not for thesis candidates. May be repeated. Maximum 4 hours.

504 Seminar (1) Presentations and discussion of topics. May be repeated. Maximum 2 hours.

505 Seminar Preparation (1) Application of speaking, writing, and organizational skills in preparation and presentation of scientific material to both scientific and general audiences. Preparation of abstracts for scientific presentations. Required of all entering graduate students during their first year of graduate study. (Same as Environmental and Soil Sciences 501.)

507 Professional Development Seminar (1) Satisfactory/No Credit grading only. (Same as Agriculture and Natural Resources 507; Animal Science 507; Entomology and Plant Pathology 507; Food Science and Technology 507.)

510 Plant Disease Fungi (4) (Same as Entomology and Plant Pathology 510.)

521 Flowering Physiology (1) General phenomenology, photoperiodism, thermoecidalism, interactions of external factors, juvenility, and hormonal regulation. 3 hours weekly for 5 weeks. Prereq: Introductory plant physiology or equivalent.

522 Drought Physiology (1) Biophysical and biochemical aspects of plant water relations and drought physiology. 3 hours weekly for five weeks. Prereq: Introductory Plant Physiology or equivalent.

530 Integrated Pest Management (3) (Same as Entomology and Plant Pathology 530.)

532 Environmental Crop Physiology and Ecology (3) General and specific relations among environmental factors, crop organisms, and agricultural systems. Interrelationships of atmospheric gases in photosynthesis, evapotranspiration and foliar injury. Relationships of temperature stress, vernalization and bud dormancy to crop production. Influences of maturation ripening and senescence on post-harvest quality of fruit, vegetable, grain and forage crops. 2 hours and 1 lab. Prereq: Plant Sciences 431.

536 Ecology of Grazing Land Systems (3) Multi-university, field-oriented course. Components and functions of grazing lands and how these vary in different ecoregions; research needs, objectives and techniques in soil-plant-animal research; forage-livestock ecology and systems in grazing lands (cropland, pastureland, rangeland and forestland); role of forages in conservation practices, wildlife habitats, and sustainable agriculture; and industries involved with forages and livestock. Two-week field trip, inclusive report and examination. Prereq: Consent of instructor.

544 Protein Gel Electrophoresis (1) (Same as Entomology and Plant Pathology 544.)

545 Plant Microtechnique (1) (Same as Entomology and Plant Pathology 545.)

551 Organismal Plant Genetics (3) Discovery of genetics, polyploidy, extrachromosomal inheritance, apomixis, incompatibility systems, mutations, controlling elements, quantitative inheritance and heritability. Prereq: General genetics and 471 or equivalent.

571 Design and Analysis of Biological Research (3) (Same as Animal Science 571.)

592 Internship (1-2) Application of horticulture and design principles and practices in supervised, professional setting, approved by department. Satisfactory/No Credit or letter grade.

593 Problems in Plant Sciences (1-3) Independent study. Current topic related to technology, science or design. May be repeated. Maximum 6 hours.

600 Doctoral Research and Dissertation (3-15) P/NP only.

603 Special Topics in Crop Physiology and Ecology (1-3) Microclimatology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and germplasm in crop production, theory and application of quantitative methods in crop physiology and ecology research. May be repeated. Maximum 6 hours.

605 Special Topics in Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutations, chromosome dynamics, polyploidy, genetic engineering, interspecific hybridization, linkage, screening methods, genome organization. May be repeated. Maximum 6 hours.

633 Plant Metabolism (3) Metabolism of chemical compounds of economic importance in crop production: plant growth regulators, naturally occurring plant metabolites, and herbicides. Prereq: Botany 521 or 522 and organic chemistry or biochemistry.

643 DNA Analysis (2) (Same as Entomology and Plant Pathology 643.)

653 Advanced Plant Breeding (3) Principles and methodologies targeting genetic gain for crop improvement. Concepts of qualitative and quantitative trait improvement. Parental germplasm, hybridization, population formation, inbreeding, genetic variance, heritability, selection methods, molecular genetic markers, genetically engineered crops. Prereq: 571 and general genetics, or equivalent, or consent of instructor.
The graduate program in architecture is relatively new, with its first class entering in 1993. However, the School of Architecture, with its professional Bachelor of Architecture program, celebrated its thirty-fifth birthday in 2000. In addition to the undergraduate and graduate programs in architecture, the college also offers an undergraduate degree in interior design. All professional programs in the college are fully accredited, enabling graduates to pursue licensure throughout the U.S.

The graduate program in architecture is a first professional degree program. It is designed to accommodate students who come from a variety of academic backgrounds and interests. This includes students who have had little or no previous formal study in the field of architecture but have discovered a deep and abiding interest in the subject. The program also accommodates students who have received an architectural education but have not completed the requirements for a professional degree. These students may receive some advanced standing in the program.

In the U.S., most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes two types of degrees: the Bachelor of Architecture and the Master of Architecture. A program may be granted a six-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.

Master’s degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

The University of Tennessee Master of Architecture program received a full six-year accreditation as a result of its last NAAB accreditation review in 2002.

The graduate program in architecture defines architecture broadly as the creation of human habitats. Architecture at Tennessee is more than the design of individual buildings. Rather it is dedicated to the shaping of community in the fullest sense of the word. The curriculum reflects the program’s recognition that architecture is fundamentally shaped by environmental and cultural forces. As such, the humanities, social sciences, arts, and applied sciences are all brought to bear on the discipline of architecture. It is through design that such issues can be thoughtfully explored and given physical form. Thus design plays a central role in this comprehensive and creative process.

As a professional program, the college is committed to help students obtain the requisite knowledge and skills needed to enter and fully participate in the profession of architecture. At the same time, it attempts to maintain a wide vision and critically reach beyond the profession without losing contact with the realities of everyday architectural practice. Designed to be challenging and provocative, the program allows students the opportunity to develop discernment and judgment, enabling them to find their own voices as designers who are accountable contributors to the built environment.

The offices of the graduate program and college administration are located at 224B Art and Architecture Building.
School of ARCHITECTURE

Professors
Davis, M.K., MArch .................................................. Harvard
Kelso, R.M., PhD ..................................................... Loughborough
Kinzy, S.A., PhD ..................................................... Columbia
Moffett, M.S., PhD .................................................. Massachusetts Institute of Technology
Rabun, J.S., PhD ...................................................... York
Robinson, M.A., MArch ........................................... Pennsylvania
Shell, W.S., MSArch ................................................ Pennsylvania
Watson, J.S., MArch ............................................... Columbia

Associate Professors
Thurlow, A., MSArch .............................................. Pennsylvania
Stach, E., Dipl-Ing .................................................... Cornell
DeKay, M., MArch .................................................. Harvard
Debelius, C.A., MArch ............................................. California (Berkeley)
Drisin, A., MDesS .................................................. Stanford
Fox, D., MArch ....................................................... Cranbrook Academy of Art
Moir-McClean, T., MArch ....................................... Michigan
Ambroziak, B., MArch ............................................ Florida
Schimmenti, M., MArch ........................................... Pennsylvania

Assistant Professors
Daddo, G., PhD .......................................................... Pennsylvania
Klinkhammer, B., Dip-Ing ........................................ RWTH (Aachen)
Small, M., MS. Arch. ................................................ Columbia
Stach, E., Dip-Ing .................................................... RWTH (Aachen)
Thurlow, A., MSArch ............................................. Columbia

MAJOR DEGREE
Architecture .......................................................... MArch

MASTER OF ARCHITECTURE PROGRAM
Architecture Major

The School of Architecture offers two tracks leading to the Master of Architecture degree. Track 1 is for students seeking the first-professional degree who already hold a bachelor’s degree or an advanced degree in another field. Track 2 is for students with an accredited first-professional degree who seek to develop an area of specialization. Contact the school for additional information.

ADMISSION

In addition to meeting the Graduate Council’s minimum requirements, the following specific admission requirements to the Master of Architecture program must be met:

- For Track 1 applicants, a bachelor’s degree with a 3.0 GPA from an accredited college or university is required. International applicants must have an equivalent 4-year degree and 3.0 GPA. Candidates with a GPA less than 3.0 may be considered for conditional admission when evidence of exceptional promise is identified. Undergraduate work must include at least twelve semester hours of humanities, a basic understanding of physical principles, systems and analytical procedures and an understanding of mathematical principles and analytical procedures, as well as a general understanding of the use of computers. The school requires an essay and three letters of recommendation. A personal on-site interview is desirable but not mandatory. For those applicants from accredited 4+2 architecture programs, a portfolio is required in addition to the above requirements.

- For Track 2 applicants, a Bachelor of Architecture degree from an NAAB accredited program, or foreign equivalent is required. Candidates with a GPA less than 3.0 may be considered for conditional admission when evidence of exceptional promise is identified. Submission of a portfolio to Architecture to include an essay and three letters of recommendation are also required. A personal on-site interview is desirable but not mandatory.

The general portion of the Graduate Record Examination is required of all applicants. Applicants should take the GRE at least one semester in advance of application for admission.

REQUIREMENTS

- Track 1 requires a minimum of 48 semester hours of undergraduate preparation and 60 semester hours of graduate coursework, taking approximately 3 1/2 years of full-time study. A minimum of 4 hours of architectural electives or approved electives from another discipline must be taken at the 500 level or above.

- Track 2 requires a minimum of 36 semester hours of graduate coursework.

- Both tracks require 6 hours of Thesis 500 with a public presentation and oral defense of the thesis. Retention in the program is contingent upon evidence of satisfactory progress toward the degree. Student’s progress will be reviewed each semester by the Graduate Program Head. Any questions regarding progress will be reviewed by the Graduate Program Advisory Committee.

For further information, contact the School of Architecture.

GRADUATE COURSES

Architecture (133)

403 Introduction to Preservation (3) History, theory, and legal aspects of architectural preservation and restoration.

404 Preservation Technology (3) Techniques of preservation: methods of analysis, history of materials and technology used in old buildings. Prereq: 403.

406 Ideas in Architecture (3) Historical and critical review of major ideas of architecture through the ages. Open to all students.

410 History and Theory of Urban Form (3) Patterns of community development. Selected historical and contemporary examples. Basic urban design issues and exemplary design approaches through lectures, readings, essays, and sketch studies. Historical change in urban form and design.

412 Non-Western and Indigenous Architecture (3) Building responsive to climate, material availability, and economic level, as designed by anonymous builders. Pre-historic times to present throughout world. Fertile Crescent; Indus Valley; Hindu; Buddhist, and Mughal architecture of India, China, and Japan.

415 Medieval Architecture (3) History of architecture from decline of Rome to the beginning of Renaissance.

417 The International Style (3) Survey of architecture of early modern movement, primarily in Europe and America, 1900-1940.

420 History of American Architecture (3) Consideration of architecture and city planning in the United States from the pre-Columbian period until the mid-twentieth century.

425 Special Topics in Architecture (1-6) Faculty initiated courses. Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 12 hours.

432 Computer Applications in Design II (3) Advanced computer-aided design using three-dimensional modeling software. Design analysis using computer animation, rendering techniques, visualization, and video. Prereq: 231 or consent of instructor.
433 Computer Applications in Design III (3) Integration of three-dimensional modeling and technical analysis using computer to augment building design. Independent studies under faculty direction. Prereq: Consent of instructor.

445 Advanced Lighting (3) In-depth analysis and innovative concepts in design of lighting. Prereq: 342.

463 Architectural Development (3) Principles and practice of architect as developer. Impact of economics, finance and urban policy on design and development of real estate. Open to all students.

473 Architectural Photography (3) Photography as design, research, and presentation medium. Application of photographic techniques, printing and processing, Color and black and white.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

503 Modern Architecture: Histories and Theories (3) History and theory of modern architecture: late 19th and 20th centuries through broad-based examinations of question of modernity and specific case studies of buildings, projects, landscapes and theories.

504 Issues in Preservation (3) Architectural issues: preservation, restoration and conservation of historic structures. Prereq: Consent of instructor.

507 Architecture, Culture and Modernity (3) Scope of ideas generated in architecture’s recent history to reveal and explain production and reception of architecture: historical background necessary to understand those concepts. Complements history sequence but in specialized field of theory.

509 Seminar in Architectural Technology (3) Technological aspects influencing building form. Role of technical aspects of structural, environmental and building infrastructure as integrated systems supporting access use and expression of building.

514 Seminar in Ethical Imperatives (3) Social, cultural, philosophical and moral issues which impact professional responsibilities. Attitudes, values, and ideas that address formation of profession’s ethos.

515 Seminar in Issues in Urban Design (3) Investigations of urban forms, patterns, and attitudes that have shaped towns and cities. Prereq: Consent of instructor.

516 Materials and Methods of Construction (3) Properties of interior and exterior building materials and their relation to construction methods and detailing. Theory of materials selection and application and role materials and methods play in design process.

521 Principles of Architectural Form (3) Historical and contemporary architectural theory through investigation of literature and related examples. Theories of understanding and theories of application related to generation of architectural form and space in response to both cultural and environmental focus.

525 Special Topics in Architecture (1-3) Student- or instructor-initiated course. May be repeated. Maximum 9 hours. Satisfactory/No Credit or letter grade.

526 Directed Readings in Architecture (3) Readings on topics of interest: primary texts, history, theory, urban issues, technology and professional practice. Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

528 Topics in Architectural History and Theory (3) Historic topics, ideas, and theories in architecture. Prereq: Consent of instructor.

532 Computer Applications for Architecture (3) Advanced use of computers in architecture. Prereq: Consent of instructor.

551 Research Methods (3) Quantitative and qualitative methods of research in architectural inquiry. Systematic study and application of applied and speculative investigations in field of architectural research. Review and identification of techniques and methodologies and applications for architectural research and scholarship.

553 Advanced Topics in Architectural Technology (3) In-depth investigations and analysis: architectural technology lighting, structure, enclosure, mechanical and other architectural technologies. Prereq: Consent of instructor.

562 Professional Practice (3) Management and organizational theories and practices for delivering professional design services: assessment of building industry and its influence on practice; analysis of basic management functions within professional firms; legal and ethical concerns facing practitioners today; and introduction to special obligations and privileges of design professional.


591 Foreign Study (1-9)

592 Off-Campus Study (1-9)

593 Independent Study (1-9)
College of Arts and Sciences

Stuart Riggsby, Dean
Don Richard Cox, Associate Dean for Academic Programs
Carolyn Hodges, Interim Associate Dean for Personnel Affairs and Affirmative Action
William M. Dunne, Associate Dean for Research and Resource Development

http://www.artsci.utk.edu

Departments
- Anthropology
- Audiology and Speech Pathology
- Biochemistry and Cellular and Molecular Biology
- Botany
- Chemistry
- Classics
- Computer Science
- Earth and Planetary Sciences
- Ecology and Evolutionary Biology
- English
- Geography
- History
- Life Sciences
- Mathematics
- Microbiology
- Modern Foreign Languages and Literatures
- Philosophy
- Physics and Astronomy
- Political Science
- Psychology
- Religious Studies
- Sociology
- Theatre
- Urban and Regional Planning

Schools
- Art
- Music

Facilities for Research and Service
- Center for Applied and Professional Ethics
- Center for Environmental Biotechnology
- Center for Psychoanalysis and the Humanities
- Center for Quaternary Studies of the Southeastern United States
- Center for the Study of War and Society
- Child Behavior Institute
- Forensic Anthropology Center
- Hearing and Speech Center
- Institute for Applied Microbiology
- Institute for Resonance Ionization Spectroscopy
- Joint Institute for Heavy Ion Research
- Psychological Clinic
- Science Alliance
- Social Science Research Institute

The University of Tennessee began as a liberal arts institution. Before the turn of the century, less emphasis was placed on the liberal education. However, the liberal arts continued to thrive, emerging as a college in 1904. Thus, the College of Liberal Arts (now known as the College of Arts and Sciences) is one of the oldest established colleges in the university.

The College of Arts and Sciences consists of a wide array of academic disciplines and interdisciplinary programs. The central purposes of a liberal education include the encouragement of intellectual tolerance, a dedication to the quest for knowledge as a worthwhile goal in and of itself, and the cultivation of a responsible, creative individual mind. These qualities enable one to develop an ability to reason and to express oneself clearly, an incentive to absorb emerging knowledge, and a competence to confront the uncertainties of human experience. Faculty research
and creative activity is the foundation on which education in this college is built. As a result of that endeavor, the lives of students are enriched and the world’s body of knowledge grows.

The College of Arts and Sciences offers programs in twenty-seven academic disciplines leading to nine advanced degrees: Doctor of Audiology, Doctor of Philosophy, Master of Arts, Master of Fine Arts, Master of Mathematics, Master of Music, Master of Public Administration, Master of Science, Master of Science in Planning.

General Information

Foreign Study Courses

Foreign study courses offered in some departments of the college provide an opportunity to undertake independent study outside the United States. Prior to departure the student must have a plan of study approved by the department head and a supervising faculty member of the department concerned. Credit will be given only upon fulfilling all requirements set by the department and may vary from 1-15 hours. The maximum credit that may be applied toward a degree in the college is established in each individual case by the department in which the student is working.

Off-Campus Study

Recognizing that learning is not restricted to formal classroom situations, the college allows students to earn credit toward graduation for approved off-campus study. Such study may be undertaken only with prior approval of the faculty member and the department concerned. It may include certain kinds of work experiences, community involvement, or political campaigns. Credit per semester will vary from 1-15 hours. The maximum credit that may be applied toward a degree in the college is established in each individual case by the department in which the student is working.

Independent Study

Certain educational goals may best be met through independent study by an individual under the direction of a faculty member. Students who wish to do such independent work should obtain the approval of the faculty members and the departments concerned prior to embarking upon their study. Credit per semester will vary from 1-15 hours. The maximum credit which may be applied toward a degree in the college is established in each individual case by the department in which the student is working.

Department of Anthropology

http://web.utk.edu/~anthrop/

Andrew Kramer, Head and Graduate Liaison

Professors

Bass, W.M. (Alumni Distinguished Service Professor), PhD ......................................................... Pennsylvania
Faulkner, C.H. (Distinguished Professor), PhD ................................................................. Indiana
Harrison, F.V., PhD ............................................................................................... Stanford
Howell, B.J., PhD ................................................................................................. Kentucky
Jantz, R.L., PhD ........................................................................................................ Kansas
Klippel, W.E., PhD ......................................................................................................... Missouri
Konigsberg, L., PhD ........................................................................................................ Northwestern
Logan, M.H., PhD ........................................................................................................ Penn State
Schroedl, G.F., PhD ...................................................................................................... Washington State
Simek, J.F. (Distinguished Professor), PhD........................................................................ State University of New York (Binghamton)

Associate Professors

Anderson, D.G., PhD ........................................................................................................... Michigan
Kramer, A., PhD ............................................................................................................. Michigan
Marks, M., PhD ............................................................................................................... Tennessee

Assistant Professor

Qirko, H.N., PhD .................................................................................................................. Tennessee

Research Director

Driskell, B.N., PhD ............................................................................................................. Kentucky

Research Associate Professor:

Chapman, J. (Director, F.H. McClung Museum), PhD .................................................. North Carolina

Research Assistant Professor and Curator

Frankenberg, S., PhD ........................................................................................................ Northwestern

Research Assistant Professors

Ahlman, T.M., PhD ............................................................................................................ Tennessee
Elam, M., PhD ................................................................................................................... Missouri
Herrmann, N.P., PhD ........................................................................................................ Tennessee
Sherwood, S., PhD ............................................................................................................. Tennessee

Lecturer and Coordinator, Forensic Center

Jantz, L.M., PhD ................................................................................................................ Tennessee

Lecturer

McKeown, A.H., PhD ........................................................................................................ Tennessee

Adjunct Faculty

Dunnell, R., PhD ................................................................................................................ Yale

Adjunct Associate Professor

Sullivan, L.P., PhD ........................................................................................................... Wisconsin (Milwaukee)

MAJOR DEGREES

Anthropology .................................................................................................................. MA, PhD

The Department of Anthropology offers both the MA and PhD with a major in anthropology and concentrations in archaeology, biological anthropology, cultural anthropology, and zooarchaeology. A concentration in Mediterranean archaeology is available on the master’s level. Additional information on the anthropology graduate program may be obtained from the departmental brochure or by contacting the department.

MASTER OF ARTS

Anthropology Major

ADMISSION

Students wishing to enter the Master of Arts program with a major in anthropology should have an undergraduate GPA of 3.5 in the major, 3.3 overall, and hold a bachelor’s degree from an accredited university with a major in anthropology. Applicants with a major in a related field (biology, sociology, geology, classics or geography) will be considered only if they have a formal minor in anthropology or its equivalent (at least five upper-division anthropology courses).

In cooperation with the Classics and History Departments, the Department of Anthropology is able to offer a concentration in Mediterranean archaeology. Students who apply in this area should have completed appropriate undergraduate courses in archaeology or anthropology. An anthropology minor is preferred.

All prospective MA students must make formal application to the University of Tennessee, Knoxville, Graduate Admissions. Copies of the application form, transcripts, and GRE scores that
are sent to Graduate Admissions should also be sent directly to the Department of Anthropology at the same time. In addition, the department requires a letter of intent from the applicant indicating career goals and reasons for selecting the University of Tennessee, Knoxville, three letters of recommendation, and one sample of the prospective student’s written work (a class paper or research report); these materials should be sent directly to the Graduate Secretary, Department of Anthropology, South Stadium Hall 250, the University of Tennessee, Knoxville, Tennessee 37996-0720.

Graduate applications are considered once a year by the Graduate Committee. All application materials must be received in the department by January 15 for admission the following fall. Because of the structure of first-year studies, MA students should plan to begin their studies in the fall semester.

REQUIREMENTS

The program leading to the MA is a general curriculum that allows for concentration after completion of a core course sequence. Formal requirements include:

- Selection of an MA advisor. This should be done as soon as possible in the student’s program but must be done no later than the end of the first semester in residence. The department graduate secretary must be informed in writing of each student’s advisor.
- A minimum of 30 credit hours in graduate courses. Twenty-four hours must be in coursework graded A-F. Coursework must include three core classes taken in the first year:
  a. 510 Method and Theory in Cultural Anthropology
  b. 560 Theory in Archaeology
  c. 590 Method and Theory in Biological Anthropology

Additional coursework should be selected in consultation with the student’s advisor and must include one additional course from two anthropology concentrations besides the student’s primary concentration. At least 20 hours of coursework must be at the 500 level or higher. Students concentrating in Mediterranean archaeology, in consultation with their advisor, should select their additional 18 hours from courses offered in the Anthropology, History, or Classics departments.

- During the first year, comprehensive Graduate Evaluation Examinations (GEEs) are required of all MA students and are based on the content of the core courses. These examinations are given during regularly-scheduled final periods in each core class and are graded by all faculty within the appropriate sub discipline for each course. At the end of the first year, all MA students will be evaluated by the entire faculty and will either be retained or dropped from the program based on their first year’s performance and GEE scores.
- All MA students must attend the graduate section of the visiting lecturer program. To insure compliance with this requirement, each student is required to register for one credit hour of Anthropology 550 in the fall semester of each year and fulfill all requirements for the course as defined by the instructor. Materials covered by visiting lecturers may appear on the GEE.

- A graduate-level introductory statistics course, usually Statistics 537.
- In the second year of the program, students pursue their concentration area and undertake thesis research. Coursework will be determined through consultation with the student’s advisor and committee (composed of the advisor and at least one other member of the anthropology faculty along with other mutually-agreed upon members).
- Successful completion of the thesis and final oral examination. Normally, students will complete and defend their theses during the spring semester of their second year.
- Two copies of the thesis are required by the Office of Graduate Student Services. In addition, bound copies of the thesis are to be provided to the department and to all members of the student’s MA committee.

In addition to the requirements listed above, MA students have the option of completing a minor in statistics. The statistics minor requires 9 hours of coursework, normally Statistics 537 and 538 plus one additional course from an approved list.

DOCTOR OF PHILOSOPHY

Anthropology Major

In addition to the Graduate Council requirements, requirements for the PhD with a major in anthropology, in the appropriate sequence of completion, are as follows:

ADMISSION

Admission to the PhD program is contingent upon completion of all requirements prior to that level. Master’s thesis candidates at the University of Tennessee, Knoxville, who are conditionally accepted into the PhD program can enroll as doctoral students the semester following conferral of the MA. Students holding master’s degrees from other institutions must apply by January 15 for admission the following fall and must begin their studies in the fall semester.

Admission to the PhD program is based upon the applicant’s academic record and credentials, but also on fit between an individual’s interest and faculty areas of research. Applicants will not be admitted to the PhD program unless appropriate faculty members are available to chair and serve on the doctoral committee. Doctoral program applicants should communicate directly with the potential chairperson and two additional members of the anthropology faculty who will be asked to serve on the committee.

Applicants to the PhD program should meet the same academic standards as MA program applicants and furnish the same materials (see Admission under Master of Arts). Admission to the program requires either:

- Acceptance of a master’s in anthropology; or
- Acceptance of a master’s in another discipline, with the provision that the student will follow the first-year program with entering MA students, i.e., complete the core courses (510, 560, 590) and pass the Graduate Evaluation Examinations.
REQUIREMENTS

Doctoral Committee

A doctoral committee is appointed following admission to the program. In consultation with this committee, the student defines the future program of studies. When the student and committee have agreed upon the specific fields of specialized competence over which the student will be examined, a brief delineation of the fields by the student, approved by the members of the committee, is presented to the department head and the student’s major professor. As early as possible, but no later than a full semester after admission to candidacy, the student shall formally present a written dissertation proposal to the department head and advisor.

Residence and Coursework

Every potential PhD candidate must complete two consecutive semesters of full-time residence prior to taking the doctoral comprehensive examination. The student must complete the minimum coursework requirements of the Graduate Council, including at least nine hours of 500- or 600-level courses outside of anthropology, chosen in consultation with the doctoral committee, particularly the outside member who represents the cognate area. Outside coursework may be taken in a single discipline or be distributed across two or more disciplines as appropriate to the individual’s program of study.

Statistics

Demonstration of competence in statistics by completing Statistics 537 and 538 with a grade of B or better is required.

Language

Students must demonstrate knowledge of one foreign language. This language should normally be French, German, Russian or Spanish, but another language may be substituted at the committee’s discretion. This requirement may be met by either:

- Successful performance on a language examination administered by the appropriate language department. A student electing this alternative should consult with the advisor; or
- Completion of the second semester of specialized reading courses for graduate students with a grade of B or better.

The department does not accept completion of the intermediate (200 level) sequence of a language as a formal option for fulfilling the language requirement.

Doctoral Comprehensive Examination

Students must successfully complete a written and oral comprehensive exam.

- Comprehensive Written Examination: When the PhD aspirant has completed all of the foregoing requirements and is judged by the committee to be prepared in the field(s) of concentration, the student will be required to take a comprehensive written examination. The exam will consist of three sections and be given by the student’s committee. All three sections must be taken within seven consecutive days.

- Comprehensive Oral Examination: This examination follows shortly after successful completion of the comprehensive written exam. The major professor acts as chairperson of the committee.

Admission to Candidacy

Upon successful completion of the comprehensive exam and with the formal approval of the Dean of Graduate Studies, the student is admitted to candidacy for the PhD degree. The formal dissertation prospectus must be filed no later than one full semester after advancement to candidacy.

Dissertation Research

This period of research and writing will be under the direct guidance of the candidate’s major professor. The major professor will act as chairperson of the candidate’s committee. The candidate must earn a minimum of 24 hours in Anthropology 600 and maintain continuous registration until the dissertation is accepted. The option of presenting publishable papers as a dissertation is not a formal option for the Anthropology Department.

Defense of Dissertation Examination

When the dissertation has been tentatively accepted by the committee, a final oral examination will be held. The committee conducts the exam, which is ordinarily held as a colloquium in which the candidate will expound on the nature and significance of his/her contribution to anthropological knowledge as set forth in the dissertation.

GRADUATE COURSES

Anthropology (122)

410 Principles of Cultural Anthropology (3) Exploration and illustration of major concepts, theories, and methods in cultural anthropology, with application to analysis of specific ethnographies. Prereq: 130.

411 Linguistic Anthropology (3) Basic linguistic concepts applied to research in cultural anthropology; investigation of relationships between language and culture. Prereq: 130 or Linguistics 200. (Same as Linguistics 411.)

412 Folklore in Anthropology (3) Introduction to anthropological study of folklore, using folklore and folk life materials from various tribal, peasant, and complex societies. Prereq: 130 or consent of instructor.

413 Dynamics of Culture (3) Major forms of culture change, ranging from evolution and diffusion to religious revitalization and political revolt. Continuity and change in diverse cultural settings through use of archaeological, ethnohistoric, and contemporary cases. Prereq: 130 or consent of instructor.

414 Political Anthropology (3) Organization and dynamics of power and politics in both stateless and state-level societies. Role of symbols, rituals, and ideologies in producing and reproducing power relations. Relationship between actors (individuals) and structures. Encapsulation of traditional political forms and systems within modern states. Prereq: 130 or consent of instructor.

416 Applied Anthropology (3) Introduction to principles, practice and ethics of anthropology applied to practical problems in non-academic settings. Overview of career opportunities in various domains of applied anthropology. Prereq: 130 or consent of instructor.

431 Ethnographic Research (3) Conceptual and practical exploration of methods and techniques cultural anthropologists use in fieldwork. Prereq: 130 or consent of instructor.

435 Historical Archaeology Laboratory (3) Laboratory procedures for processing, identification, and interpretation of artifacts from historical sites. Artifactual material from historic East Tennessee sites used for class projects. Recommended prereq: 361.

436 Cities and Sanctuaries of the Greek and Roman World (3) (Same as Classics 436.)

440 Cultural Ecology (3) Concepts and methods in studying dynamic interaction between prehistoric and present day cultures and their environments; ecological theory, methods of analysis, and review of selected case studies. Prereq: 120, 130, 410, or consent of instructor.
COLLEGE OF ARTS AND SCIENCES

442 Intensive Survey of the Archaeology of the Prehistoric Aegean (3) (Same as Classics 442.)

443 Intensive Survey of the Archaeology of Greece (3) (Same as Classics 443.)

444 Intensive Survey of the Archaeology of Etruria and Rome (3) (Same as Classics 444.)

462 Early European Prehistory (3) Origins and evolution of human culture in Europe through beginnings of settled life. Paleolithic and Mesolithic chronology and lifeways. Prereq: 120 or consent of instructor.

463 Rise of Complex Civilizations (3) Development of complex societies in Old World from origins of agricultural economies to rise of States. Mesolithic, Neolithic, and Metal Age Lifeways in Africa, Europe, and Asia. Prereq: 120 or consent of instructor.

464 Principles of Zooarchaeology (3) Basic osteological studies of major vertebrate groups; aboriginal use of animals in subsistence and culture. Identification and interpretation of archaeologically derived molluscan and vertebrate remains; introduction to laboratory use of comparative collections. Prereq: 120 or consent of instructor.

465 Urban Anthropology (3) Field archaeology and interpretation of archaeological remains on historic urban sites in U.S. Lectures and field and laboratory research on urban sites in East Tennessee. Recommended prereq: 361.

480 Human Osteology (4) Intensive examination of human skeleton. Prereq: 110 or consent of instructor. 3 hours and 1 lab.

481 Museology I: Museums, Purpose and Function (3) (Same as Art 481.)

482 Museology II: Exhibition Planning and Installation (3) (Same as Art 482.)

484 Museology III: Field Projects (1-12) (Same as Art 484.)


494 Primate Behavior (3) Social organization and behavior of selected primates: group composition, size, and structure; patterns of mating; other social interactions; communication; and cultural behavior. Application of primate studies to human ethology. Prereq: 110 or consent of instructor.

500 Thesis (1-15) P/NP only.

501 Graduate Research (1-9) Independent investigation of special problems in anthropology. May be repeated. Maximum 18 hours.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

510 Method and Theory in Cultural Anthropology (3) Development of primary theoretical orientations by cultural anthropologists; formulation of research problems and methods of collecting, organizing, and utilizing data. Prereq: Consent of instructor.

511 Special Topics in Cultural Anthropology (3) Seminars for advanced students on topics of special interest: ethnomedicine, psychological anthropology, comparative social organization, religion, and art. Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

512 Urban Studies in Anthropology (3) Process of urbanization examined cross-culturally; theory and method in researching urban communities; urban problems and applied anthropology.

514 Anthropology of Development (3) Application of anthropological theory and methods, and findings to community and national development programs. Analysis of anthropologists’ roles, values, and ethical issues in selected case studies. Survey of anthropologists’ work in non-academic settings.

515 Medical Anthropology (3) Cultural impact on disease patterning, theories of disease causation, and models of therapy. Theoretical and applied aspects of the anthropological study of health and disease. Prereq: Consent of instructor.

517 Forms of Social Inequality (3) Anthropological perspectives on societies stratified along lines of rank, caste, race, ethnicity, and class; inequalities engendered by sex role structure. Construction of social distinctions before and after rise and consolidation of modern world system. Intersections of race and ethnicity with class and gender.

520 Seminar in Zooarchaeology (3) Approaches to analysis and interpretation of archaeological fauna. Intensive reading; evaluation and discussion of major faunal studies, guides to identification, methods of presenting faunal data. May be repeated. Maximum 6 hours.

521 Laboratory Studies in Zooarchaeology (4) Examination and comparison of skeletons of major vertebrate groups, shells of terrestrial and aquatic mollusks, in relation to animal remains from archaeological contexts. Basic osteology and shell characters of species encountered in aboriginal sites; use of comparative collections. May be repeated. Maximum 8 hours.

522 Seminar in Archaeology (3) Theoretical and practical issues in contemporary archaeology: ethnoarchaeology, paleoethnobotany, taphonomy, ceramic analysis, agricultural origins, and regional archaeological cultures. May be repeated. Maximum 9 hours.

530 Fieldwork in Archaeology (3-9) Practicum in surveying, excavating, processing, and analysis of archaeological data. Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

550 Contemporary Issues in Anthropology (1-3) Review of recent directions in method and theory in anthropology. May be repeated. Maximum 6 hours.

560 Theory in Archaeology (3) Detailed consideration of theory in contemporary archaeology: models of scientific explanation, research design, archaeological formation processes, and methods of analysis and interpretation.

561 Archaeological Resource Management (3) Federal legislation and regulations affecting identification, protection, and management of archaeological resources. Professional ethics and responsibilities and relationship of federal and state agencies, public interest groups, and professional archaeologists in conduct of federally sponsored archaeology. May be repeated. Maximum 6 hours.

562 Special Topics in Mediterranean Archaeology (3) (Same as Classics 562.)

563 Lithic Artifact Analysis (3) Methods for analyzing prehistoric stone tools in practical laboratory/lecture format. Stone tool production, use, stylistic variability, and discard processes.

564 Archaeology of Southeastern United States (3) Archaeological research on prehistoric American Indian cultures in Southeastern United States; Tennessee prehistory.

565 Graduate Seminar in Ancient Mediterranean Civilization (3) (Same as Classics 565.)

580 Advanced Human Variation (3) Genetic and morphological variation among extant human groups; relationships of variation to geography, ecology and subsistence.


582 Paleoanthropology (4) Fossil record from origin of hominids to appearance of anatomically modern humans. Functional morphology and phylogenetic relationships of fossil humans. Prereq: 480.

583 Skeletal Biology (3) Practical and theoretical approaches to analysis of prehistoric human skeletal remains. Demography, vital statistics, pathology, nutrition, and measures of biological relationships as related to population as adaptive unit. Prereq: 480.

585 Laboratory Studies in Biological Anthropology (3) Topical coverage of laboratory methods in biological anthropology. Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

590 Method and Theory in Biological Anthropology (3) Current methods of analysis in biological anthropology and of past and current history of theoretical perspectives. Paleoanthropology, human osteology, and human variation and population structure. Prereq: Consent of instructor.

591 Foreign Study (1-15) See College of Arts and Sciences.

592 Off-Campus Study (1-15) See College of Arts and Sciences.

593 Independent Study (1-15) See College of Arts and Sciences.

600 Doctoral Research and Dissertation (3-15) P/NP only.

601 Advanced Graduate Research (1-6) Independent investigation of special problems in anthropology by advanced graduate students. May be repeated. Maximum 12 hours. Only 3 hours may count toward 600-level requirement.

611 Advanced Seminar in Cultural Anthropology (3) Critical evaluation of current issues in theory and data interpretation. May be repeated. Maximum 6 hours.

660 Advanced Seminar in Archaeology (3) Selected topics in prehistoric and historic archaeology. May be repeated. Maximum 6 hours.

690 Selected Topics in Physical Anthropology (3) For doctoral students in biological anthropology. May be repeated. Maximum 6 hours.

691 Selected Topics in Paleoanthropology (3) May be repeated. Maximum 6 hours.

695 Gross Human Anatomy (9) Skeleton, muscles, and cardiovascular system. Dissection of cadavers. 5 hours and 5 labs. Prereq: 480 or Human Biology.
School of ART

http://web.utk.edu/~art

Paul Lee, Director
Beauvais Lyons, Graduate Liaison

Professors
Blain, S. J., MFA ..................................................... Wisconsin
Brauk, M., MFA ...................................................... Yale
Goldenstein, M.B., MFA .......................................... Nebraska
Habel, D.M., PhD .................................................. Michigan
Lee, B., MFA .......................................................... Yale
Lee, P., MFA .......................................................... Cranbrook Academy of Art
Leland, W.E., MFA ................................................ Tennessee
Lyons, B., MFA ...................................................... Arizona State
Magen, N., PhD ..................................................... Case Western Reserve
Moffett, F.C., PhD .................................................... Chicago
Riesing, T.J., MFA ................................................... Nebraska
Staples, C., MFA ..................................................... Michigan State
Stewar, F.C., MFA .................................................... Claremont
Wilson, D., MFA .................................................... Wisconsin
Yates, S.A., MFA ..................................................... North Carolina (Greensboro)

Associate Professors
Broden, S., MFA .................................................... New York State College of Ceramics at Alfred
Brown, J., MFA ....................................................... Rhode Island School of Design
Dey, W., PhD ........................................................ Indiana
Lough, W., MFA ...................................................... Temple
Lowe, S., MGD ....................................................... North Carolina State
Martin, F., MFA ...................................................... Cranbrook
Odem, J., MFA ...................................................... Florida State
Shmerer, D., MFA ................................................... Virginia Commonwealth
Wright, S., PhD ...................................................... Stanford

MAJOR DEGREE
Art ................................................................. MFA

The Master of Fine Arts is the terminal degree in studio art. It is offered in the concentration areas of ceramics, graphic design, drawing, media arts, painting, printmaking, and sculpture.

MASTER OF FINE ARTS
Art Major

ADMISSION
To become a candidate, the applicant must be admitted by the Office of Graduate Admissions and approved by the School of Art. In addition to the minimum admission requirements, the School of Art specifically requires the following:
- A detailed letter of intent including statement requesting assistantship, if desired.
- Three letters of recommendation from former professors or professionals in the field.
- An undergraduate major in art or evidence of equivalent proficiency.
- A portfolio to be evaluated by the faculty.

Further information is available by writing to the School of Art.

REQUIREMENTS
A minimum of 60 hours to include:
- Successful completion of 20 hours of studio in a concentration area. An inter-area program must be approved by the graduate faculty only after the second semester in residence. Ten hours of concentration must be in second year courses (512, 514, etc.).
- A minimum of 9 hours of graduate level academic (non-studio) courses of which at least 6 hours are to be in art history.
- Eleven hours of electives which may consist of any combination of courses offered by the university for graduate credit.
- Art 599, Project in Lieu of Thesis (20 hours). A third year of semi-independent study. Student must have completed all other coursework prior to registration.

Four semesters (normally the first 40 hours) beyond the bachelor’s degree are required in residence. An exception is made for working professional designers who may complete their first 20 hours, with the permission of the faculty, on a part-time basis. Residence is defined by the School of Art as (1) a minimum enrollment of six hours per semester and (2) use of School of Art facilities so that students are available for discussion and criticism.

The candidate’s committee will consist of a minimum of 3 members and a maximum of six members and will be appointed prior to registration for 599. The committee must consist of one faculty member from the candidate’s concentration area (designated as chairperson) and a faculty member from outside the concentration area. The inclusion of an art history faculty member on each committee is encouraged.

Exhibition and oral examination: With the completion of all requirements for the MFA, the student must produce an exhibition and, in the presence of that work, must satisfactorily complete an oral examination.

ACADEMIC STANDARDS
- First-year evaluation: At the end of the first two semesters in residence, the student must present a portfolio for evaluation by the faculty and receive permission to continue in the program.
- Second-year evaluation: With completion of all coursework, the student must present work for evaluation by the faculty and receive permission to register for Projects in Lieu of Thesis.
- If, in a review by the student’s major area faculty, the student’s progress is deemed insufficient, the faculty may recommend a work period without advancement toward the degree, probation with specific goals set for a specific time, or dismissal.

Art History Minor
A graduate minor in art history may be arranged during the student’s first semester of study with the consent of the student’s area instructors and the art history faculty. Students must complete a minimum of 12 hours in art history that is agreed upon by the art history faculty after review of previous undergraduate
coursework. A reading knowledge of French, German, or Italian is a prerequisite, unless waived by the art history faculty. Gradu-
ate Council policy stipulates that a member from the minor unit
must serve on the thesis committee.

**GRADUATE COURSES**

**Art (140)**

400 Special Topics (2-4) Student- or instructor-initiated course offered at convenience of department. May be repeated.

410 Drawing (2-4) Intermediate to advanced. May be repeated.

420 Ceramics (2-4) Intermediate to advanced. May be repeated.

430 Photography (2-4) Intermediate to advanced. May be repeated.

440 Painting (2-4) Intermediate to advanced. May be repeated.

450 Metal Design (2-4) Intermediate to advanced. May be repeated.

460 Fiber (2-4) Intermediate to advanced. May be repeated.

470 Fabric (2-4) Intermediate to advanced. May be repeated.

480 Enameling (2-4) Intermediate to advanced. May be repeated.

481 Museology I: Museums, Purpose and Function (3) Development of museums of art, history, natural and applied science. (Same as Anthropology 481.)

482 Museology II: Exhibition Planning and Installation (3) Exhibition concept development and implementation. Exhibition design and installation techniques. Publicity, production, matting and framing, shipping and storage. Prereq: 481 or consent of instructor. (Same as Anthropology 482.)

484 Museology III: Field Projects (1-12) Special field projects: restoration, preservation, registration, and other related research on or off campus. Prereq: 481 and 482, and consent of instructor. May be repeated. Maximum 12 hours. (Same as Anthropology 484.)

490 Wood (2-4) Intermediate to advanced. May be repeated.

499 Special Topics (3) Student- or instructor-initiated course offered at convenience of department. May be repeated. Maximum 12 hours.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

507 Professional Practices: Teaching Internship (1) Individual study in development of skills and methodology in teaching studio courses. For students who are not GTAs. Prereq: Consent of instructor. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

591 Foreign Study (1-15) See College of Arts and Sciences.

592 Off-Campus Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hours.

**Art Ceramics (135)**


429 Ceramics: Special Topics (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hours.

521 Graduate Ceramics I (2-5) May be repeated. Maximum 10 hours.

525 Graduate Ceramics II (2-5) May be repeated. Maximum 10 hours.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hours.

599 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by graduate faculty. May be repeated. Maximum 20 hours. Satisfactory/No Credit grading only.

**Art Design/Graphic (136)**

405 Computer Enhanced Graphic Design (3) Exploration of new technologies and their significance to graphic design. Prereq: 351, 356 with a grade of C or better and consent of instructor. May be repeated. Maximum 12 hours.

451 Advanced Graphic Design (3) Theory and techniques of visual problem-solving as applied to advanced applications of graphic design. Prereq: 352 with a grade of C or better.

452 Graphic Design Seminar (3) Discussion of design and professional issues: politics, economics, and ethics for graphic designer. Culminates in student-initiated project. Prereq: 451 with a grade of C or better.

453 Advertising Illustration (3) Media and techniques as applied to advertising illustration. Prereq: 254 and successful completion of any portfolio review.

454 Editorial Illustration (3) Media and techniques as applied to editorial illustration for books, magazines, and newspapers. Prereq: 254 and successful completion of any portfolio review.

456 Graphic Design Practicum (1-12) Practical work experience in graphic design field. Only by prearrangement with department. Prereq: Consent of instructor. May be repeated. Maximum 12 hours.

459 Special Topics in Graphic Design (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hours.

550 Studies in Graphic Design/Illustration History (3) Design and illustration ca. 1850 to present. Prereq: MFA candidate or consent of department. May be repeated. Maximum 6 hours.

551 Graphic Design I (2-6) May be repeated. Maximum 10 hours.

552 Graphic Design II (2-6) May be repeated. Maximum 10 hours.

553 Computer Enhanced Design (2-6) Prereq: Consent of instructor. May be repeated. Maximum 10 hours.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hours.

599 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by graduate faculty. May be repeated. Maximum 20 hours. Satisfactory/No Credit grading only.

**Art Drawing (137)**

419 Special Topics in Drawing and Painting (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hours.

511 Graduate Drawing I (2-6) May be repeated. Maximum 10 hours.

512 Graduate Drawing II (2-6) May be repeated. Maximum 10 hours.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hours.

599 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by graduate faculty. May be repeated. Maximum 20 hours. Satisfactory/No Credit grading only.

**Art History (139)**

403 History of Photography (3) Survey of history of photography from introduction of daguerreotype and calotype to more recent trends. Aesthetics and use of photography as medium for artistic expression.

411 Art of South and Southeast Asia (3) Survey of art and architecture of Indian subcontinent and Southeast Asia from 2000 B.C. to 20th century. Major achievements of each period in religious, political, and social contexts.
415 Art of China (3) Survey of art and architecture of China from Neolithic period to 20th century. Major achievements of each period in religious, political, and social contexts.

416 Chinese Art of the 20th and 21st Centuries (3) Survey of Chinese art from the late nineteenth century through the present. Hong Kong, Taiwanese, and expatriate artists are also considered.

419 Art of Japan (3) Survey of art and architecture of Japan from Neolithic period to 20th century. Major achievements of each period in religious, political, and social contexts.

425 Early Christian and Byzantine Art to 1350 (3) Art in Italy and the Eastern Empire from the beginnings of Christian art to c. 1350. Mosaic, painting, sculpture and architecture. Writing-emphasis course. (Same as Judaic Studies 425.)

431 Medieval Art of the West, 800-1400 (3) Western European art of the “Dark Ages,” Romanesque, and Gothic periods. Writing-emphasis course. (Same as Judaic Studies 431.)

441 Northern European Painting, 1350-1600 (3) From courtly art of late Middle Ages to Northern Renaissance. Jan van Eyck, Roger van der Weyden, and Durer; early printmakers. Writing-emphasis course.

442 Art of Northern Europe, 1600-1675 (3) Concentrated study of Bruegel, Rubens, Rembrandt, Georges de la Tour, Vermeer, Poussin, and Hals. Writing-emphasis course.


453 Art of Southern Europe, 1575-1700 (3) Concentrated study of Caravaggio, Bernini, and Italian Baroque developments in all media. Spanish Baroque painting and sculpture: Velázquez. Writing-emphasis course.

454 Renaissance and Baroque Theory (3) Theory of Western art in early modern period: development and evolution in European Art during Renaissance and Baroque periods. Prereq: 172, 173, or consent of instructor.

461 Art of Southern and Eastern Africa (3) Art traditions of eastern and southern regions of Africa. Sculpture, painting, pottery, textiles, architecture and human adornment. Some ancient Stone and Iron Age traditions. Diverse ethnic and regional art traditions practiced in the area from 19th century to present. (Same as African and African-American Studies 461.)

462 Art and Archeology of Ancient Africa (3) Historical art traditions of sub-Saharan Africa. Prehistoric rock paintings: art from archaeological sites and ancient kingdoms. First and second millennia B.C. for early terracotta sculpture and rock paintings, 11th through 19th centuries A.D. for later ancient kingdoms. (Same as African and African-American Studies 462.)

463 Arts of the African Diaspora (3) Aesthetic, philosophical and religious patterns of African descendants of Brazil, Surinam, Caribbean and United States. Full range of art forms: sculptural and performance traditions, architecture, textile, basketry and pottery art forms. (Same as African and African-American Studies 463.)

471 History of North American Art (3) Landmarks in painting, architecture, sculpture, and design from prehistory to 1900.

472 History of 20th-Century American Art (3) Developments in architecture, painting, and design from 1900.

473 19th-Century American Painting (3) From West and Copley to emergence of “The Eight.”

474 Theory of 20th-Century Art in Europe and America (3) Theoretical basis for modern movement. Analysis and discussion of individual works of art in light of contemporary writings by artists and theorists. Prereq: 172, 173, or consent of instructor.


476 History of 20th-Century Painting and Sculpture in Europe (3) Development of Modern and Post-Modern movements in Europe. Investigation of progression of abstraction through more recent conceptual trends. Analysis of work of individual artists such as Picasso, Matisse, and others.

479 Special Topics in Art History (3) Student- or instructor-initiated course offered at convenience of department. May be repeated. Maximum 12 hours.

483 History of American Sculpture (3) American sculpture from prehistory to 1900s.


489 Studies in Art History (3) Concentration in individually selected area. Prereq: Consent of instructor. May be repeated. Maximum 6 hours.

571 Studies in Medieval Art (3) Art and architecture of Middle Ages: major monuments from Byzantium or western Europe. Prereq: MFA candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hours.

572 Studies in Italian Renaissance Art (3) Art and architecture of 14th, 15th, and/or 16th centuries in Italy. Early or High Renaissance or Mannerist periods. Prereq: MFA candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hours.

573 Studies in Baroque Art (3) 17th-century art and architecture: major artists and works from southern or northern Europe. Prereq: MFA candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hours.

574 Studies in Modern Western Art (3) Selected topics in 19th- and 20th-century western art. Prereq: MFA candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hours.

575 Studies in Modern American Art (3) Selected topics in 19th- and 20th-century American art. Prereq: MFA candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hours.

576 Studies in Asian Art (3) Selected topics in Japanese or Chinese Art. Prereq: MFA candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hours.

579 Special Topics in Art History (3) Student- or instructor-initiated course offered at convenience of department. Prereq: MFA candidate or consent of instructor. May be repeated with consent of department. Maximum 9 hours.

Art Media Arts (134)


433 History of Film and Modern Art (3) Study of development and interaction between cinematic arts and visual arts within context of modern art history. Available for Art History credit. (Same as Cinema Studies 433.)

435 Cinematography as Art (3) Continued development of concepts and techniques for creation of film as art form: individual projects. Prereq: 235, 330, or consent of instructor. May be repeated. Maximum 9 hours.

436 Video Art (3) Continued development of concepts and techniques for creation of video works as art form: individual projects. Prereq: 236, 330, or consent of instructor. May be repeated. Maximum 9 hours.

439 Special Topics in Media Arts (3) Student- or instructor-initiated course offered at convenience of department. May be repeated. Maximum 12 hours.

441 Digital Photography II (4) Continuation of exploration and implications of use of computer in photography. Prereq: 330, 341, and consent of instructor.

442 Large Format Photography II (4) Studio course that continues exploration of use of large format camera in photography. Prereq: 330, 342, and consent of instructor.

531 Photography I (2-6) May be repeated. Maximum 10 hours.

532 Photography II (2-6) May be repeated. Maximum 10 hours.

535 Media Arts I (2-6) May be repeated. Maximum 10 hours.

536 Media Arts II (2-6) May be repeated. Maximum 10 hours.

577 Studies in Media as Art (3) Selected topics in theory and history of media as art form. May be repeated. Maximum 9 hours.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (3) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 12 hours.

599 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by graduate faculty. May be repeated. Maximum 20 hours. Satisfactory/No Credit grading only.

Art Painting (138)

413 Painting IV (6) Advanced painting, individual concepts and personal expression with varied media. Prereq: 315. May be repeated. Maximum 12 hours.

419 Special Topics in Drawing and Painting (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hours.

513 Graduate Painting I (2-6) May be repeated. Maximum 10 hours.

514 Graduate Painting II (2-6) May be repeated. Maximum 10 hours.

515 Graduate Watercolor I (2-6) May be repeated. Maximum 10 hours.

516 Graduate Watercolor II (2-6) May be repeated. Maximum 10 hours.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hours.

599 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by graduate faculty. May be repeated. Maximum 20 hours. Satisfactory/No Credit grading only.

Art Printmaking (132)

461 Advanced Print Workshop (1-6) Individual and collaborative studio work encompassing theory and practice in intaglio, lithography, relief printing, screenprinting, monoprint, papernaking, book arts and/or photo-print processes. Prereq: 361 or consent of instructor. May be repeated. Maximum 12 hours.

469 Special Topics in Printmaking (3-6) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hours.

561 Printmaking I (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods and monoprint. May be repeated. Maximum 10 hours.

562 Printmaking II (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods and monoprint. Prereq: 561.

563 Printmaking III (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods and monoprint. Prereq: 561, 562.

564 Printmaking IV (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods and monoprint. Prereq: 561, 562, 563.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hours.

599 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by graduate faculty. May be repeated. Maximum 20 hours. Satisfactory/No Credit grading only.

Art Sculpture (143)

441 Advanced Sculpture (3-6) Individual development of sculptural problems and techniques. Students work independently while participating in group projects, critique, and discussion. Prereq: 6 hours of 300 level sculpture. May be repeated. Maximum 12 hours.

449 Special Topics in Sculpture (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Successful completion of any portfolio review. May be repeated. Maximum 12 hours.

541 Graduate Sculpture I (2-6) May be repeated. Maximum 10 hours.

542 Graduate Sculpture II (2-6) May be repeated. Maximum 10 hours.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hours.

599 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by graduate faculty. May be repeated. Maximum 20 hours. Satisfactory/No Credit grading only.

Department of AUDIOLOGY AND SPEECH PATHOLOGY

http://web.utk.edu/~aspweb/

Ilsa Schwarz, Head

Professors

Asp, C., PhD ..................................................... Ohio State
Nabokov, A., PhD ......................................... Polish Academy of Sciences
Schwarz, I., PhD ............................................. Oregon

Associate Professors

Burchfield, S., PhD .......................................... Michigan State
Hedrick, M., PhD ........................................... Vanderbilt
Swanson, L., PhD ............................................ Purdue
Thelein, J., PhD ................................................ Iowa

Assistant Professors

Erickson, M.L., PhD ........................................ Southern California
Flipsen, P., PhD ............................................... Wisconsin
Harkrider, A., PhD ......................................... Texas
Horton-Ikard, R., PhD ....................................... Wisconsin
Munoz, M., PhD ............................................. Texas
Plyer, P., PhD .................................................. Tennessee
Von Hapsburg, D., PhD .................................... Texas

Instructor

Singletary, T., MS ........................................... Colorado State

Adjunct Faculty

Handel, S., PhD ............................................... Johns Hopkins
Lipscomb, D., PhD ........................................... Washington

Clinical Director

Michael, A., PhD ............................................. Vanderbilt

Clinical Faculty

Barnes, V., MA .................................................... Tennessee
Beejer, J., MA .................................................... Tennessee
Buehler, V., MA ................................................ Tennessee
Donels, E., MA .................................................. Tennessee
Dungan, J., MA ................................................ Tennessee
Hume, S., PhD .................................................. Tennessee
Jenkins, K., MA ................................................ Tennessee
Lewis, D., MA .................................................. Tennessee
Pack, J., MA ...................................................... Tennessee
Pearson, E., MA ................................................ Tennessee
Plyer, E., AuD ................................................. Arizona School of Health Sciences
Schay, N., MA ..................................................... Tennessee
Sevrafs, M., MA ................................................ Tennessee
Sheridan, C., MA ................................................ Tennessee
Sindetly, T., MS .................................................. Colorado State
Thomason, T., MA ........................................... Tennessee
Thurman, S., MA .............................................. Tennessee
Valentine, D., MA ............................................. Tennessee
Vaughn, T., MS ............................................... Eastern Kentucky
Ward, T., MS .................................................... East Tennessee State
Webb, P., MEd .................................................. Florida
Yeager, K., BS ................................................. South Alabama

MAJORS DEGREES

Speech Pathology ............................................ MA
Audiology ...................................................... AuD
Speech and Hearing Science .............................. PhD

MASTER OF ARTS

Speech Pathology Major

Admission to this graduate program is competitive. This graduate program is accredited by the Council on Academic Accreditation of the American Speech-Language-Hearing Association.
**REQUIREMENTS**

The master’s program in speech pathology is a two-year program and consists of the completion of 42 semester hours of academic content courses (including thesis) plus practicum. A minimum of three academic courses must be completed during all semesters (terms) except one. That is, students must take a minimum of nine semester hours of academic courses for at least four semesters or terms and six semester hours in the other semester or term.

The required courses are 506, 511, 518, 526, 539 or 541, 561, 582, and at least two seminars from the following courses: 522, 523, 531, 626, or 661 and at least 15 hours of elective courses. Undergraduate coursework may not be substituted for seminar courses. Students who have not completed an undergraduate course in each of the following three areas--speech sound disorders, voice disorders, and fluency disorders--must complete one graduate course in each of the three areas.

Students majoring in speech pathology may elect either the thesis or non-thesis option. The master’s program in speech pathology with thesis includes six hours of 500 credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. Students in the non-thesis option must pass a final written examination.

**Aural Habilitation Concentration**

Graduate students in both audiology and speech pathology may elect to pursue a concentration in the area of aural habilitation. Admission to the program is competitive and applications are available on the departmental website. The aural habilitation concentration requires:

- Three semesters of clinical practicum in treatment of children who have hearing impairments totaling a minimum of 130 clock hours,
- Completion of 6 semester hours of graduate course work in language, audiology and/or aural habilitation in elective requirements for the MA or AuD.

Specific requirements are outlined in the MA and AuD Graduate Handbooks as well as on the departmental website.

**DOCTOR OF AUDIOLOGY**

**Audiology Major**

The Doctor of Audiology (AuD) program is designed to prepare individuals for professional careers in audiology. The degree program is clinically oriented, with primary emphasis on processes involved in hearing, vestibular function, and communication. The program is designed to meet the entry-level requirements for the practice of audiology established by the Council on Academic Accreditation of the American Speech-Language-Hearing Association. Students will be expected to demonstrate competencies in the following areas:

- Prerequisite knowledge and skills for the practice of audiology.
- Foundations of practice for audiology.
- Prevention and identification of auditory, vestibular, and related communication disorders.
- Evaluation of auditory, vestibular, and related communication disorders.
- Treatment of auditory, vestibular, and related communication disorders.

The program will normally consist of four calendar years of study beyond the baccalaureate degree with the first three years being devoted primarily to formal coursework, and the last year to a full-time externship in the practice of clinical audiology.

**REQUIREMENTS**

The program is a minimum of 112 semester hours, including a minimum of:

- 67 semester hours of academic coursework at the 500- and 600-levels.
- 3 semester hours of directed research in audiology, vestibular, or related communication disorders.
- 24 semester hours of clinical practice in audiology.
- 18 semester hours of externship in audiology.
- A qualifying examination.
- A comprehensive examination.

**Aural Habilitation Concentration (see preceding section)**

**DOCTOR OF PHILOSOPHY**

**Speech and Hearing Science Major**

The PhD program in with a major in speech and hearing science seeks to develop individuals for professional careers in a variety of positions including research and college teaching in the concentration areas of speech and language pathology, audiology, speech-language science or hearing science. The degree program is research oriented with primary emphasis on processes involved in normal, or disordered speech, language and hearing. Students will be expected to demonstrate their knowledge in areas related to the concentrated field of study. These areas include:

- Basic speech, hearing, or language processes.
- Basic speech, hearing, or language disorders or differences.
- Related disciplines providing insight into human communication processes.
- Technical skills in instrumentation and experimental design which enable the student to investigate problems pertaining to speech and hearing processes.

**REQUIREMENTS**

The doctoral program requires successful completion of course work, research projects, a comprehensive examination and dissertation. The total program includes a minimum of 60 semester hours with a minimum of:

- 6 semester hours in a research tool
- 6 semester hours in a cognate field outside the department
- 24 semester hours in the major area of study (6 credits must be at the 600 level within the department). These will include:
  a. a minimum of 6 semester hours on the topic of major interest
  b. a minimum of 6 semester hours earned through participation in two different research projects
  c. 3 semester hours of ASP 611 (Experimental Design) course (or equivalent)
522 Seminar in Speech Sound Disorders (3) Current research in diagnosis and management of speech sound disorders. Prereq: 435 or equivalent or consent of instructor.

523 Seminar in Voice Disorders (3) Current research in diagnosis and management of voice disorders. Multicultural, gender and age-related issues. Prereq: 440 or consent of instructor.

526 Dysphagia (3) Clinical diagnosis, evaluation, and treatment of adult swallowing disorders and critical interpretation of research literature on dysphagia. Prereq: 506 or consent of instructor.

531 Seminar on Stuttering (3) Current significant research in stuttering. Prereq: 431 or consent of instructor.

533-534 Advanced Clinical Practice in Speech-Language Pathology (1-4, 1-4) Prereq: 434 or equivalent and consent of instructor. 534 may be repeated. Maximum 6 hours. Enrollment for less than 2 hours must have prior departmental approval.

535 Advanced Clinical Practice in Speech-Language Pathology: Off-Campus Sites (1-4) Prereq: 100 hours clinical experience, consent of instructor. May be repeated. Maximum 6 hours. Enrollment for less than 2 semester hours must have prior departmental approval.

538 Advanced Clinical Practice in Speech-Language Pathology: Public Schools (1-4) May be repeated. Maximum 6 hours. Enrollment for less than 2 hours must have prior departmental approval.


541 Pediatric Oromotor Disorders (3) Evaluation, diagnosis, and treatment of pediatric oromotor disabilities that affect normal acquisition of feeding and pre-speech skills. Prereq: 506 or consent of instructor.

542 Hearing Disorders (3) Effects of heredity, development/aging, diseases, and physical agents on hearing. Prereq: 473 or equivalent or consent of instructor.

543 Amplification Technology (3) Description of hearing aid circuits, components and performance characteristics, Electroacoustical and real-ear analysis of hearing aids. Coupler material and geometry effects. Practical experience in troubleshooting, repair, and construction of hearing aids. Prereq: 473, 507 or equivalents or consent of instructor.


545 Sound Measurement Techniques and Hearing Conservation (3) Techniques of measurement and analysis of sound: hearing conservation in schools and industry. Prereq: Consent of instructor.

546 Audiology Assessment (3) Theoretical bases for behavioral audiometry and acoustic immittance measurement.

547 Special Problems in Audiology (1-3) Prereq: 473 or equivalent and consent of instructor. May be repeated. Maximum 6 hours.

552 Seminar in Speech Pathology (2-3) Current significant research in speech pathology. Topics vary. Prereq: 9 hours in speech pathology. May be repeated with consent of department. Maximum 9 hours.

555 Special Problems in Speech-Language Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hours.

556 Independent Study in Speech-Language Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hours.

558 Phonological Disorders (3) Current theories and approaches to assessment and intervention for individuals with difficulty acquiring or using speech sound system of English. Prereq: 435 or equivalent or consent of instructor.

561 Child Language Disorders (3) Current literature on assessment and intervention techniques for young language learners. Prereq: 461 or equivalent or consent of instructor.

563 Language Disorders: Birth to Three (3) Overview of family-focused, transdisciplinary intervention process. Assessment/treatment of infants, toddlers, and preschoolers. Description of disabilities and resulting communication disorder. Prereq: 461 or equivalent or consent of instructor.

574 Pediatric Audiology (3) Theoretical and practical considerations in evaluation and treatment of hearing loss in infants and children. Audiological intervention in case management of hearing impaired child: amplification, educational alternatives, and state and federal guidelines.
576 Physiologic Assessment of the Auditory System I (3) Otocoustic emissions, electrocochleography, and auditory brainstem responses. Anatomical origins, principles, and applications. Use of these responses in evaluation of auditory function and determination of site-of-lesion. Prereq: 507, 546 or equivalents, or consent of instructor.

577 Vestibular Disorders (3) Anatomy, physiology, and pathophysiology of vestibular system and other systems that contribute to balance. Practicum in electronystagmography. Prereq: 507, 542, 546, 576 or equivalents or consent of instructor.

581 Assessment of Central Auditory Processing (3) Overview of current central auditory processing disorder (CAPD) literature and assessment procedures, with emphasis on a holistic view by combining perceptual, electrophysiological, linguistic, and cognitive measurements. Prereq: 546, 574, 594 or equivalents or consent of instructor.

582 Speech and Language Services in School (3) Organization and implementation of speech and language programs in schools.

583 Physiologic Assessment of the Auditory System II (3) Middle-latency, long-latency, and event-related potentials. Neurophysiological mechanisms, principles, and applications. Use of these potentials in evaluation of neurological and cognitive function. Prereq: 576 or equivalent or consent of instructor.

584 Amplification for Children with Hearing-Impairment (3) Study of strategies for selecting and fitting amplification systems for children; outcome measures and service coordination. Prereq: 543, 544, 574 or equivalents or consent of instructor.

585 Cochlear Implants (3) Overview of cochlear implants, focusing on theory of auditory stimulation and cochlear implant systems; candidacy, surgical preparation, and follow-up/outcome measures; the rehabilitation process; and cochlear implant case presentations. Prereq: 507, 576, 583 or equivalents or consent of instructor.

586 Standards and Practice Issues in Audiology (3) Overview of professional practice standards, ethics, medical/legal issues, business practices, and reimbursement procedures in audiology. Prereq: 512 or equivalent or consent of instructor.

591 Foreign Study (1-15) See College of Arts and Sciences.

592 Off-Campus Study (1-15) See College of Arts and Sciences.

593 Independent Study (1-15) See College of Arts and Sciences.

594 Advanced Aural Habilitation/Rehabilitation of the Hearing-Impaired (3) Study of grieving process, counseling, group and individual amplification systems, classroom/speech acoustics, central auditory problems, therapy methods for rehabilitation and speech reading, school-based programs, programs for adults and the elderly; student research reports/case studies. Prereq: 473, 494 or equivalents or consent of instructor.

595 The Verbotonal System: Auditory/Speech Perception (3) Innovative theory; therapy procedures, and S UVAG amplification/filters for diagnosis/evaluation/remediation of spoken language/listening skills of hearing-impaired children/adults: use of rhythms, movements and suprasegmentals; special audiometric tests, acoustic filters, correcting misarticulations through optimal listening; central auditory treatment; second (foreign) language through listening/spoken language; relationship of concepts to conventional concepts/practice; student research reports. Prereq: 305, 473, 494 or equivalents or consent of instructor.

600 Doctoral Research and Dissertation (3-15) P/NP only.

601 Experimental Phonetics (3) Acoustical and perceptual analyses of speech production and overall oral communication. Prereq: 517 or consent of instructor.

602 Psychoacoustics (3) Auditory perception and reception of nonspeech and speech stimuli. Prereq: 507 or equivalent or consent of instructor.

604 Genetics & Pharmacology of Hearing (3) Study of genetics, pharmacology, and general cellular processes as they relate to hearing. Prereq: 507 or equivalent or consent of instructor.

605 Speech Perception and Hearing Impairment (3) Study of perception of nonspeech and speech stimuli, with particular emphasis on the effects of hearing impairment on perception.


609 Seminar in Speech Science (3) Experimental areas: speech physiology, acoustic analysis, recognition, perception and intelligibility of speech, communication theory, and psycholinguistic measurement of speech and language. Topics vary. Prereq: 601 or consent of instructor. May be repeated. Maximum 6 hours.

611 Experimental Design in Speech and Hearing (3) Analysis of experimental design in theses and related journals. Generation of experimental designs. Prereq: Consent of instructor.

613 Externship in Audiology (1-9) Off-campus clinical training experience. Prereq: Consent of academic advisor. May be repeated. Maximum 36 hours.

626 Advanced Seminar in Neurologically-based Communication Disorders (3) Topics vary. Prereq: 520, 539, 524 or consent of instructor. May be repeated. Maximum 6 hours.

650 Advanced Seminar in Audiology (3-6) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

652 Advanced Seminar in Speech and Language (2) Topics vary: aberrations of voice, articulation, speaking time and rhythm, language development or use, and language symbolization. Prereq: Consent of instructor. May be repeated. Maximum 8 hours.

655 Practicum in College Teaching (1-3) Supervised experience in college teaching. Prereq: Consent of instructor. May be repeated. Maximum 6 hours. Satisfactory/No Credit grading only.

656 Directed Research (1-4) Participation in ongoing or non-dissertational research. Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

657 Directed Study in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

658 Directed Study in Audiology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

659 Directed Study in Speech Science (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

660 Directed Study in Hearing Science (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hours.

661 Advanced Seminar: Language Disorders in Children (3) Topics vary. Prereq: 561 or consent of instructor. May be repeated. Maximum 6 hours.

662 Seminar in Audiologic Assessment (3) Synthesis of information on audiologic and vestibular assessment and application of clinical cases. Prereq: 542, 546, 574, 576, and 577, or equivalents or consent of instructor.

663 Seminar in Aural Rehabilitation (3) Synthesis of information on audiologic habilitation and rehabilitation cases. Prereq: 543, 544, 584, 594, or equivalents or consent of instructor.

Department of BIOCHEMISTRY AND CELLULAR AND MOLECULAR BIOLOGY

http://web.bio.utk.edu/bcmb/

Bruce D. McKee, Head and Graduate Liaison

Professors

Ganguly, R., PhD .......................................................... Nebraska
Handel, M.A., PhD .......................................................... Kansas State
Howell, E., PhD ............................................................ Lehigh
Joy, D. (Distinguished Scientist), PhD .......................... Oxford (UK)
Kennedy, J., PhD .......................................................... Iowa
Koontz, J., PhD ............................................................ Kentucky
MacCabe, J., PhD ......................................................... California (Davis)
McKee, B., PhD ............................................................ Michigan State
Peterson, C., PhD .......................................................... Louisiana State
Roberts, D., PhD .......................................................... California (Davis)
Serpersu, E., PhD .......................................................... Hackett

Associate Professors

Bruce, B., PhD ........................................................... California (Berkeley)
Hall, J., PhD ................................................................. Illinois
Prosser, R., PhD ............................................................ Illinois

Assistant Professors

Dealwis, C., PhD .......................................................... London
Fernandez, E., PhD ....................................................... Loyola
Guo, H., PhD .............................................................. Harvard
Jain, N., PhD ................................................................. Brandeis
Labrador, M., PhD ....................................................... Madrid (Spain)
Park, J., PhD ................................................................. Texas
Venkatasah, S., PhD ...................................................... Ohio State
ADMISSION

Applicants for graduate study are expected to have a background equivalent to that required of undergraduate majors in this department. This includes a knowledge of the basic principles of biochemistry, cell biology, genetics and physiology. Requirements for admission are:

- One year of general biology or the equivalent
- A minimum of 8 semester hours of approved biology courses beyond the introductory level and including the subject areas of genetics, cell biology and physiology
- Two years of chemistry including one year of general chemistry and one year of Introductory Organic Chemistry with laboratory
- At least one semester of biochemistry
- One year of calculus
- One year of physics
- Graduate Record Examination scores
- A minimum grade point average of 3.0 out of 4.0

Otherwise superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the department’s Graduate Recruiting Committee.

MAJOR DEGREES

Biochemistry and Cellular and Molecular Biology ................. MS, PhD

DOCTOR OF PHILOSOPHY

Biochemistry And Cellular And Molecular Biology Major

REQUIREMENTS

- Biochemistry and Cellular and Molecular Biology 511-512, 515-516, and 517.
- At least two additional approved graduate courses in the life sciences or chemistry, or physics, or other physical science to be determined upon consultation with the mentor and the dissertation committee. No survey courses will be accepted.
- At least 6 hours of topics offered in 615 or its equivalent.
- Participation in 601 and 603 during the entire period of residence. Participation in at least one journal club chosen from among 605-608 for six semesters.
- Comprehensive examination, taken before the end of the third year of study.
- A dissertation reporting the results of original and significant research carried out during the term of candidacy.
- A final oral examination which will be concerned primarily with the student’s dissertation.

PETITIONING FOR MASTER’S DEGREE

Students who have passed the comprehensive examination in the PhD program and have completed at least 30 hours of approved coursework for graduate credit, at least two-thirds of which must be at or above the 500 level, may petition the department for award of a master’s degree. The additional requirements for such a degree are:

- The preparation of a research manuscript suitable for submission for publication in a major scientific journal and oral defense of that manuscript before an examining committee of three faculty members appointed by the head of the department, at least two of whom shall be members of the department; or
- Publication of at least one full-length paper in a major scientific journal as senior author.

GRADUATE COURSES

Biochemistry and Cellular and Molecular Biology (188)

401-402 Biochemistry-Molecular Biology I, II (4,4) 401 — Amino acid structure and chemistry, protein structure and chemistry, protein folding, enzyme behavior and function, reaction mechanisms, catabolism and energy transfer, synthetic metabolism including photosynthesis, and protein transport. 402 — Structure of DNA and RNA, experimental methods of analyzing nucleic acids, mechanisms of RNA and protein synthesis, mechanisms of DNA replication, repair and recombination, chromosome structure and function, regulation of gene expression, genome structure and genomics, and mechanisms of biological regulation. Prereq: Biology 240, Chemistry 350, 360, 369.


410 Cellular and Comparative Biochemistry (4) Electolyte behavior, chemistry and structure of proteins; enzyme behavior and biological function; catabolism and energy capture; synthetic metabolism; nucleic acid function; protein synthesis, and biochemical genetics; regulation of biological processes. May not be counted if credit received for 401. 3 hours and 1 discussion. Prereq: Chemistry 350, 360, 369; Biology 140, 240.

421 Cell and Tissue Structure and Function (4) Study of animal cells and tissues at light and electron microscope levels. 2 hours and 2 labs. Prereq: Biology 140.

429 Cell Biology Laboratory (3) Series of open-ended, discovery-based exercises developed to design and test new drugs using modern cell biology and computer technologies. Experimental modules: techniques used in cell isolation, purification, culturing, fluorescence microscopy, receptor binding and signal transduction, apoptosis, cell cycle analysis, protein and steroid secretion, computer modeling, and state-of-the-art electron microscopy. Experiment design, execution, data analysis, and peer evaluation. Prereq/Coreq: 401 or 410.


465 Human Genetics (3) Genetic and molecular principles and problems of human inheritance. Prereq: Biology 240.

471-481 Biophysical Chemistry (3,3) Physicochemical principles with applications to biological systems. 471—Thermodynamics; chemical equilibrium; solution chemistry; transport; electrochemistry; kinetics; enzyme catalyzed reactions. 481—Elementary quantum chemistry; interactions of light with biological molecules; optical and magnetic spectroscopy; light scattering; case studies of selected macromolecules. Prereq: Chemistry 350, 360; Mathematics 125; General Biology or consent of instructor. (Same as Chemistry 471-481.)

480 Physiology of Exercise (3) (Same as Exercise Science 480.)

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

511 Advanced Protein Chemistry and Cellular Biology (3) Cellular structure and function at molecular and supramolecular level in progression: protein structure and function; membrane structure and function; bioenergetics and membrane proteins. Prereq: Prior knowledge of cell biology and biochemistry and/or consent of instructor.

512 Advanced Molecular Biology (3) Regulation of nucleic acid expression and protein activity. Nucleic acid structure and function; replication and repair of nucleic acids; gene expression; protein synthesis; post-translational protein modification; mitosis and meiosis; cell cycle and cell growth. Prereq: 511 or consent of instructor.

513 Advanced Protein Biochemistry and Cell Biology II (3) Advanced topics of cellular function and regulation of cell division and growth, and structure and function of supramolecular structures: cytoskeleton and cell junctions and adhesions. Prereq: 511.

515 Experimental Techniques I (4) Modern experimental methodology and instrumentation lab. cell growth; spectrophotometry; microscopy; nucleic acid purification and analysis; enzyme assays; enzyme purification; electrophysiology; computer analysis of nucleic acid and protein sequences. Lecture on theory of laboratory to accompany two lab periods per week. Primarily for departmental graduate students. Prereq: Consent of instructor.

516 Experimental Techniques II (3) Laboratory rotations. Students work in laboratory of faculty member on clearly defined project. Written proposal and oral report. Primarily for departmental graduate students. Prereq: 515. Satisfactory/No Credit grading only.

517 Physical Biochemistry (3) Physics and chemistry of biological systems and molecules. Thermodynamics; diffusion and transport; physical chemistry of macromolecules; enzyme kinetics; binding reactions; spectroscopy; electrophysiology. Prereq: 511 or consent of instructor.

520 Special Topics (1-3) Selected directed readings or special course in topics of current interest. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 6 hours. Satisfactory/No Credit grading only.

525 Graduate Research Participation (3-12) Tutorial laboratory experience. May be repeated. Maximum 12 hours.

530 Experimental Design and Analysis (2) Development of skills in strategies of experimental design and interpretation of experimental results. Critical discussion of research articles illustrating issues in experimental design. Preparation of grant proposal in standard format to be read and discussed by class and by panel of faculty expert in area of proposal. Prereq: Consent of instructors.

550 Advanced Concepts in Neurobiology/Physiology (3) Concepts related to neurobiology/physiology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Prereq: Consent of instructor. May be repeated.

552 Physiology of Hormones (3) Cellular and organismal action of hormones in invertebrate and vertebrate animals. 2 hours and 1 lab. Prereq: Consent of instructor. Recommended prereq: 410.

560 Advanced Concepts in Structural Biology/Biochemistry (3) Concepts related to structural biology/biochemistry with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Prereq: Consent of instructor. May be repeated.

561 Environmental Toxicology (3) (Same as Ecology and Evolutionary Biology 561.)

562 Introduction to Electron Microscopy - Transmission Electron Microscope (4) Practical application to techniques for preparation of biological samples for viewing in transmission electron microscopy. Use of microscope and ancillary equipment, darkroom techniques, preparation of materials for publication and special project. Two 3 hour labs. Admission limited only to departmentally approved graduate students. (Same as Botany 510.)

564 Introduction to Electron Microscopy-Scanning Electron Microscope (3) Practical introduction to techniques of electron microscopy and to scanning electron microscope. Use of microscope, introduction to darkroom techniques and digital image processing, preparation of samples for observation, and special project. 2 hours and 1 lab. Prereq: Consent of instructor.

570 Advanced Concepts in Cellular Molecular Biology (3) Concepts related to cellular/molecular biology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Prereq: Consent of instructor. May be repeated.

580 Advanced Concepts in Genetics/Developmental Biology (3) Concepts related to genetics/developmental biology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Prereq: Consent of instructor. May be repeated.

591 Foreign Study (1-15) See College of Arts and Sciences

592 Off-Campus Study (1-15) See College of Arts and Sciences

593 Independent Study (1-15) See College of Arts and Sciences

600 Doctoral Research and Dissertation (3-15) P/NP only.

601 Departmental Seminar (1) Invited speakers. Topics posted in advance. Required every semester in residence. Satisfactory/No Credit grading only.

603 Graduate Research Colloquium (1) Seminars and lectures dealing with current advances in fields of biochemical and biophysical methods. Mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell biology, neurobiology, and related topics. Required every semester in residence. Satisfactory/No Credit grading only.

605 Journal Club in Neurophysiology/Physiology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hours. Satisfactory/No Credit grading only.

606 Journal Club in Structural Biology/Biochemistry (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hours. Satisfactory/No Credit grading only.

607 Journal Club in Cellular/Molecular Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hours. Satisfactory/No Credit grading only.

608 Journal Club in Genetics/Developmental Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hours. Satisfactory/No Credit grading only.

610 Current Topics in Biochemistry, Cellular, and Molecular Biology (1-3) Critical reviews of research problems and methods in biochemistry, cell biology and/or molecular biology. Oral presentations, written reports, computer simulations by faculty and students. Prereq: Consent of instructor. May be repeated. Maximum 4 hours.

612 Advanced Topics in Environmental Toxicology (1-3) (Same as Ecology and Evolutionary Biology 612.)

615 Special Topics in Biochemistry, Cellular, and Molecular Biology (3) Biochemical and biophysical methods, mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell ultrastructure and physiology, neurobiology, and related topics. Prereq: 511, 512 or consent of instructor. May be repeated. Maximum 9 hours.
Department of  
BOTANY  
http://fp.bio.utk.edu/botany  
Edward E. Schilling, Head and Graduate Liaison  

Professors  
Hickok, L., PhD  .................................................. Massachusetts  
Hughes, K., PhD  .................................................. Utah  
Mullin, B., PhD  .................................................. North Carolina State  
Petersen R. (Distinguished Professor), PhD  ............................................. Columbia  
Pigliucci, M., PhD  .................................................. Connecticut  
Schilling, E., PhD  .................................................. Indiana  
Schwarz, O., PhD  .................................................. North Carolina State  

Associate Professors  
Smith, D., PhD  .................................................. Tennessee  
von Arnim, A., PhD  .................................................. East Anglia (UK)  
Wofford, B.E. (Curator of Herbarium), PhD  ............................................. Tennessee  

Assistant Professors  
Nebenführ, A., PhD  .................................................. Oregon State  
Small, R., PhD  .................................................. Iowa State  
Williams, J., PhD  .................................................. Georgia  

Lecturer  
McFarland, K., PhD  .................................................. Tennessee  

MAJOR  
Botany .......................................................... MS, PhD  

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with a major in botany and concentrations in anatomy, bryology, cytology, cytogenetics, ecology, genetics, lichenology, molecular biology, morphology, mycology, photobiology, physiology, phycology, pteridology, and systematics.

Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

For further information, contact the department head or the graduate coordinator.

ADMISSION  
The Botany Department requires scores from the general portion of the Graduate Record Examination, at least three letters of recommendation or standard recommendation forms from academic or professional persons, a short statement describing reasons for interest in graduate education in botany, and the following academic requirements:

- Bachelor’s degree: a BA or BS from an accredited college or university and a cumulative grade point average of 2.5 or better (on a 4.0 scale), with evidence of ability to do work of graduate quality
- General botany or general biology: 8 semester hours
- Advanced botany or closely allied biological sciences: 12 semester hours
- Physical sciences: general inorganic chemistry: 8 semester hours; organic chemistry: 8 semester hours. Physics highly recommended
- College mathematics: 6 semester hours including 1 term of calculus

Evidence of a broad undergraduate background, an ability to do work of graduate quality, and an interest in the study of plant science are considered to be much more important than the particular courses taken as an undergraduate. Accordingly, students lacking specific prerequisite courses but otherwise qualified may be admitted to graduate studies in botany. In such cases, the deficiencies should be removed as soon as possible, typically during the first year of the student’s graduate program. The determination of deficiencies and the manner in which they will be removed will be decided upon by the student’s pro-temp committee during the first meeting with the student.

MASTER OF SCIENCE  
Botany Major  
The program for the Master of Science is patterned to fit the needs of students who desire a less extensive course of study than the PhD program. However, the applicant must be equally well prepared and display an aptitude and ability for advanced study. The MS includes thesis and non-thesis options.

REQUIREMENTS  

Thesis Option  
The thesis program is the usual route taken by botany students for the MS. It is important that the entering student promptly identify a major professor and a suitable research project. The requirements for the thesis option consist of the following:

- Satisfactory preparation of a written formulation and an oral defense to the student’s committee of a research proposal suitable for a thesis. This must be completed before enrollment in Botany 500.
- Successful completion of 30 hours of graduate credit, at least two-thirds of which must be at the 500 level or higher.
- Satisfactory completion of two hours at the 600 level.
- Preparation of a written thesis and its oral defense.
- Presentation of a 30 minute departmental seminar.
- Educational service in the form of teaching and/or ancillary services; consult major professor and department head.

Non-Thesis Option  

- Satisfactory completion of 34 semester hours of approved graduate courses of which 30 semester hours must be in botany including Botany 503. At least two-thirds of the hours must be at the 500 level or higher.
- Satisfactory completion of two hours at the 600 level.
- Educational service in the form of teaching and/or ancillary services; consult major professor and department head.
- Satisfactory performance on a final written examination on all work offered for the degree. The student’s committee may also require that an oral examination follow the written examination.

The listed requirements for the MS should be interpreted as minimal requirements. Specific stipulations or requirements such as additional foreign languages or an additional oral comprehensive examination may be required by the student’s faculty committee.
DOCTOR OF PHILOSOPHY
Botany Major

The Doctor of Philosophy program is patterned to provide training that involves extensive independent research within the student’s area of concentration. Although there is no formal program of coursework, the student’s committee may require specific courses for the completion of the degree. Most students spend from three to five years working on their PhD.

REQUIREMENTS

- Satisfactory presentation of a research problem by means of a written proposal and an oral defense to the student’s committee. This must be completed before enrollment in Botany 600.
- Satisfactory performance on a written comprehensive examination.
- Presentation of one or more cognate areas outside of the department totaling 6 hours of graduate credit with at least a B average.
- Satisfactory completion of 6 hours at the 600 level (excluding dissertation).
- Preparation of a written dissertation and its oral defense.
- Presentation of a departmental seminar near the end of the doctoral program.

The listed requirements for the PhD should be interpreted as minimal requirements. Specific stipulations or requirements such as additional foreign languages or an additional oral comprehensive examination may be required by the student’s faculty committee.

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 Economics for program description.

GRADUATE COURSES

Botany (198)

401 Field Studies in Botany (1-3) Field experience and taxonomy of special plant groups. Topics vary: bryology, lichenology, pteridology, agrostology, mycology, phycology, aquatic vascular plants, synantherology, woody plants, and botanical photography. May be repeated under different topic. Maximum 9 hours.


412 Plant Anatomy (3) Cells, tissues and organs: development in vegetative and reproductive structures of vascular plants—seed plants. Prereq: Biology 110-120 or 130-140 or equivalent.

419 Science as Method (3) (Same as Ecology and Evolutionary Biology 419; Philosophy 419.)

431 Plant Ecology (4) Interactions between individuals, species, communities and their environments. Circulation of energy and matter in ecosystems. Weekly field trips or laboratory periods, and at least two weekend field trips. Prereq: 330 or equivalent. (Same as Ecology and Evolutionary Biology 431.)

451 Plant Tissue Culture (3) (Same as Entomology and Plant Pathology 451; Plant Sciences 451.)

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

503 Non-Thesis Research (2) Library, field, or laboratory research under supervision of staff member. Not for thesis candidates. May be repeated. Maximum 4 hours.

507 Biological Illustration (3) Principles and applications of photography (B/W and Color) photomacro- and photomicrography, drawing, graphics and video for recording and presentation for research and publication of data in pictorial and graphic form.

510 Introduction to Electron Microscopy—Transmission Electron Microscopy (4) (Same as Biochemistry and Cellular and Molecular Biology 562.)


530 Advanced Taxonomy of Flowering Plants (3) Evolution and classification of families of angiosperms, local flora. 2 hours and 1 lab. Prereq: 330 or equivalent.

531-532 Special Problems in Botany (1-4, 1-4) May be repeated. Maximum 12 hours.

544 Seminar in Botany (1) Readings and discussions of current literature and/or selected topics in botanical research. May be repeated. Maximum 8 hours. Satisfactory/No Credit grading only.

585 Methods and Instrumentation in Field Investigation (1) Appropriate methods and instrumentation. Topics vary. May be repeated with consent of instructor. Maximum 5 hours. Satisfactory/No Credit grading only.

599 Advanced Evolutionary Ecology (3) Advanced concepts in evolutionary and ecological genetics. Biogeography, climate, population genetics, evolution and natural selection, population growth and regulation, competition, niche, experimental ecology, predation, phylogenetics in ecology, biodiversity and conservation. Prereq: General Biology and General Ecology; one or more courses on organismal biology (ecology, evolution) at the upper undergraduate level or consent of instructor. Students cannot receive credit for both 499 and 599. (Same as Ecology and Evolutionary Biology 599.)

600 Doctoral Research and Dissertation (3-15) P/NP only.

606-607 Advanced Topics in Botanical Sciences (1-3, 1-3) Experimental botanical science: nomenclature, morphology and systematics of vascular plants, cryptogamic botany, cytology and cell biology, genetics, plant physiology, palynology and ecology. May be repeated. Maximum 12 hours.

662 Seminar in the History of Botany (2) History of botanical exploration and advances from early civilized to modern periods. May be repeated. Maximum 4 hours.

Department of CHEMISTRY

http://www.chem.utk.edu

Craig E. Barnes, Interim Head
Charles S. Feigleir, Graduate Liaison

Professors

Adcock, J.L., PhD ................................................................. Texas
Baker, D.C., PhD ............................................................. Ohio State
Barnes, C.E., PhD ............................................................. Stanford
Bartmess, J.E., PhD .......................................................... Northwestern
Compton, R.N., PhD .......................................................... Tennessee
Cook, K.D., PhD .............................................................. Wisconsin
Dunning, Jr., T.H., (Distinguished Scientist, Science Alliance Center of Excellence), PhD .................. California Institute of Technology Feigleir, C.S., PhD .......................................................... Colorado
Guiochon, G.A. (Distinguished Scientist, Science Alliance Center of Excellence), PhD .................. Université de Paris (France)
Kabalka, G.W. (Robert H. Cole Professor, Alumni Distinguished Service Professor), PhD ........................................Purdue
Kovac, J.D., PhD .................................................................Yale
Larese, J.Z., PhD .................................................................Wesleyan
Magid, I.J., PhD .................................................................Tennessee
Magid, R.M., PhD .................................................................Yale
Mays, J.W. (Distinguished Scientist, Science Alliance Center of Excellence), PhD ........................................Akron
Pagini, R.M., PhD ...............................................................Wisconsin
Schweitzer G.K. (Alumni Distinguished Service Professor), PhD .................................................................Illinois
Sepaniak, M.J., PhD .............................................................Iowa State
Williams, T.F. (Alumni Distinguished Service Professor), PhD .................................................................London (UK)
Woods, III, C., PhD ...............................................................North Carolina State
Wunderlich, B. (Distinguished Scientist), PhD ..................Northwestern
Xue, Z., PhD ..................................................................UCLA

**Associate Professors**

Dadmun, M.D., PhD ..........................................................Massachusetts
Gilman, S.D., PhD ...............................................................Penn State
Hinde, R.J., PhD .................................................................Chicago
Musfeldt, J.L., PhD ..............................................................Florida
Schell, F.M., PhD ...............................................................Indiana

**Assistant Professors**

Turner, J.F.C., PhD ............................................................Oxford (UK)
Young, D.G.J., PhD ..........................................................Ohio State
Zhang, X., PhD .................................................................Pennsylvania
Zhao, B., PhD .................................................................Akron

### MAJOR DEGREES

Chemistry .................................................................. MS, PhD

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**REQUIREMENTS**

The requirements for the MS with a major in chemistry consist of the satisfactory completion of:

1. Research and a thesis to give 6 to 12 hours of graduate credit in Chemistry 500.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar. (No more than 2 hours may be applied to the course requirements.)
3. Prescribed courses based on performance on diagnostic examinations.
4. Sufficient graduate course work in chemistry (at the 400 level or above) and/or a related field to make an overall total of 30 hours, including one of the following sequences: 510-511-512, three of 530-531-532-533, 550-551-552, 570-572-573 and 590-594-595. At least 14 hours of this graduate coursework must be at the 500 level or above.
5. A final oral examination.

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**DOCTOR OF PHILOSOPHY**

**Chemistry Major**

### CONCENTRATIONS

The department offers concentrations in eight areas for the PhD with a major in chemistry: analytical chemistry, chemical physics (in cooperation with the Department of Physics), environmental chemistry, inorganic chemistry, organic chemistry, physical chemistry, polymer chemistry, and theoretical chemistry.

### REQUIREMENTS

The requirements for the PhD in chemistry (except for the chemical physics concentration) consist of the satisfactory completion of:

1. Research and a dissertation to give at least 24 hours of graduate credit in Chemistry 600. Registration must be continuous from the beginning of research.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar.
3. Prescribed courses based on performance on diagnostic examinations.
4. Completion of the comprehensive examination series and defense of an original research proposal to give 2 hours of credit in Chemistry 601.
5. Eighteen additional hours in courses at the 500 level or above including at least one course above 601 and one of the following sequences: 510-511-512, 530-531-532-533, 550-551-552-553-554, 570-571-572-573 and 590-594-595.
6. A final oral examination.

The PhD program with a concentration in chemical physics is conducted jointly with the Department of Physics. Requirements depend on the choice of the major department. Chemistry departmental requirements include passing the above degree requirements in chemistry with concentration in physical chemistry.

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**MASTER OF SCIENCE**

**Chemistry Major**

### CONCENTRATIONS

The department offers concentrations in six areas for the MS: analytical chemistry, environmental chemistry, inorganic chemistry, organic chemistry, polymer chemistry, and physical chemistry.
chemistry plus six additional hours in physics at the 500 level or above. Three of the additional physics hours can be used to satisfy the 18 hours requirement in item 5.

**GRADUATE COURSES**

**Chemistry (235)**


471-481 *Biophysical Chemistry (3,3) (Same as Biochemistry and Cellular and Molecular Biology 471-481.)*

473-483 *Physical Chemistry (3, 3) Students may not receive credit for both 471 and 473 nor for both 481 and 483. 473 - Properties of gases; first, second and third laws of thermodynamics; chemical equilibria; simple phase equilibria; properties of solutions. 483 - Introduction to statistical thermodynamics; kinetics of chemical reactions; introduction to quantum mechanics and applications to electronic structure of atoms and molecules; molecular spectroscopy. Prereq: 130 or 138; Physics 136 or 138 or 222 or 231; and Mathematics 241, 247.

479-489 *Physical Chemistry Laboratory (2,2) Experiments on topics discussed in 471-481 or 473-483. 1 lab. Prereq/Coreq: Corresponding courses 471 or 473 for 479 and 481 or 483 for 489.*

500 *Thesis (1-15) P/NP only.*

501 *Chemistry Seminar (1) Lectures and discussion on current research. May be repeated. Continuous registration required for resident graduate students. Satisfactory/No Credit grading only.*

502 *Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.*

505 *Special Problems (3) Specially assigned theoretical or experimental work on problems not covered in other courses. Prereq: Consent of department. May be repeated. Maximum 6 hours Satisfactory/No Credit grading only.*

510 *Analytical Spectrometry (3) Principles and practice of optical and mass spectrometric techniques in quantitative chemical analysis. Required background: Two semesters of physical chemistry.*

511 *Analytical Separations (3) Principles and practice of chemical separations based on extraction, chromatographic, and electrophoretic phenomena. Required background: Two semesters of physical chemistry.*

512 *Electroanalytical Chemistry (3) Fundamentals of electrode processes; principles and practice of electroanalytical techniques in quantitative chemical analysis and applied to study of chemical systems. Required background: Two semesters of physical chemistry.*

530 *Chemical Bonding (3) Wave mechanical atom, group theory, quantum approach to molecular orbital theory, covalent, ionic, and metallic bonding, ligand field theories, solid state. Required background: One semester of inorganic chemistry.*

531 *Characteristics of Inorganic Compounds (3) Descriptive chemistry of elements; structure, reactions, kinetics, mechanisms, equilibria, and spectra of coordination, organometallic, bioinorganic compounds. Required background: One semester of inorganic chemistry.*

532 *Experimental Methods of Inorganic Chemistry (3) Electronic, infrared, Raman, microwave, NMR, ESR, nuclear quadrupole, Mossbauer, mass, and photoelectron spectroscopies for characterization of inorganic compounds. Required background: One semester of inorganic chemistry.*

533 *Chemistry of the Transition Metals (3) Theoretical and experimental foundations of modern coordination, organometallic, and bio-inorganic chemistry of transition metals; transition metal mediated catalysis, materials chemistry, isolobal theory, kinetics and mechanism of reactions of transition metals, and applications in organic synthesis. Required background: One semester of inorganic chemistry.*

550 *Structure and Reactivity in Organic Chemistry (3) Structure and bonding in organic compounds; molecular orbital theory, stereochemistry, conformational analysis, and molecular mechanics; substituent effects on acidity and reactivity; introduction to reaction mechanisms. Required background: Two semesters of organic chemistry.*


552 *Organic Reaction Mechanisms (3) Techniques and principles in study of organic reaction mechanisms; applications and interpretations in polar, radical, and pericyclic reactions; reactive intermediates. Prereq: 550.*


554 *Organic Spectroscopy Laboratory (1) Use of IR, UV, MS and multinuclear FTNMR spectrometers. Development of problem-solving ability in area of spectroscopic characterization of organic molecules. Prereq: 360 or equivalent. Coreq: 553.*

570 *Quantum Chemistry and Spectroscopy (3) Basic principles of quantum mechanics and their applications to molecular orbital theory, molecular structure, and spectroscopy; introduction to group theory. Required background: Two semesters of physical chemistry.*

571 *Advanced Quantum Chemistry and Spectroscopy (3) Prereq: 570 or consent of instructor.*

572 *Thermodynamics and Statistical Mechanics (3) Macroscopic and microscopic description of equilibrium systems. Basic principles of thermodynamics and statistical mechanics, and application to selected chemical systems. Required background: Two semesters of physical chemistry.*

573 *Chemical Kinetics and Transport (3) Time-dependent phenomena in chemistry: chemical kinetics, chemical dynamics, transport theory. Required background: Two semesters of physical chemistry.*

590 *Polymer Chemistry (3) Fundamentals of polymer synthesis and characterization through application of organic and physical chemical principles. Required background: Two semesters each of organic and physical chemistry.*


595 *Physical Chemistry of Polymers (3) Conformation of macromolecules, solution and bulk properties, rubber elasticity, kinetics of polymerization, polymer thermodynamics. Prereq: 590 or equivalent.*

600 *Doctoral Research and Dissertation (3-15) P/NP only.*

601 *Chemistry Research Proposal (2) Preparation and oral defense of original written research proposal based on thorough survey of chemical literature. Prereq: Consent of department head. Satisfactory/No Credit grading only.*

610 *Selected Topics in Analytical Chemistry (3) Topics of current significance. Prereq: 510, 511, 512 or consent of instructor. May be repeated. Maximum 12 hours.*

630 *Selected Topics in Inorganic Chemistry (3) Topics of current significance. Prereq: 530, 531, 532 or consent of instructor. May be repeated. Maximum 12 hours.*

650 *Selected Topics in Organic Chemistry (3) Topics of current significance. Prereq: Two of 550, 551, 552 or consent of instructor. May be repeated. Maximum 12 hours.*

670 *Selected Topics in Physical Chemistry (3) Topics of current significance. Prereq: 570, 572, 573 or consent of instructor. May be repeated. Maximum 12 hours.*

690 *Selected Topics in Polymer Chemistry (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 12 hours.*

691 *Selected Topics in Thermal Analysis of Polymeric Materials (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 9 hours. Maximum 3 hours may be applied toward degree in chemistry.*
The graduate courses in the Classics include the wider reading of Greek and Latin authors in a selected field, a more detailed study of one of the great genres of classical literature, and the development of background for the appreciation of Greek or Roman life and literature. Students admitted to the Anthropology MA may pursue an emphasis in Mediterranean archaeology. (See Department of Anthropology.)

**GRADUATE COURSES**

**Classics (257)**

- **401 Greek Poetry (3)** Epic, lyric, drama. Authors vary. Prereq: 261. May be repeated. Maximum 9 hours.
- **402 Greek Prose (3)** History, philosophy, and oratory. Authors vary. Prereq: 261. May be repeated. Maximum 9 hours.
- **405-406 Selected Readings from Greek Literature (3,3)** For advanced students in Greek, plays, historical writings, poetry of ancient Greece in original Greek. Prereq: 401-402 or consent of instructor. May be repeated. Maximum 9 hours.
- **414 Cicero and Techniques of Latin Prose Composition (3)** For advanced students in Latin, practice in prose composition, writings of Cicero the model. Prereq: 351-352 or consent of instructor.
- **431-432 Selected Readings from Latin Literature (3,3)** For advanced students in Latin, oratory, historical writings, poetry of ancient Rome in original Latin. Prereq: 351-352 or consent of instructor. May be repeated. Maximum 9 hours.
- **435 Medieval Latin (3)** Selected readings from Latin prose and poetry of medieval Europe. Prereq: Consent of instructor.
- **436 Cities and Sanctuaries of the Greek and Roman World (3)** Major cities and sanctuaries in Greece, the Greek colonies, and the Roman Empire. Approach is archaeological, focusing on physical evidence—landscape, architecture and artifacts—as well as description of ancient authors. Cities include various types: planned and unplanned, seaports, caravan centers, government and commercial centers. The sanctuaries also vary in function including prophetic centers, athletic centers, theater centers, and healing centers. Writing-emphasis course. (Same as Anthropology 436.)
- **441 Special Topics in Classical Civilization (3)** Art, literature, religion, and society of Greece and Rome. May be repeated with consent of department. Maximum 9 hours.

**Department of CLASSICS**

http://web.utk.edu/~classics/

David W. Tandy, Head

**Professors**

Craig, C.P. (Lindsay Young Professor), PhD North Carolina (Chapel Hill)
Martin, S.D., PhD Michigan
Tandy, D.W. (Distinguished Professor of Humanities), PhD Yale

**Associate Professor**

Sutherland, E.H., PhD California (Berkeley)
Sklenar, R.J., PhD Michigan
Smith, D.G., PhD Stanford
Van de Moortel, A., PhD Bryn Mawr

**Research Professors**

Gesell, G.C., PhD North Carolina (Chapel Hill)
Langdon, M.K., PhD Pennsylvania

**Adjunct Faculty**

Dessel, J.P., PhD Arizona
Fitzgerald, J.L., PhD Chicago
Jones, D.W., PhD Chicago
Kulikowski, M., PhD Toronto
Shepardson, C., PhD Duke
Stiebert, J., PhD Glasgow

**442 Intensive Survey of the Archaeology of the Prehistoric Aegean (3)** Survey of archaeology and art of the Aegean from the earliest human to the rise of the Greek polis in the 8th century B.C. Highlights include Early Cycladic art, Minoan and Mycenaean complex societies, Thera, cultural interconnections with Egypt and the Near East, and the Trojan War. Emphasis on anthropological and modern art historical approaches. Writing-emphasis course. (Same as Anthropology 442.)

**443 Intensive Survey of the Archaeology of Greece (3)** Survey of the archaeology and art of Greece and the Greek-speaking areas from the Orientalizing through Hellenistic periods (c. 700 – 30 B.C.). Developments in architecture, sculpture, and vase painting seen in the context of changes in society. Archaeological evidence for daily life, economy, and political institutions. Writing-emphasis course. (Same as Anthropology 443.)

**444 Intensive Survey of the Archaeology of Etruria and Rome (3)** Survey of the archaeology of Italy and the Roman World from prehistoric times to the fall of the Roman Empire (1000 B.C. – A.D. 476). Highlights are the rise and decline of Etruscan culture, the development of Roman architecture, art, and urban planning; art and architecture used for political propaganda, and Roman cosmopolitan culture during the Empire. Writing-emphasis course. (Same as Anthropology 444.)

**562 Special Topics in Mediterranean Archaeology (3)** Selected topics in archaeology or art of the prehistoric Aegean, historic Greece or Rome. Lectures, discussions, student presentations, and papers. May be repeated. Maximum 9 hours. (Same as Anthropology 562.)

**565 Graduate Seminar in Ancient Mediterranean Civilization (3)** Theoretical and practical issues in the civilizations of the prehistoric Aegean or historic Greece. Study and discussions conducted in seminar format. Emphasis on developing students’ skills in research and oral as well as written presentation. May be repeated. (Same as Anthropology 565.)
MASTER OF SCIENCE
Computer Science Major

ADMISSION
Two semesters of calculus plus two additional semesters of college mathematics (e.g., linear algebra, differential equations, probability) and a course in discrete structures and in systems programming are required for admission.

REQUIREMENTS
For the master’s degree, 30 semester hours of graduate credit are required, 24 of which must be 500 level or above. Computer Science 530, 560, and 580 are required for the degree. Graduate courses taken outside the department are sometimes allowed but must be approved by the Graduate Committee before enrollment.

Thesis Option
The student must reach agreement on a thesis topic with a faculty advisor and must take 6 hours of 500 Thesis. Six hours of 500 Thesis may count in the 24-hour requirement at the 500 level or above.

Non-Thesis Option
The student must take coursework in an area to prepare for the non-thesis master’s examination. The student must verify that an acceptable set of courses has been taken before the student may schedule the examination. Information concerning the examination is available in the departmental office.

Problems in Lieu of Thesis Option
The student must reach agreement on the problem topic with a faculty advisor and pass an oral exam on the problems before a committee of three or more faculty members, at least two of whom must be computer science faculty.

Computer Science Minor
The graduate minor consists of any two of the three core courses (530, 560, 580) plus an additional 3 hours of graded computer science graduate-level courses at or above the 400 level.

DOCTOR OF PHILOSOPHY
Computer Science Major

ADMISSION
A student seeking admission to the PhD program is expected to meet the following requirements:

- The student should have three letters of recommendation sent directly to the department head from individuals capable of assessing the student’s potential for advanced work in computer science (for example, college teachers or employers for whom the student has worked after earning a bachelor’s degree). The department reserves the right to contact these individuals or other knowledgeable people if additional information is deemed necessary or desirable.

- The student is expected to have taken the GRE verbal and quantitative general test within the past three years and to have these scores sent to the Office of Graduate Admissions.

REQUIREMENTS
Original research reported in a dissertation of high quality is emphasized. The minimum hour requirements are 24 hours of course 600 Doctoral Research and Dissertation and 24 hours of graduate courses beyond the equivalent of a master’s degree (i.e., beyond 30 graduate credit hours) graded A-F. Computer Science 530, 560, and 580 are required for the degree. At least six hours of 600-level graded courses must be taken in computer science at the University of Tennessee, Knoxville. The student’s advisor and committee will establish the specific course requirements. The comprehensive examination consists of a departmental written examination and a subsequent oral examination conducted by the student’s committee.

GRADUATE COURSES

Computer Science (266)

420 Advanced Topics in Machine Intelligence (3) Search, learning, expert systems, neural networks, pattern recognition and natural language processing. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hours.

430 Advanced Topics in Hardware Systems (3) Architecture, parallel processors, microprogramming, networks and communications. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hours.

460 Advanced Topics in Software Systems (3) Operating systems, compilers, parallel computation, software engineering, database systems and programming languages. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hours.

470 Advanced Topics in Scientific Computation (3) Numerical methods, supercomputers and computer modeling and simulation of physical systems. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hours.

471 Numerical Analysis (3) (Same as Mathematics 471.)

472 Numerical Algebra (3) (Same as Mathematics 472.)

480 Advanced Topics in Theoretical Computer Science (3) Theory of computation, complexity theory, formal languages and graph theory and its applications. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hours.

494 Special Topics in Computer Science (1-3) May be repeated. Maximum 9 hours.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

522 Cybernetics (3) Various functions in living systems and their actual or potential realization in computers. Prereq: Discrete Structures.

525 Software Engineering (3) Survey of key ideas in software engineering: formal methods, tools, testing, reliability, structured design and development, metrics, management and history of the field.

530 Computer Systems Organization (3) Architectures and systems organization for serial and parallel machines. Prereq: Architecture or machine organization.


541 Database Management Systems (3) Data model theory, optimization, and normalization; intelligent database systems; comparison of implementations; analysis of distributed and networked databases. Techniques for evaluation of performance, integrity, security and reliability. Prereq: 311.

551 Pattern Analysis (3) Decision-theoretic and structural pattern analysis. Deterministic and statistical decision rules, feature extraction and representation; syntactic and semantic methods, relational models. Prereq: Discrete structures and probability or statistics.

552 Image Analysis (3) Enhancement and restoration of digital images. 2D transforms, Segmentation and description. Computational procedures for image reconstruction. Prereq: One year calculus and discrete structures.

560 Software Systems (3) Design and implementation of compilers, software systems; optimization, run-time storage administration. Software system design issues; description, structure and design of contemporary software systems. Prereq: 360.

571-572 Numerical Mathematics (3) (Same as Mathematics 571-572.)

574 Finite Element Methods (3) (Same as Mathematics 574.)

575 Matrix Theory and Techniques in Numerical Analysis (3) (Same as Mathematics 575.)

576 Sparse Matrix Computations (3) Solution of large sparse linear systems; graph models, rendering techniques, symbolic factorizations, data structures, numerical algorithms, complexity analyses, parallel algorithms. Prereq: Numerical linear algebra.

580 Foundations (3) Foundations of computer science, including computability, computational complexity, fundamental algorithms and algorithm analysis. Required background: Automata theory.

581 Advanced Design and Analysis of Algorithms (3) Analysis of algorithms and relevance of analysis to design of efficient computer algorithms. Sorting, searching, graph algorithms, pattern matching, dynamic programming, efficient approximation algorithms. Prereq: 580.

593 Independent Study (1-15) May be repeated.

594 Special Topics in Computer Science (1-3) May be repeated.

600 Doctoral Research and Dissertation (3-15) P/NP only.

620 Advanced Topics in Intelligent Systems (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

650 Advanced Topics in Pattern/Image Analysis (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

660 Advanced Topics in Software Systems (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

670 Advanced Topics in Scientific Computing (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

680 Advanced Topics in Theory and Foundations (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

690 Advanced Topics in Computer Science (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

The Department of Earth and Planetary Sciences offers both the MS and PhD with a major in geology. Persons interested in these programs should contact the Director of Graduate Admissions in the department.

ADMISSION

For admission, an applicant must provide transcripts of previous university work, two rating forms or letters of recommendation, and GRE scores (general). Students are not normally admitted under non-degree status.

Prerequisite for both degrees is a bachelor’s degree, including coursework in mineralogy, optical mineralogy, petrology, stratigraphy, paleontology, structural geology, and field geology. One year each of coursework in calculus and chemistry and one year of coursework in biology, physics, or statistics are also required. Applicants lacking any of these may be admitted, but the deficiencies must be removed within the first year without graduate credit. Substitutions may also be allowed.

MASTER OF SCIENCE

Geology Major

REQUIREMENTS

The department offers the thesis option in the master’s program. Graduation requires successful oral defense of a written thesis and a minimum 3.0 GPA in all graduate coursework.

Course requirements are a minimum of 30 semester hours, including:

- Six hours of Thesis 500.
- Registration in 595 during the first two years in residence. Two hours may be counted toward the 30-hour minimum. This requirement may be waived in unusual circumstances.

- Sixteen hours of geology courses, with at least 14 hours at the 500 or 600 level, including at least one course from any three of the following five groups:
  1. 410, 460, 475, 480, 530, 563, 565, 568.
  2. 420, 421, 450, 545, 546, 550, 556, 557
  3. 470, 570, 572, 575, 576.
  5. Any 400- or 500-level courses with graduate credit from related departments (allied sciences, mathematics, and engineering), selected with approval of the advisor.

- Eight hours of additional graduate coursework.
DOCTOR OF PHILOSOPHY
Geology Major

The prerequisite for the PhD program, in addition to that for the MS program, is either a master’s degree with a major in geology or a bachelor’s degree plus completion of 24 hours of graded coursework with at least one course from any three of the groups listed in #3 above. These courses may be taken while completing other course requirements.

REQUIREMENTS

Graduation requires passing a comprehensive examination, taken no later than the end of the second year, completion of all course requirements with a minimum 3.0 GPA, completion of the language requirement, and successful oral defense of the dissertation.

The comprehensive examination includes both written and oral parts in which the candidate will be tested on his/her knowledge of the area concerning the proposed dissertation and of related fields. The candidate is expected to be conversant in a wide field of geological sciences.

A minimum of 24 hours of graded coursework beyond the master’s degree is required in addition to the 24 hours of Dissertation 600. The coursework includes the sum of 9 hours of 600-level geology courses, 9 hours of 500-level or higher geology courses, and 6 hours of additional graduate courses. Extra departmental coursework is encouraged.

The student must demonstrate a reading knowledge of a foreign language in which there is a body of geologic literature, as approved by the student’s dissertation committee. The foreign language requirement may be waived for PhD students whose native language is not English and who have demonstrated mastery of the English language, as determined by the student’s dissertation committee.

GRADUATE COURSES

Geology (424)

401 Quantitative Methods in Geology (3) Applications of calculus and differential equations to problems in earth sciences. Examples of diffusion equation in hydrogeology; wave equation in geophysics; mechanical modeling and boundary conditions in structural geology and tectonics. Prereq: two 100-level geology courses and Mathematics 141, or consent of instructor.


411 Optical Mineralogy (2) Laboratory course on principles of optical mineralogy. Use of petrographic microscope to identify rock-forming minerals with applications to petrology and environmental mineralogy. Prereq: 310.

412 Elements of X-ray Diffraction (2) Laboratory course on principles and applications of X-ray diffraction. Phase identification, quantitative determination of mineral abundances in mixtures, and crystal structure determination. Prereq: 310.

420 Palaeoecology (4) Principles of ecological analysis as applied to fossils and fossil assemblages: data collection and interpretation. Laboratory designed around preparation of scientific reports based on field and laboratory analysis. 3 hours and 1 lab. Writing emphasis course.

421 Invertebrate Paleontology (4) Survey of invertebrate animal phyla: skeletal structure and preservation, functional morphology, ecology, and stratigraphic distribution. 2 hours and two 2 hour labs. Prereq: 320 or consent of instructor.

440 Field Geology (5) Summer field course for advanced undergraduate geology majors and first-year graduate students in geology. Taught off-campus and requires full time of student. Synthesis of major aspects of geological sciences in societal context. Field techniques demonstrated, practiced, and applied to solution of geologic problems. Prereq: Completion of major core courses and consent of instructor.

450 Process Geomorphology (3) Integrative approach to development of surface of earth based upon case histories, maps, remote sensing imagery. 2 hours and one 2 hour lab. Prereq: two 100-level geology courses or consent of instructor. (Same as Geography 450.)

455 Basic Environmental Geology (3) Applications of geological sciences toward comprehension of effects of geological processes on humans and effects of human activities on earth’s environments. 2 hours and one 3 hour lab or field period. Prereq: one 100-level geology course or consent of instructor.

460 Principles of Geochemistry (4) Applications of chemical principles to geologic systems: problem-solving techniques. Phase diagrams, partitioning of trace elements, thermodynamic principles for evaluating stabilities of mineral assemblages, aqueous solutions, and applications of radiogenic and stable isotopes to geologic systems. 3 hours and one 2 hour tutorial. Prereq: Chemistry 120-130, Mathematics 141-142. Recommended prereq: Geology 330 or consent of instructor.

470 Applied Geophysics (3) Basic principles of geophysical exploration: applications to environmental problems. Seismic and electromagnetic methods. Prereq: 6 hours of geology courses numbered above 300 and Physics 135-136 or equivalent, or consent of instructor.

475 Physical and Chemical Systems of the Earth (3) Development of physical earth from solar nebula to present. Formation, composition and evolution of hydrosphere, crust, mantle, and core. Interdependence of earthquakes, volcanism, plate tectonics, geomagnetism, chemical and isotopic processes of interior, and earth’s temperature. Historical perspective on major controversies of past, and problems unresolved today. 2 hours and 1 discussion. Prereq: 16 hours of geology courses numbered 300 and above.

480 Principles of Economic Geology (4) Ore-forming processes, classification of mineral deposits, survey of different types of mineral deposits with examples, and metallogeneis. 1 hour and one 2 hour lab. Prereq: 310 and 330 or equivalents. Recommended prereq: 460.

485 Principles of Hydrogeology (3) Physical principles of flow, flow equations, geologic controls, aquifer analysis, water well design/testing, introduction to transport processes. Prereq: one 100-level geology course, Mathematics 141-142, and Physics 135 or 136 or equivalent, or consent of instructor. (Same as Civil Engineering 485.)

486 Hydrogeology Laboratory (1) Application and demonstration of hydrogeological principles in field and laboratory. Prereq or coreq: 485 or Environmental Engineering 535 or consent of instructor.

500 Thesis (1-15) P/NP only.

501 Fractal Models in Earth Sciences (3) An introduction to the theory and methods of fractal analysis as applicable to earth sciences. Topics include deterministic and statistical fractals, self-affine fractals, multifractals, percolation, renormalization group theory, cellular automata, and methods of estimating fractal parameters (e.g., dimension and lacunarity). Applications to be discussed include: characterization of coastlines, drainage basins, and fracture networks; terrain simulation; modeling porous media and hydraulic properties; rock fragmentation; spatial variability of mineral deposits; and temporal variability of earthquakes and floods. Prereq: 401, or at least two Earth Science related courses, or consent of instructor.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

505 Structure of the Southern and Central Appalachians (2) Structural development of Southern and Central Appalachians from extensional Late Proterozoic—early Paleozoic rift-drift-platform margin through processes related to compressional events producing accretionary elements that formed Appalachians throughout the Paleozoic. Comparisons to similar orogens. Prereq: 570.

510 Clay Mineralogy (3) Origin, chemistry, structures, and properties of clay minerals; application of mineralogical techniques in clay mineral studies. 2 hours and 1 lab. Prereq: 310 and 568 or equivalent.

530 Petrogenesis of Crystalline Rocks (4) Origin and properties of igneous and metamorphic rocks, magmatic and subvolcanic processes and physical conditions. Laboratory involves petrographic study of crystalline rocks in thin section. 3 hours and 1 lab. Prereq: 410.

535 Applied Ground Water Hydrology (3) (Same as Environmental Engineering 535.)
539 Geologic Applications of Remote Sensing (3) An introduction to the use of visible, infrared, microwave/radio, and nuclear remote sensing techniques in the geologic study of the Earth. Topics covered include mineral spectroscopy, light scattering models, instrumentation for remote sensing, calibration and atmospheric removal, multi- and hyperspectral image cube analysis, and ground-truthing techniques. Emphasis on working directly with remote sensing data to solve geologic problems. 2 lecture hrs and one 2-hour lab. Prereq: 310; Mathematics 141-142; and Physics 135; or consent of instructor.

540 Seminar in Local Geology (1) Introduction of geology of Southern Appalachians. 1 hour plus field trips.

544 Paleopedology (3) Field, microscopic, and geochemical analysis of fossil soils (paleosols) and comparison with modern analog soils; interpretation of changes in paleoweathering processes, paleoclimate, and paleoatmospheric chemistry over 4.6 billion years of earth history based on paleosols. Prereq: 340 or equivalent, general chemistry, or consent of instructor.

545 Sandstone Petrology/Physical Sedimentology (4) Field and microscopic analysis of terrigenous clastic rock types; physical processes of sedimentation, transport of sediment, and formation of sedimentary structures. 3 hours and 1 lab. Prereq: 340 or equivalent.

546 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonate sediments and diagenesis of resultant rocks; field and laboratory analysis of sample material and preparation of scientific reports. 3 hours and 1 lab.

550 Regional Geomorphology (3) Integrative approach to study of natural geomorphological regions stressing links and similarities across boundaries, unique characteristics of major divisions, provinces, sections, and districts. May be repeated with consent of instructor. Maximum 6 hours.

556 Ice-Age Environments and Global Climate Change (3) (Same as Ecology and Evolutionary Biology 556.)

557 Quaternary Ecology (3) (Same as Ecology and Evolutionary Biology 557.)

561 Organic Geochemistry (3) Fundamentals of organic geochemistry; primary production, diagenesis, and preservation of organic matter in the sedimentary rock record; and formation and alteration of geologic environments using biomarker compounds. 3 lecture hours. Prereq: Chemistry 120-130 or equivalent or consent of instructor.

563 Stable Isotope Geochemistry (3) Theoretical aspects of isotope fractionation and applications to geologic systems. Isotope exchange, variations in natural waters, diagenetic, hydrothermal and metamorphic systems. Prereq: General Chemistry or equivalent.


568 Geochemical Analysis (3) Collection and treatment of geochemical data with electron microprobe, x-ray fluorescence, and atomic absorption spectrophotometry techniques. 2 hours and 1 lab. Prereq: 310 or consent of instructor.

570 Advanced Structural Geology (4) Current topics in structural geology and tectonics of mountain belts; recent literature. 3 hours and 1 lab or seminar. Prereq: 370 or equivalent, or consent of instructor.

572 Tectonics (4) Field and subsurface characterization, and mechanical development of natural fractures; role in groundwater flow. Prereq: Structural Geology or equivalent, or consent of instructor. (Same as Civil Engineering 572.)

575 Tectonics (4) Evolution of Earth’s lithosphere in context of plate tectonics theory. Formation of continents through comparative anatomy of mountain belts, including Appalachians, Alps, Urals, Caledonians, Cordillera, Andes, and Himalayas. 3 hours and 1 seminar. Prereq: Structural Geology or consent of instructor.

576 Reflection Seismology (3) Imaging subsurface features using reflected seismic waves. Energy sources, modes of wave propagation, field procedures, computer data processing, and pitfalls. Applications to tectonic and environmental problems. Prereq: 470 or consent of instructor.

585 Contaminant Hydrogeology (3) Physical transport processes, isotopes and groundwater age dating, processes influencing inorganic, organic and microbial contaminants, sampling and monitoring methods, remediation of contaminated groundwater, aquifer protection. Prereq: 485 or 535; 460; or Environmental Engineering 555 or equivalent; and consent of instructor.

586 Field and Laboratory Methods in Hydrogeology (3) Research methods. Measurement of hydraulic properties, drilling, sampling and instrumentation, tracer experiments. Formulating hypotheses and research plans. Prereq or coreq: 485 or Environmental Engineering 555; and consent of instructor.

590 Special Problems in Geology (1-3) Directed study or special topics. Prereq: Consent of instructor. May be repeated. Maximum 10 hours.

591 Foreign Study (1-15) See College of Arts and Sciences.

592 Off-Campus Study (1-15) See College of Arts and Sciences.

593 Independent Study (1-15) See College of Arts and Sciences.

595 Selected Topics in Geology (1) Presentation of research by faculty and visiting scientists. Registration required each semester for resident full-time graduate students, except in summer and when registered for 596. Satisfactory/No Credit grading only.

596 Geology Colloquium (1) Preparation and oral presentation of scientific material. Grade based on content, preparation, presentation, and instructor critique in departmental seminar. Taken only once during residence for each graduate student.

600 Doctoral Research and Dissertation (3-15) P/NP only.

620 Seminar in Paleontology (3) May be repeated with consent of department. Maximum 9 hours.

630 Seminar in Petrology (3) May be repeated with consent of department. Maximum 9 hours.

640 Seminar in Sedimentary Geology (3) May be repeated with consent of department. Maximum 9 hours.

650 Seminar in Geomorphology and Quaternary Geology (3) May be repeated with consent of department. Maximum 9 hours.

660 Seminar in Geochemistry (3) May be repeated with consent of department. Maximum 9 hours.

670 Seminar in Structural Geology (3) May be repeated with consent of department. Maximum 9 hours.

675 Seminar in Geophysics (3) Advanced treatment of selected topics in geophysics. Prereq: 470 or consent of instructor.

685 Seminar in Hydrogeology (3) May be repeated with consent of department. Maximum 9 hours.

Department of ECOLOGY AND EVOLUTIONARY BIOLOGY

http://eeb.bio.utk.edu/

Christine R.B. Boake, Head
Louis J. Gross, Associate Head
Gary F. McCracken, Graduate Liaison

Professors
Boake, C.R.B., PhD .............................................................. Cornell
Bunting, II, D.I., PhD ......................................................... Oklahoma State
Burghardt, G.M., PhD ............................................................ Chicago
Delcourt, H., PhD ............................................................... Illinois
Dercourt, P.A., PhD ............................................................. Minnesota
Ducharme, N., PhD ............................................................. Kansas
Emery, M.A., PhD .............................................................. Virginia
Gavrilovs, S., PhD ............................................................... Moscow State
Greenberg, N.B., PhD .......................................................... Rutgers
Gross, L.J., PhD ................................................................. Cornell
Harris, III, W.R., PhD .......................................................... Tennessee
Hallam, K., PhD ................................................................. Pennsylvania
McCready, G.R., PhD ............................................................ Comell
Pan, M.L., PhD ................................................................. Pennsylvania
Pigliucci, M., PhD ............................................................... Connecticut
Rieckert, S.F., PhD ............................................................. Wisconsin
Sayer, G.S., PhD ................................................................. Idaho
Schultz, T.W., PhD .............................................................. Tennessee
Simberloff, D. (Gore Hunger Chair of Excellence), PhD .................................... Harvard

Associate Professor
Drake, J.A., PhD ................................................................. Purdue

Assistant Professors
Butler, M., PhD ................................................................. Washington (St. Louis)
Fordyce, J.A., PhD .............................................................. Davis
King, A., PhD ................................................................. Arizona
Near, T.J., PhD ................................................................. Illinois
Sanders, N.J., PhD .............................................................. Stanford
Weltzin, J., PhD ................................................................. Arizona

Research Professors
Cooper, L.W., PhD ............................................................. Alaska
Grebmeier, J.M., PhD ......................................................... Alaska
Shared faculty are drawn from other university departments, the Oak Ridge National Laboratory, the U.S. Geological Survey, and the Tennessee Valley Authority.

**MAJOR DEGREES**
Ecology and Evolutionary Biology........................................... MS, PhD

The Department of Ecology and Evolutionary Biology administers an interdisciplinary graduate program which offers the Master of Science and Doctor of Philosophy degrees with a major in ecology and evolutionary biology and concentrations in behavior, ecology (including mathematical ecology) and evolutionary biology.

**ADMISSION**
Applications are accepted once a year. The deadline for receipt of all application materials is 6 January for those applicants wishing to enroll in the following fall or spring semesters. Applications incomplete as of that date, or received after that date, will not be considered. Applicants are expected to have an academic background consistent with a bachelor’s degree in one of the life sciences. They are expected to have completed a minimum of one year of general biology, two years of chemistry including one year of general chemistry, one year of physics, and one year of college-level calculus. Occasionally, applicants who are highly qualified otherwise but lack one of these courses or course sequences will be admitted with the expectation that the deficiency will be made up within the first year of graduate study. Applicants are required to submit scores from the general Graduate Record Examination (GRE) and successful applicants will usually have a composite score on the verbal, mathematical and analytical sections of the GRE of at least 1850. Submission of scores on appropriate (e.g., biology, mathematics) advanced GRE examinations is recommended but not required. Applicants are also expected to have an overall grade-point average of at least 3.0, and 3.0 or above for all science and mathematics courses, on a 4.0 scale (successful applicants will usually have grade-point averages well above these minima).

Application must be made to both the Office of Graduate Admissions and the department. The departmental application requires 3 letters of reference from persons capable of assessing the applicant’s suitability for graduate work in biology and a statement of professional goals and reasons for applying to this program. Applicants for the doctoral degree are expected to have made prior contact with potential research advisors in the department’s graduate program and this approach is recommended for applicants for the master’s degree program as well. Inquiries should be directed to the Chair, Graduate Committee, Department of Ecology and Evolutionary Biology, the University of Tennessee, Knoxville, Tennessee 37996-1610.

**MASTER OF SCIENCE**
Ecology And Evolutionary Biology Major

**REQUIREMENTS**
In addition to general requirements of the Graduate Council, aspirants for the Master of Science are expected to: (1) during the first semester in residence, take a prescriptive diagnostic examination covering major concepts in ecology and evolutionary biology. The examination may be taken twice and must be passed before the student is admitted to candidacy; (2) complete course requirements as determined by the department and the student’s faculty thesis research committee; and (3) satisfactorily complete and defend a research thesis.

**DOCTOR OF PHILOSOPHY**
Ecology And Evolutionary Biology Major

**REQUIREMENTS**
In addition to general requirements of the Graduate Council, aspirants for the Doctor of Philosophy degree are expected to: (1) during the first semester in residence, take a prescriptive diagnostic examination covering major concepts in ecology and evolutionary biology. The examination may be taken twice and must be passed before the student is admitted to candidacy; (2) complete course requirements as determined by the department and the student’s faculty dissertation research committee; (3) pass a written and oral comprehensive examination designed to test for adequate knowledge in those areas essential to the student’s research program; and (4) satisfactorily complete and defend a dissertation. The department does not require a reading knowledge of a foreign language, but this may be imposed by the student’s faculty dissertation research committee. If so, the student has the option of demonstrating reading knowledge of the prescribed language by either (a) passing the official reading examination given by the language department or (b) earning a grade of at least a B in the second semester of a special language reading course for graduate students.

**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 Economics for program description.

**GRADUATE COURSES**

Ecology and Evolutionary Biology (278)

411-412 Minicourse in Ecology and Evolutionary Biology (2) Selected advanced topics in ecology, behavior, and evolutionary biology, concentrated in time and subject matter. Consult departmental listing for topics offered. Prereq: As announced. May be repeated. Maximum 4 hours may apply toward departmental major.

419 Science as Method (3) Dynamic process of scientific discovery. Comparisons of science, nonscience, pseudoscience, successful and unsuccessful science. Ethics of scientific research, philosophical aspects of scientific enterprise, and implications for teaching and writing about science. Prereq: Introductory science or philosophy course, or consent of instructor. (Same as Botany 419; Philosophy 419.)

421 Community Ecology (3) Interactions between individuals, species, communities and environments, including competition, coexistence, predation, herbivory; causes and consequences of biological diversity; biological invasions; application of advanced sampling and analysis techniques; local to global environmental change. Periodic field trips or laboratories. Prereq: Biology 250 or equivalent.

431 Plant Ecology (4) (Same as Botany 431.)

446 Introduction to Oceanography (4) Basic oceanography: physical, chemical, geological and biological processes and patterns. Oceanic subsystems: upwellings, polar oceans, hydrothermal vents, gyres, coral reefs, estuaries, and coastal regions. Field trip to coast required. Prereq: General Biology and Chemistry 120-130; Biology 250 recommended.

450 Comparative Animal Behavior (3) Principles and methods of ethology: ecological, developmental, physiological and evolutionary aspects. (Same as Psychology 450.)

459 Comparative Animal Behavior Laboratory (3) Introduction to observational and experimental research in ethology. Coreq: 450. (Same as Psychology 459.)
460 Evolution (4) Principles, facts, and theories regarding biological evolution. Concepts, processes and product in development of organic diversity. Historical development of ideas concerning biological evolution. 3 hours and 2 hours lab/discussion. Prereq: Biology 240 or consent of instructor.

461 Special Topics in Organismal Biology (3) Evolution, ecology, biogeography, classification, and anatomy of selected animal and plant taxa. Prereq: Biology 250 or consent of instructor. May be repeated if topic differs. Maximum 12 hours.

470 Aquatic Ecology (3) Introduction to the physiochemical nature of inland waters with description of biotic communities and their interrelationships. 2 hours and 1 lab. Prereq: Chemistry 120-130, Biology 250.

474 Ichthyology (4) Evolution, classification, collection and identification, distribution and biology of fishes: freshwater fauna of Eastern North America. 2 hours and 2 labs. Prereq: Biology 250 or consent of instructor.

484 Conservation Biology (3) Application of principles and techniques of ecological research to conservation of biological diversity at genetic, population, community, and ecosystem levels. Prereq: Biology 240, 250.

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Satisfactory/No Credit grading only.

503 Ecology and Evolutionary Biology Seminar (1) Advanced topics in ecology, behavior, and evolutionary biology. Senior departmental majors encouraged. Required of all first- and second-year graduate students. May be repeated. Maximum 4 hours. Satisfactory/No Credit grading only.

504 Special Topics (1-3) Selected directed readings or special course in topics of current interest. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 9 hours. Satisfactory/No Credit grading only.

508 Introduction to Faculty Research (1) Orientation of new graduate students to current research of departmental graduate faculty. Prereq: Admission to program in Ecology and Evolutionary Biology. Required of all first-year students. Satisfactory/No Credit grading only.

509 Foundations: Readings in Ecology (1-2) Readings and discussion of classic papers in field.

511 Foundations: Readings in Evolution (1-2) Readings and discussion of classic papers in field.

512 Foundations: Readings in Conservation Biology (2) Readings and discussion of classic papers in field.

514 Foundations: Readings in Mathematical and Computational Ecology (2) Readings and discussion of classic papers in field.

515 Foundations: Readings in Environmental Toxicology (1-2) Readings and discussion of classic papers in field.

516 Colloquium in Ethology (1) (Same as Psychology 516.)

520 Ecology for Planners and Engineers (3) Ecological principles and effects that human-caused changes have on living organisms. Lectures and field trips. Appropriate for students in Planning and Environmental Engineering. Not intended for graduate students in Ecology and Evolutionary Biology.

524 Physiological Ecology of Animals (3) Adaptive physiological response of animals to natural changes in or extremes of physical and biotic environment. Terrestrial vertebrates. Prereq: Undergraduate courses in animal physiology and ecology, Biochemistry and Cellular and Molecular Biology 440 and Biology 250 or equivalent.

535 Ecology and Development in the Amazon (3) Natural history, ecosystem diversity and function, and opportunities for sustainable economic development in the Amazon Basin. Includes field trip of 7-10 days to Manaus, Brazil.

540 Insect Taxonomy I: Major Orders (3) Survey of classification of major orders of insects, with practical experience in identification of insects at family level. 4 hours combined lecture and lab. Prereq: Consent of instructor.

541 Insect Taxonomy II: Minor Orders (3) Survey of classification of minor orders of insects, with practical experience in identification of insects at family level. 4 hours combined lecture and lab. Prereq: 540 or consent of instructor.

542 Insect Structure and Function (3) Integrated study of morphology and physiology at tissue and cellular level of insects. Prereq: Consent of instructor.

543 Aquatic Insects (3) Taxonomy and biology of aquatic insects; immature forms. 2 hours and 1 lab. Prereq: Consent of instructor.

544 Fresh Water Invertebrate Zoology (3) Ecology and taxonomy of fresh water invertebrates exclusive of insects. 3 hours lab and field study. Prereq: Comparative Invertebrate Biology or equivalent and consent of instructor.

545 Advanced Animal Behavior (3) Second-level course in ethology, stressing evolution, genetics, physiology, ecology and human behavior. Prereq: 450 or equivalent. (Same as Psychology 545.)

546 Ethological Psychology (3) (Same as Psychology 546.)

547 Conceptual Foundations of Evolution and Behavior (3) (Same as Psychology 547.)

552 Development Planning in the Third World (3) (Same as Planning 552.)

555 Environmental Planning (3) (Same as Planning 555.)

556 Ice-Age Environments and Global Climate Change (3) Glacial-interglacial climatic cycles and dynamic responses of landscapes within glacial, periglacial, and non-glacial environments across North America over past 2.5 million years. (Same as Geology 556.)

557 Quaternary Ecology (3) Perturbation, process, and pattern within Quaternary ecosystems; climatic change and vegetational response during last 2.5 million years. Prereq: Consent of instructor. (Same as Geology 557.)

560 Biometry (3) Statistical applications in biological research. Prereq: Statistics course or consent of instructor.

561 Environmental Toxicology (3) Basic concepts in toxicology; molecular toxicology and detoxification; reproductive toxicology; mutagenesis, teratogenesis, carcinogenesis, pathologic changes and environmental impact. Prereq: Biochemistry and Cellular and Molecular Biology 410, Organic Chemistry or consent of instructor. (Same as Biochemistry and Cellular and Molecular Biology 561.)

575 Ecological Genetics (3) Genetics of natural populations, using both single-locus and quantitative genetic approaches. Prereq: Statistics course.

577 Landscape Ecology (3) Ecological structure, function, and change through time of landscape mosaics; quantitative measures of landscape heterogeneity; responses of organisms to changes in landscape heterogeneity. Prereq: Biology 250 or equivalent or consent of instructor.

581-582 Mathematical Ecology (3,3) (Same as Mathematics 581-582.)

583 Zoogeography (3) Processes determining geographic distribution of animals and distribution and composition of animal communities. Prereq: Ecology course or consent of instructor.

585 Mathematical Evolutionary Theory (3) (Same as Mathematics 585.)

591 Foreign Study (1-15) See College of Arts and Sciences.

592 Off-Campus Study (1-15) See College of Arts and Sciences.

593 Independent Study (1-15) See College of Arts and Sciences.

599 Advanced Evolutionary Ecology (3) (Same as Botany 599.)

600 Doctoral Research and Dissertation (3-15) P/NP only.

602 Advanced Topics in Ecological Process and Structure (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in ecological process and structure. Consult departmental listing for offerings. May be repeated with consent of department. Maximum 9 hours.

603 Advanced Topics in Evolutionary Biology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in evolutionary biology. Consult departmental listing for offerings. May be repeated with consent of department. Maximum 9 hours.

606 Advanced Topics in Conservation Biology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in conservation biology. Consult departmental listing for offerings. May be repeated with consent of department. Maximum 9 hours.

607 Seminar in Ecology and Evolutionary Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hours.

609 Advanced Topics in Comparative Animal Behavior (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in animal behavior. Consult departmental listing for offerings. May be repeated with consent of department. Maximum 9 hours.

610 Advanced Topics in Mathematical, Theoretical and Computational Ecology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in mathematical, theoretical, and computational ecology. Consult departmental listing for offerings. May be repeated with consent of department. Maximum 9 hours.

611 Advanced Topics in Organismal Biology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in organismal biology. Consult departmental listing for offerings. May be repeated with consent of department. Maximum 9 hours.
612 Advanced Topics in Environmental Toxicology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in environmental toxicology. Consult departmental listing for offerings. May be repeated with consent of department. Maximum 9 hours. (Same as Biochemistry and Cellular and Molecular Biology 612.)

635 Environmental Assessment and Sustainable Development in Third World Countries (3) Concepts and methods of environmental impact assessment and risk assessment. Sustainable development concepts and issues in developing countries. The role of risk and impact assessment in achieving sustainable development. Prereq: Biology 250 or equivalent. (Same as Botany 635: Planning 635.)

681-682 Advanced Mathematical Ecology (3,3) (Same as Mathematics 681-682.)

Department of ENGLISH

http://web.utk.edu/~english/

John P. Zomchick, Head

Misty G. Anderson, Graduate Liaison

Professors

Carroll, D.A. (J. Douglas Bruce Professor), PhD .................. North Carolina
Cox, D.R., PhD ....................................................... Missouri
Dumas, B.K., PhD ..................................................... Arkansas
Dunn, A.R., PhD ...................................................... Washington
Ensor, A.R., PhD ..................................................... Indiana
Finneman, R.J. (John C. Hodges Professor), PhD .................. North Carolina
Garner, Jr., S.B. (Young Professor), PhD ......................... Princeton
Goslee, D.F., PhD .................................................. Yale
Goslee, N.M. (Alumni Distinguished and Young Professor), PhD ......, Yale
Heffernan, T.J.A. (Curry Professor), PhD ..................... Cambridge
Kallet, M., PhD ..................................................... Rutgers
Keene, M.J., PhD ....................................................... Texas
Kelly, R.M. (Young Professor), PhD ............................. Duke
Leggett, B.J. (Humanities Professor), PhD ....................... Florida
Leki, I., PhD ......................................................... Illinois
Lofaro, MA, PhD ...................................................... Maryland
Maland, C., PhD ...................................................... Michigan
Smith, A., PhD ....................................................... Houston
Stillman, P., PhD ..................................................... Pennsylvania
Trahern, Jr., J.B. (Alumni Distinguished Professor), PhD ...... Princeton
Wier, A., MFA ......................................................... Bowing Green
Zomchick, J.P., PhD ................................................ Columbia

Associate Professors

Anderson, M.G., PhD ............................................... Vanderbilt
Atwill, J.M., PhD .................................................... Purdue
Elias, A.J., PhD ......................................................... Texas
First, R., PhD ......................................................... Texas
Jennings, L.D., PhD .................................................. Michigan
Ren, X., PhD ......................................................... Minnesota
Schoenbach, L.M., PhD .......................................... Virginia
Thaggard, M., PhD ............................................... (California) Berkeley

Assistant Professors

Billone, A.C., PhD .................................................... California
Black, J.L., PhD ...................................................... Toronto
Haddox, T.F., PhD .................................................. Vanderbilt
Hirschfeld, H.A., PhD ........................................... Duke
Ikard, D., PhD ......................................................... Wisconsin
Knight, M., MFA ..................................................... Virginia
Reiff, M.J., PhD ..................................................... Kansas
Schoenbach, L.M., PhD .......................................... Virginia
Seshagiri, U., PhD .................................................. Illinois

Lecturers

Barrow, R., PhD ..................................................... Iowa
Burton, J.C., PhD ................................................. State University of New York (Stony Brook)
Capps, S.E., PhD .................................................. Tennessee
Christie, P.P., PhD .................................................. Tennessee
Dziuban, E.K., MA .................................................. Tennessee
Edwins, J.A., PhD .................................................. Tennessee
Forsythe, M.L., MA .................................................. Tennessee
Hardwig, M.R., PhD ........................................... Tennessee
Hardwig, W.J., PhD ............................................... Florida
Harris, S.C., PhD .................................................. Tennessee
Havens, K.L., PhD ................................................ Tennessee
Huk, P., PhD .......................................................... Southern California
Hussein, A., PhD .................................................... Tennessee
Hyman, K., PhD ..................................................... Illinois (Chicago)
Knox, L., MA ......................................................... Indiana
Larsen, W.B., PhD .................................................. Tennessee
McDowell, M.R., MA ............................................ Tennessee
McKinstry, D.K., PhD ........................................... Tennessee
Meltzer-Sumner, S.E., PhD .................................... Tennessee
Meredith, E.G., MA ................................................. Tennessee
Morgan, T., PhD ..................................................... State University of New York (Buffalo)
Pearson, F.M., MA .................................................. Tennessee
Peavler, J.L., MA ................................................... Tennessee
Preston, N.H., PhD ................................................ Tennessee
Renfro, M.M., PhD ................................................ Tennessee
Robertson, K.C., MA ............................................. Tennessee
Sclawinski, S., PhD .............................................. South Carolina
Slater, R.L., PhD .................................................... North Carolina
Stafford, A.A., PhD ............................................. Pittsburgh
Thompson, P., PhD .............................................. Louisiana State
Tomlinson, J.A., MA ............................................. Tennessee
Wier, A., MFA ......................................................... Texas
Yost, R., MA ........................................................... Tennessee

Permanent Part-Time Lecturers

Berry, L.C., MA ..................................................... Tennessee
Tschantz, P.A., MA ................................................ New Mexico State

Writing Center Director

Edwins, J.A., PhD ................................................ Tennessee

MAJOR

DEGREES

English .............................................................. MA, PhD

The Department of English offers the Master of Arts and the Doctor of Philosophy degrees with a major in English. Thesis and non-thesis options are available for the MA, as well as a special concentration in writing. The department also offers a creative writing dissertation option in the doctoral program.

Detailed information about the master’s and doctoral programs, and about individual graduate courses, may be obtained by writing the Director of Graduate Studies in English, 306 McClung Tower. A prospective student must contact the department to receive the proper information and forms with which to apply. For additional information, please visit the graduate Web site through the College of Arts and Sciences home page at www.artssci.utk.edu.

The Department of English does not accept students in non-degree or provisional status. A student who wishes to enter the department must apply in degree-seeking status for his/her application to receive consideration for admission to any graduate program in English.

MAJOR OF ARTS

English Major

REQUIREMENTS

A minimum of 24 semester hours in English beyond the BA to include 6 hours at the 600 level; 12 additional hours at the 500-600 level (Only 3 hours of 593 Independent Study may be applied toward the MA); and 6 hours for graduate credit at any level, including the 400 level. In this coursework, students must maintain at least a 3.0 GPA.
The requirements for the writing concentration are the same as those for the thesis option above with the following exceptions:

**Thesis Option**
Written under the direction of a faculty member of the department and approved by a committee of two other faculty members. Six semester hours of credit will be given.

**Non-Thesis Option**
Six hours of additional courses at the 500-600 level, making a total of 30 hours of required coursework.

**Language Requirement**
Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
- Completion of the second year of a language at college level with a grade of C or better.
- Completion of French 302 or German 332 at the University of Tennessee, Knoxville, with a grade of B or better.
- Passing of the regular PhD foreign language examination as currently administered at the University of Tennessee, Knoxville.

**Capstone Experience Requirement**
An integral part of all options in the master’s degree program in English is a capstone experience which allows the student to synthesize and apply the knowledge and skills gained through the completion of the program in a substantial way. Examples of capstone experiences include, but are not limited to, the completion of a thesis or the formal public presentation of a paper at a professional meeting or departmental colloquium. All capstone experiences normally occur after the completion of 24 hours of coursework and must be approved by the Director of Graduate Studies.

**Final Examination**
A candidate presenting a thesis must pass a one-hour oral examination; a candidate presenting a creative project must pass a ninety-minute oral examination. The examination consists of a short thesis defense, but chiefly of questions covering the general history of English and American literature, not merely the coursework taken. A reading list of primary works designed to help the student prepare for these questions is available in the office of the Director of Graduate Studies in English.

A non-thesis student must pass a written examination, followed by a one-hour oral examination, both consisting of the same sort of questions as the examination taken by the thesis student.

**Residence Requirement**
There is no residence requirement for the MA, but students should attempt to pursue a full-time program whenever possible.

**Writing Concentration**
The master’s program with writing concentration is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry.

**Requirements**
The requirements for the writing concentration are the same as those for the thesis option above with the following exceptions:

**Coursework**
Writing students may substitute two 400-level writing courses for two 500-level courses. Students must take at least 9 hours in writing and 9 in literature, the remaining 6 to be selected from any English courses at the proper level. Of the courses in writing, at least 3 hours must be taken at the 500 level; additional 500-level courses are strongly recommended.

**Writing Project**
One of the following writing projects for six hours of credit:
- A thesis, using research to analyze some aspect of writing or rhetorical theory
- A creative project, such as a collection of poems or short stories, a short novel, a play, or a creative work of non-fiction prose

The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and the project director. In addition to the director, two other English Department faculty members will supervise and approve the project; at least one should be from the literature faculty.

**Final Examination**
The reading list may be modified by the MA examining committee, meeting as a body with the student, to reflect the candidate’s particular writing emphasis. However, most of the oral examination should focus upon the literature outlined in the original reading list.

**DOCTOR OF PHILOSOPHY**

**English Major**

**Requirements**
A student must successfully complete a program of study, normally six full semesters as outlined below, approved by the candidate’s committee or the Director of Graduate Studies in English.

**Coursework**
At least 54 semester hours beyond the BA (of which at least 24 semester hours must be beyond the MA) to include at least 21 semester hours at the 600 level; at least 15 semester hours at the 500 level or above (only 3 hours of 593 Independent Study may be applied toward the MA and 3 after the MA); a 3-hour course in teaching composition; and 15 additional hours at any level approved for graduate credit (including a maximum of 12 hours at the 400 level if approved by the Director of Graduate Studies).

Up to six of these additional hours may be taken in some cognate field or fields such as history, philosophy, French. These courses must be drawn from those approved for graduate credit. All other coursework must be in the English department. In this coursework, students must normally maintain a 3.5 GPA.

**Dissertation**
Twenty-four semester hours of dissertation. These represent the research for and writing of the dissertation. The research and dissertation will be directed by a faculty member of the department and approved by a doctoral committee of three or four other faculty members.
Language Requirement
A language requirement met in one of the following ways:

- Two languages approved by the Director of Graduate Studies in English. The requirement for each language may be fulfilled by (a) completion of French 302 or German 332 with a grade of B or better; (b) completion at the University of Tennessee, Knoxville, of any two courses on the 300 level or above in the foreign language or literature with at least a grade of B in each course; (c) passing of the regular PhD foreign language examination as currently administered at the University of Tennessee, Knoxville.

- One modern language approved by the Director of Graduate Studies in English. This requirement must be fulfilled by a passing grade on the language examination given by the University of Tennessee, Knoxville, and completion of two courses given in the foreign language at the 400 level or above, at least one course to be at the 500- or 600-level. A minimum grade of B must be received in each course.

- One modern language approved by the Director of Graduate Studies in English and intensive study of the English language. This requirement must be fulfilled by completion of (a), (b), or (c) for one foreign language; and completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509 History of the English Language (offered in alternate years only). For the other 3 hours, the student may either complete the history of the language sequence or choose other course in language taught in the Department of English at the 500- or 600-level and approved by the Director of Graduate Studies in English. These courses will not count toward the minimum number of courses for the PhD, and anyone electing this language option may not take the comprehensive examination in linguistics.

Examinations
A four-hour qualifying examination taken before the end of the first year of PhD coursework; this examination is given three times a year, with the MA written examination; a comprehensive written examination which may be divided as the department directs; see the English Department graduate brochure. The comprehensive examination is given twice a year, normally in March and September. Before a student may take it, he/she must have completed all coursework required. A student must also have met all requirements for foreign languages before beginning the first part of the examination.

Dissertation Defense
A one-hour examination on the dissertation and other related areas.

Residence Requirement
Two consecutive semesters as a full-time student. For students not on teaching assistantships, full-time consists of nine or more hours of coursework and/or dissertation hours each semester. For students on assistantships, full-time consists of at least six hours of courses and/or dissertation hours and three hours of teaching each semester.

GRADUATE COURSES

English (339)

Students enrolling in English graduate courses must first register in the office of the Director of Graduate Studies in 306 McClung Tower.

401 Medieval Literature (3) Reading and analysis of selected medieval literary masterpieces in modern English.

402 Chaucer (3) Reading and analysis of Canterbury Tales and Troilus and Criseyde in Middle English.

404 Shakespeare I: Early Plays (3) Shakespeare’s dramatic achievement before 1601. Reading and discussion of selected plays from romantic comedies, including Twelfth Night; English histories, including Henry IV; and early tragedy, including Hamlet.

405 Shakespeare II: Later Plays (3) Shakespeare’s dramatic achievement between 1601 and 1613. Reading and discussion of selected plays from great tragedies, including Othello; problem plays, including Measure for Measure; and dramatic romances, including The Tempest.

406 Renaissance Drama (3) English theatre problems 1590 and 1640 through a reading of representative plays by Shakespeare’s contemporaries: Marlowe, Webster, Jonson.

409 Spenser and his Contemporaries (3) Principal achievements in prose and poetry of sixteenth century authors; Spenser, Wyatt, Marlowe, More, Sidney, and Bacon.

410 Milton, Donne and their Contemporaries (3) Principal achievements in prose and poetry of first two-thirds of seventeenth century: poetry of Milton, Donne, Marvell; and prose of Browne, Bacon, Walton.

411 Literature of Restoration and Early Eighteenth Century: Dryden to Pope (3) Survey of English literature and culture from 1660 to 1745.

412 Literature of Later Eighteenth Century: Johnson to Burns (3) Survey of English literature and culture from 1745 to 1800.

413 Restoration and Eighteenth-Century Genres and Modes (3) A major genre or literary mode: drama, novel, poetry, non-fiction prose, satire, romance, or epic, written between 1660 and 1800. May be repeated.

414 Romantic Poetry and Prose I (3) Wordsworth, Coleridge, and Blake; readings from Lamb, De Quincey, and other prose writers.

415 Romantic Poetry and Prose II (3) Keats, Shelley and Byron; readings from Hazlitt, Peacock, and other prose writers.

416 Early Victorian Literature (3) May include poetry by Tennyson and the Brownings; prose by Carlyle, Newman, and Mill.

419 Later Victorian Literature (3) May include poetry by the Pre-Raphaelites, Arnold, Hopkins, and Hardy; prose by Arnold, Ruskin, and Carroll; plays by Gilbert and Wilde.

420 The Nineteenth-Century British Novel (3) Scott to Hardy.

421 Modern British Novel (3) Works from authors such as Joyce and Woolf through contemporary British fiction writers.

422 Women Writers in Britain (3) Literary consciousness and works of women writers in Britain. Topics vary: Marie de France, Margery Kempe, Aemilia Lanyer, Elizabeth Cary, Aphra Behn, Frances Burney, Mary Wollstonecraft, Mary Shelley, George Eliot, Virginia Woolf, and Doris Lessing. May be repeated. Maximum 6 hours. (Same as Women’s Studies 422.)

423 Colonial and Postcolonial Literature (3) Emphasis on historical and theoretical methodologies for reading colonial and postcolonial literature. May be repeated once with instructor’s consent.

431 Early American Literature (3) From earliest texts to 1830: exploration and discovery, Native American, colonial, revolutionary, and early national works.

432 American Romanticism and Transcendentalism (3) Prose and poetry of American Renaissance, from c. 1830 to end of the Civil War: Cooper, Poe, Hawthorne, Melville, Emerson, Thoreau, Stowe, Douglass, Whitman, and Dickinson.

433 American Realism and Naturalism (3) Literature from time of the Civil War to World War I: Twain, Howells, James, Jewett, Freeman, Crane, and Norris.

434 Modern American Literature (3) World War I to present.

435 American Novel before 1900 (3) From earliest sentimental novels through Brown and Cooper, and major figures to 1900: Hawthorne, Melville, Stowe, Clemens, and James.