GRADUATE COURSES

411 Fundamentals of Agricultural Extension (3) History, philosophy, organizational structure, clientele served, major areas of program emphasis, teaching methods, and relationships with other educational agencies. Graduate credit for non-majors only: Sp

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when study used University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only: E

521 Extension Program Planning (2) Methods of developing county extension programs: sources of essential basic information; determination of problems and needs of people, functions of lay people and various groups of extension workers. Use of committees, step-by-step planning procedures, coordinated county and state plans and characteristics of effective programs. Prereq: 411 or consent of instructor. Sp

522 Extension Teaching Methods (2) Teaching-learning methods and techniques applicable to extension work, interpersonal relationships, and effective evaluation. Prereq: 411 or consent of instructor. Sp

523 Extension Program Evaluation (1-3) Principles, techniques, and procedures of evaluating extension programs. Prereq: 411 or consent of instructor. Sp

524 Research Methodology (3) Social research design, hypothesis testing, sampling, survey construction, calculation, interviewing, data coding, basic descriptive and inferential statistics, and presentation of results. Prereq: 411 or consent of instructor. Sp

525 Curriculum Planning in Agricultural Education (3) Models and principles for developing curricula in agricultural education and scheduling of activities for planned instructional programs. Prereq: 435, 436 or consent of instructor. Sp

526 Agricultural Education for First-Year Teachers (2) Development of necessary knowledge needed for first-year teachers teaching agricultural education courses and conducting program of agricultural education in local communities. Prereq: 411 or consent of instructor. Sp

527 Adult Education and Strategies for Teaching (3) Psychological, philosophical, sociological/religious theories of adult education, methods and strategies for organizing classes and teaching adults. Prereq: 411 or consent of instructor. Sp

528 Advanced Techniques for Teaching Agricultural Economics (3) Teaching techniques, determining needed competencies, organizing and managing agricultural economics facilities. Prereq: 435, 436 or consent of instructor. Sp

529 Supervised Occupational Experiences in Agricultural Education (3) Practical work experiences in a variety of specialties for the development of special skills and techniques in agricultural education. Prereq: 435, 436 or consent of instructor. Sp

530 Special Topics in Agriculture and Extension Education (1-3) Current issues. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs. E

531 Extension History, Philosophy and Objectives (2) Historical and philosophical foundation of extension service in American agriculture, key figures, issues, legislative movement, farmer organizations and programs. Cooperative Extension Service, origin, legislation and growth of nature of present-day objectives and programs. Prereq: 411 or consent of instructor. Sp

532 Managing Extension Organizations, Programs and Personnel (3) Theory and principles of management for individual and organizational effectiveness. Prereq: 521, 531, or consent of instructor. Sp

533 Managing Extension Organizations, Programs and Personnel (3) Theory and principles of management for individual and organizational effectiveness. Prereq: 521, 531, or consent of instructor. Sp

534 Special Problems in Agricultural Education (1-3) Special research and/or special problems reported on by supervised independent study. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

Agricultural Economics and Rural Sociology

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREES

Agricultural Economics .. M.S., Ph.D.

Dan McMenemy, Head

Professors:

Badenhop, M. B. (Emeritus), Ph.D. .... Purdue
Brooker, J. R. (Liaison), Ph.D. ............ Florida
Cleland, C. L. (Emeritus), Ph.D. ....... Wisconsin
Eastwood, D. B., Ph.D. ..................... Tufts
English, B. C. (Emeritus), Ph.D. ........  Iowa State
Keller, L. H. (Emeritus), Ph.D. .......... Kentucky
Kilgore, T. H., Ph.D. ..................... Kentucky
Leuthold, F. O., Ph.D. ................... Wisconsin
McLeomore, D. E., Ph.D. ............... Clemson
McManus, R. (Emeritus), Ph.D. ....... Purdue
Martin, J. A. (Emeritus), Ph.D. ....... Minnesota
Mundy, S. D., Ph.D. .................... Tennessee
Orr, R. H., Ph.D. ....................... Illinois
Park, W. M., Ph.D. ..................... California Tech
Pentecost, B. H. (Emeritus), Ph.D. .... Tennessee
Ray, Daryl E. (Bernard Blasingame Chair of Excellence), Ph.D. ....................... Iowa State
Riley, John B., Ph.D. ..................... Oklahoma State
Roberts, R. K., Ph.D. ................... Iowa State
Sappington, C. B. (Emeritus), Ph.D. .... Illinois
Whaley, T. J. (Emeritus), Ph.D. ....... Purdue
Williamson, H., Ph.D. ................. Missouri

Associate Professors:

Jakus, Paul M., Ph.D. ................. NC State
Jensen, K. L., Ph.D. .................... Oklahoma State
Larson, J. A., Ph.D. ..................... Oklahoma State
Pompeii, G. K., Ph.D. ............... California (Davis)

Assistant Professor:

Jannenick, E. C., Ph.D. ............ Maryland

The Department of Agricultural Economics and Rural Sociology offers programs of graduate study leading to the M.S. and M.S. The doctoral program includes concentrations in agricultural marketing and price analysis, agricultural policy, farm management and production economics, natural resource economics, and rural development. The M.S. program may be completed under a thesis option with concentrations in agricultural economics or rural sociology. A non-thesis option is available with a concentration in agricultural economics only. For specific information, contact the department head.

THE MASTER'S PROGRAM

Thesis Option

A candidate for the master's degree must complete a minimum of 30 hours of graduate credit in courses approved by the student's master's committee. Six hours of thesis may be counted toward this requirement. At least 27 hours of graduate credit must be earned in courses numbered at or above the 500 level. In the agricultural economics concentration, 15 hours of graduate credit must be earned in courses numbered at or above the 500 level. 

THE MASTER'S PROGRAM

Thesis Option

A candidate for the master's degree who elects the thesis option must successfully complete:

1. A minimum of 30 hours of graduate credit in courses approved by the student's advisory committee. Six hours of thesis may be counted toward this requirement.
2. A minimum of 20 hours of graduate credit in courses numbered at or above the 500 level.
3. A minimum of 12 hours of graduate credit in courses numbered at or above the 500 level. The department requires a minimum of 6 hours taught from outside the department.
4. A minimum of 3 hours of graduate credit in coursework in either research methodology or statistics.
5. A final oral examination.

Non-Thesis Option

A candidate for the master's degree who elects the non-thesis option must successfully complete:

1. A minimum of 36 hours of graduate credit in courses approved by the student's advisory committee.
2. A minimum of 20 hours of graduate credit in courses numbered at or above the 500 level.
3. A minimum of 12 hours of graduate credit in courses numbered at or above the 500 level. The department requires a minimum of 6 hours taught from outside the department.
4. A minimum of 3 hours of graduate credit in coursework in either research methodology or statistics.
5. A creative component designed by the student and approved by the student's advisory committee for 3 hours of graduate credit.
6. A written and oral comprehensive examination.
Agricultural Economics

GRADUATE COURSES

432 International Agriculture Trade and Marketing (3) Real and monetary aspects of international trade and effect on agricultural commodity flows; partial equilibrium analysis of international trade in agricultural products; international marketing of agricultural products. Prereq: Intermediate Agricultural Economics or consent of instructor. F

430 Agricultural Policy (3) Values, goals and policy process. Economic rationale and effects of policy. Historical development and current characteristics of commodity, credit, food, and trade policy. Prereq: Intermediate Agricultural Economics or consent of instructor. Sp

442 Agribusiness Management (3) Applications of advanced decision analysis concepts and tools to analyze management decisions in the farm and nonfarm agribusiness settings. Case study work on strategic planning; assessing cost structure using budgeting and break-even analysis; evaluating profitability, liquidity, and solvency using financial statements; analyzing investment and financing alternatives using capital budgeting. Prereq: Farm Business Management and consent of instructor. F

450 Agricultural Industry Analysis and Forecasting (3) Analytical tools for decision making in agricultural sectors including: crop and livestock supply and demand; farm nível and household economic modeling; market forecasting. Analysis of economic forecasting tools for influencing natural resource use or improving environmental quality. Prereq: Introductory Economics.

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

501 Registration for Use of Facilities (1-5) Required for student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be included in degree requirements. Undergraduate repeated, S/N only. E

505 Microeconomic Analysis (3) Theory of utility maximization and demand, production, cost and price determination; money and supply; price in product and market factors; efficiency and welfare. Prereq: Calculus and Intermediate Microeconomics or equivalent. F

524 Econometric Methods in Agricultural Economics (3) Application of statistical methods to agricultural economic models; estimation of supply, demand and production functions, microeconomic forecasting models; interpretation of results. Prereq: Basic Econometrics and Correlation Methods or consent of instructor. F

525 Agribusiness Operations Research Methods (3) Applications of operations research methods and concepts to agribusiness, with theoretical background and applied considerations of each technique with emphasis on applications. Computer and other applications of each technique for relevant agribusiness problems. Prereq: Basic Calculus and 524. Sp

530 Agricultural Policy Analysis (3) Evaluation of public policy as related to agricultural industry and rural areas. Prereq: 505 and Economics 513 or consent of instructor. F

542 Advanced Agribusiness Production Decisions (3) Theoretical and empirical models in agricultural resource allocation; evaluation of both static and dynamic economic issues; decision theory with application to agricultural firms; strategic impact of firm decisions on industry. Prereq: 505 and/or equivalent. Sp

550 Advanced Agribusiness Marketing (3) Use of economic concepts in agribusiness marketing decisions: Analysis of agricultural markets; buyer behavior in food and fiber markets; competitive environment. Profitability, analysis of marketing and distribution decisions; market planning and strategy, product evaluation and new product introduction; pricing decisions. Prereq: 505, Regression and Correlation Methods or equivalent. Sp

570 Advanced Natural Resource Economics (3) Analysis of natural resource allocation issues. Applied welfare economics, external effects and evaluation of public policy. Prereq: 470 and Economics 511 or consent of instructor. F

593 Special Topics in Agricultural Economics (1-3) Topics to be assigned. Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs. S/N only. E

595 Professional Internship (0) Supervised internship experience with appropriate agribusiness firm.

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

620 Advanced Quantitative Methods (3) Discussion and evaluation of advanced statistical and mathematical techniques in applied agricultural economics research. Prereq: 522, 524, and Economics 681-82, or consent of instructor. Sp,A

640 Agricultural Supply Analysis (2) Critical evaluation of both theoretical basis and empirical procedures used for estimating agricultural supply relationships using regression techniques, production functions, mathematical programming, firm growth models and simulation in supply analysis. Prereq: 540 or consent of instructor. F,A

652 Consumer Demand and Food Consumption (2) Simultaneous consumer decision making; food demand. Constraints on demand. Complete demand system models. Prereq: Economics 511 and 512 or consent of instructor. Sp,A

670 Seminar in Natural Resource Economics (2) Issues in natural resource economics. Current literature, evaluation of theory, methodology and public policy as related to allocation of natural resources. Prereq: 570 or consent of instructor. Su,A

Rural Sociology

GRADUATE COURSES

480 Technological and Community Change (3) Analysis of communication processes whereby new technology spreads within a farm population and analysis of social institutions related to change in rural communities. Prereq: Rural Sociology or consent of instructor. (Same as Sociology 480). Sp

580 Advanced Rural Sociology (3) Application of sociological concepts and theory to analyze changing structure and function of rural life in U.S. and developing countries. Demographic changes, rural and community indicators, and rural development processes. Prereq: 380 or equivalent. (Same as Sociology 580). Sp

593 Special Topics in Rural Sociology (1-3) Current sociological issues involving application of sociological theory. Prereq: 380 or consent of instructor. May be repeated. Maximum 6 hrs. E

Agriculture

(College of Agriculture Sciences and Natural Resources)

GRADUATE COURSES

507 Professional Development Seminar (1) Planning and executing graduate research programs; ethics and professionalism; graduate program procedures and resources. (Same as Animal Science 507, Biosystems Engineering 507, Biosystems Engineering 507, Biosystems Engineering 507, Ornamental Horticulture and Landscape Design 507, and Plant and Soil Sciences 507.) S/N only. F

509 Scientific Communication (1) Application of speaking, writing and organizational skills in preparation of research proposals, slide presentations, abstracts, web sites and vitae. (Same as Animal Science 509, Food Science and Technology 509, Ornamental Horticulture and Landscape Design 509, and Plant and Soil Sciences 509.) F

512 Teaching Internship in Agriculture (1) Supervised experience in teaching; test preparation and evaluation of agriculture students. May be repeated. Maximum 2 hrs for M.S. students; 4 hrs for Ph.D. students.
Animal Science

(College of Agricultural Sciences and Natural Resources and College of Veterinary Medicine)

MAJOR DEGREES

Animal Science M.S., Ph.D. Veterinary Medicine D.V.M.

Kelly Robbins, Head

Professors:
Barth, K. M. (Emeritus), Ph.D. ...... Rutgers Bell, M. C. (Emeritus), Ph.D. ...... Oklahoma State Bletnar, J. K. (Emeritus), Ph.D. ...... Ohio State Chamberlain, C. C. (Emeritus), Ph.D. ...... Iowa State

Associate Professors:

Assistant Professors:

The Department of Animal Science offers graduate programs leading to the Master of Science and Doctor of Philosophy with a major in Animal Science. At the M.S. level, areas of concentration are nutrition, breeding, physiology (reproductive, mammary, and metabolic), and management with specialization towards beef cattle, dairy cattle, swine, and poultry. Since the department is also a part of the College of Veterinary Medicine, the areas of anatomy, systemic physiology (blood, cardiovascular, and neural), and histology are also available. The Ph.D. program offers concentrations in animal nutrition, animal breeding, animal physiology, animal anatomy, and animal management. For specific information, contact the department head.

All first year graduate students are required to enroll in 507 and 509. All first- and second-year students are required to enroll in 596 each fall and each spring term.

THE MASTER'S PROGRAM

For admission to the M.S. 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 M.S. 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 6 hours of graduate coursework must be completed the first term with a minimum grade-point average of 3.0 for admission to the M.S. program.

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 is 1 hour of Agriculture 512 and at least 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 Student 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 chairman of the committee, and a minimum of two other faculty members, one of whom must be outside the Animal Science Department. The advisory committee approves the student's coursework and research plan, and conducts the final oral examination which consists of a comprehensive oral examination and a defense of the thesis.

THE DOCTORAL PROGRAM

The doctoral program requires a minimum of 48 semester hours of coursework beyond the B.S. and a minimum of 24 hours of doctoral research and dissertation. The 48 hours of coursework must include:
1. A minimum of 16 hours in related fields outside of animal science.
2. At least 24 hours must be 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 Animal Science 581 and 9 hours at the 500 or 600 level in two non-management concentration or closely related areas.
3. A minimum of 1 hour of Agriculture 512 in addition to that required at the M.S. level.
4. 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 chairman. The student and the major professor select a program of study depending on the student's area of concentration and professional goals. 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

420 Advanced Reproduction (3) Colligation, evaluation, and preservation of ova, spermatogenesis and embryos; application of methods of natural and artificial techniques of artificial insemination and embryo transfer; herd sire and dam evaluation; pregnancy determination; gestational and parturition; infertility; recent advances in hematology. Prereq: 320 or equivalent. 1 hr and 2 labs. F

430 Advanced Ration Formulation (2) Advanced ration formulation for beef and dairy cattle, sheep, swine, poultry, laboratory, zoo, and companion animals. Mathematical and computer applications to solving complex problems. Prereq: 330 or equivalent and introductory computer science course. 2 labs. Sp.

481 Beef Cattle Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into beef production and management programs. Prereq: Completion of intermediate level of livestock production and management course. 4 hrs. F

482 Dairy Cattle Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into dairy production and management programs. Prereq: Completion of intermediate level of livestock production and management course. 4 hrs. S

483 Pork Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into pork production and management programs. Prereq: Completion of intermediate level of livestock production and management course. 4 hrs. S

484 Poultry Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into poultry production and management programs. Prereq: Completion of intermediate level of livestock production and management course. 4 hrs. S

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when the student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

507 Professional Development Seminar (1) Game as Agriculture 507, Biosystems Engineering 507, Biosystems Engineering Technology 507, Food Sciences and Tech-
509 Scientific Communication (1) (Same as Agriculture 509, Food Science and Technology 509, Ornamental Horticulture and Landscape Design 509, and Plant and Soil Sciences 509.) F

511 Special Problems in Animal Science (1-4) Prereq: Consent of instructor and department head. May be repeated. Maximum 9 hrs. E

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


630 Animal Nutrition and Metabolism (4) Comparative digestive physiology, digestion, absorption and metabolism of nutrients in ruminant and nonruminant species. Concepts and methodologies of animal growth and nutrition requirements: estimation and deficiencies of nutrients. Prereq: Animal Nutrition, Feeds, and Ration Formulation or consent of instructor. F

635 Rumination (2) Anatomy, physiology, and microbiology of ruminant systems: microbial fermentation and metabolism of polysaccharides, lipids and nitrogen. Prereq: 530 or consent of instructor. F

552 Anatomy of Domestic Carnivores (4) Gross dissection by systems and regions of dog with comparison to cat. Prereq: Consent of instructor. 1 hr and 3 labs. (Same as Comparative and Experimental Medicine–Veterinary Medicine 552.) Sp

551 Mammalian Organology (3) Microscopic study of structure of organs and major organ systems. Prereq: Embryology, histology and/or consent of instructor. 2 hrs and 1 lab. (Same as Comparative and Experimental Medicine–Veterinary Medicine 551.) Sp

554 Comparative Hematology (3) Morphology, physiology and development of blood and blood forming organs: similarities and differences of major domestic and laboratory species. Prereq: Undergraduate hematology or consent of instructor. 2 hrs and 1 lab. (Same as Comparative and Experimental Medicine–Veterinary Medicine 554.) Sp, A

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; covariances, treatment arrangements, mean separation and regression. Prereq: Plant and Soil Sciences 471 or equivalent; knowledge of software package on micro- or mainframe computer. (Same as Plant and Soil Science 571.) Sp

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. Prereq: 571 or equivalent. 2 hrs and 1 lab. F

581 Advanced Livestock Management (3) Objective functions to evaluate alternative livestock production management policies. Systems approach to analysis and integration of reproductive management programs, genetic improvement programs, alternative feeding systems, and herd health programs. Consideration of time, risk, and uncertainty in livestock production. Tools, linear programming, as aids in decision-making and resource allocation.

566 Seminar (1) Advanced topics in animal science, Required of all first- and second-year graduate students. May be repeated. Maximum 4 hrs. (Same as Animal Science 566.) F, Sp

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

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

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

633 Advanced Mineral-Vitamin Nutrition (4) Chemical forms, digestion, absorption, intermediary metabolism, deficiencies, excessive intake of minerals and vitamins. Prereq: 533 or 534, and Biochemistry and Cellular and Molecular Biology 410 or Nutrition 511 or consent of instructor. Sp, A

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

652 Disorders of the Endocrine System (2) Pathological and physiological aspects of diseases; endocrine glands of various animal species. Prereq: 521 or consent of instructor. (Same as Comparative and Experimental Medicine–Veterinary Medicine 652.) Sp, A

580 Animal Nutrition and Metabolism (4) Comparative digestive physiology, digestion, absorption and metabolism of nutrients in ruminant and nonruminant species. Concepts and methodologies of animal growth and nutrition requirements: estimation and deficiencies of nutrients. Prereq: Animal Nutrition, Feeds, and Ration Formulation or consent of instructor. F

581 Advanced Livestock Management (3) Objective functions to evaluate alternative livestock production management policies. Systems approach to analysis and integration of reproductive management programs, genetic improvement programs, alternative feeding systems, and herd health programs. Consideration of time, risk, and uncertainty in livestock production. Tools, linear programming, as aids in decision-making and resource allocation.

566 Seminar (1) Advanced topics in animal science, Required of all first- and second-year graduate students. May be repeated. Maximum 4 hrs. (Same as Animal Science 566.) F, Sp

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

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

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

633 Advanced Mineral-Vitamin Nutrition (4) Chemical forms, digestion, absorption, intermediary metabolism, deficiencies, excessive intake of minerals and vitamins. Prereq: 533 or 534, and Biochemistry and Cellular and Molecular Biology 410 or Nutrition 511 or consent of instructor. Sp, A

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

652 Disorders of the Endocrine System (2) Pathological and physiological aspects of diseases; endocrine glands of various animal species. Prereq: 521 or consent of instructor. (Same as Comparative and Experimental Medicine–Veterinary Medicine 652.) Sp, A

Animal Science-Veterinary Medicine

See College of Veterinary Medicine and Comparative and Experimental Medicine

Anthropology

(Major of Arts and Sciences)

MAJOR

Anthropology ........................................... M.A., Ph.D.

Jan F. Simek, Head

Professors:

Bass, William M. (Emeritus), Ph.D. Pennsylvania
Faulkner, Charles H., Ph.D. ......................... Indiana
Jantz, Richard L., Ph.D. ......................... Kansas
Kippel, Walter E., Ph.D. ......................... Missouri
Logan, Michael H., Ph.D. ......................... Penn State
Rogers, Paul W. (Emeritus), Ph.D. ............ Texas A&M
Simek, Jan F., Ph.D. ......................... SUNY Binghamton
Underwood, Margaret C. (Emerita), Ph.D. ...... Yale

Associate Professors:

Harrison, Ira E., Ph.D. ......................... Syracuse
Howell, Benita J., Ph.D. ......................... Kentucky
Kingsberg, Lyle, Ph.D. ......................... Northwestern
Kramer, Andrew (Liaison), Ph.D. ............ Michigan
Schoedl, Gerald F., Ph.D. ......................... Washington State

Assistant Professor:

Marks, Murray K., Ph.D. ......................... Tennessee

Research Associate Professor:

Chapman, J., Ph.D. ............................ North Carolina

Research Assistant Professors:

Elam, J. Michael, Ph.D. ......................... Missouri
Frankenberg, S. (Curator), Ph.D. .............. Northwestern

The Department of Anthropology offers both the M.A. and Ph.D. degrees with concentrations in archaeology, biological anthropology, cultural anthropology, and zooarchaeology. Additional information on the Anthropology graduate program may be obtained from the departmental brochure or by contacting the Anthropology Department.

THE MASTER'S PROGRAM

Students wishing to enter the Master of Arts degree 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).

All prospective M.A. students must make formal application to The University of Tennessee, Knoxville Graduate School. Copies of the application form, transcripts, and GRE scores that are sent to The Graduate School 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, 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 Committee, Department of Anthropology, SSH 250, University of Tennessee, Knoxville, TN 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 firstyear studies, M.A. students should plan to begin their studies in the fall semester.

M.A. REQUIREMENTS

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

1. Selection of an M.A. 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.

2. 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.

3. During the first year, comprehensive Graduate Evaluation Examinations (GEEs) are required of all M.A. students and are based on the content of the core courses. The exams are given as the final examination in each core course (during regularly-scheduled final periods) and are graded by all faculty within the appropriate subdiscipline for each course. At the end of the first year, all M.A. 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.

4. All M.A. 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 501 in the Fall semester of each year and fulfill all requirements for the course defined by the instructor. Materials covered by visiting lecturers may appear in the GEE.

5. A graduate-level introductory statistics course, usually Statistics 537.

6. 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).

7. 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.

8. Two copies of the thesis are required by The Graduate School. In addition, bound copies of the thesis are to be provided to the department and to all members of the student’s M.A. committee.

In addition to the requirements listed above, M.A. 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.

THE DOCTORAL PROGRAM

In addition to The Graduate School requirements, requirements for the Ph.D. degree with a major in Anthropology, in the appropriate sequence of completion, are as follows:

**Admission:** Admission to the Ph.D. program is contingent upon completion of ALL requirements prior to that level. Master’s thesis candidates at UTK who are conditionally accepted into the Ph.D. program can enroll as doctoral students the semester following conferral of the M.A. degree.

**Residence and Coursework:** Every potential Ph.D. candidate must complete two consecutive semesters of full-time residence prior to taking the oral comprehensive examination. The student must complete the minimum coursework requirements of The Graduate School, 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.

**Statistical Demonstrations:** 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.

**Doctoral Comprehensive Examination:** A written and oral comprehensive exam must be taken by all students before proceeding to candidacy. Students must pass the written examination before proceeding to oral examination. The written examination will be given in three sections and be given by the student’s committee. All three sections must be taken within seven consecutive days.

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

2. **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 Graduate School, the student is admitted to candidacy for the Ph.D. 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 defend a minimum of 24 hours in Anthropology 600 and maintain continuous registration until the dissertation is approved. 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 explain on the nature and significance of his/her contribution to anthropological knowledge as set forth in the dissertation.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.A. program in Anthropology is available to residents of the states of Louisiana (concentration in zooarchaeology only), Virginia (concentration in zooarchaeology or cultural anthropology), Delaware, and West Virginia. The Ph.D. program is available to residents of Alabama, Louisiana, Mississippi, South Carolina, or West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

411 Principles of Cultural Anthropology (3) Exploration and illustration of major concepts, theories, and methods in cultural anthropology, with application to analysis of ethnographies. Prereq: 130 or 140.

412 Linguistic Anthropology (3) Basic linguistic concepts applied to research in cultural anthropology: investigation of relationships between language and culture. Prereq: 130 or 140.

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

414 Dynamic Anthropology (3) Exploration and illustration of major concepts, theories, and methods in cultural anthropology, with application to analysis of ethnographies. Prereq: 130 or consent of instructor.

415 Cultural Anthropology of Power and Politics (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 orders and systems within modern states. Prereq: Cultural anthropology or consent of instructor.

431 Ethnographic Research (3) Conceptual and practical exploration of methods and techniques cultural anticlo
513 Rural Studies in Anthropology (3) Theory, method, and ethnographic research on agricultural societies and aspects of traditional agrarian groups in U.S. and peasant societies. Prereq: Cultural area course or equivalent. May be repeated. Maximum 6 hrs.

514 Anthropology of Development (3) Application of anthropological theory, 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 stratification along lines of rank, caste, race, ethnicity, class, and role inequality engendered by sex role structure. Consideration of social distinctions before and after rise and consolidation of modern world systems. Intersections of race and ethnicity with class and gender.

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

521 Laboratory Studies in Zooarchaeology (3) Examination and analysis of faunal remains from U.S. and field sites in the eastern U.S. Recommended Prereq: Prehistory.

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

523 Fieldwork in Archaeology (3-9) Practicum in surveying, excavating, and analysis of archaeological data. Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs.

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 and historic resources. Legal, ethical, and social issues of federal and state governments, public interest groups, and professional archaeologists in conducting federally sponsored archaeological research. May be repeated. Maximum 6 hrs.

563 Lithic Artifactual Analysis (3) Methods for analyzing prehistoric and historic lithic artifacts. Use of typological and microlithic analysis, replication and experiment. May be repeated. Maximum 6 hrs.

580 Advanced Human Variation (3) Genetic and morphological variation among extant human populations. Anthropology of variation in physical and structural variation and social and cultural diversity. May be repeated. Maximum 6 hrs.

582 Paleoanthropology (3) Fossil record of prehistoric and historic human skeletal remains. Determination of age, sex, and race of fossil bone and processing of reports for legal medicine. 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 Anthropometry (3) Techniques of measuring and describing skeletal material and human subjects: practical applications to growth, nutrition, and human engineering. Prereq: Consent of instructor.

589 Anthropological Genetics (3) Application of population and quantitative genetic theory to study of human and nonhuman primate populations. Prereq: Consent of Instructor.

590 Method and Theory in Biological Anthropology (3) Current methods of analysis in biological anthropology. May be repeated. Maximum 6 hrs.

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. Prereq: 410 or equivalent.

611 Theory in Cultural Anthropology (3) Critical evaluation of current issues in theory and data interpretation, primarily for doctoral students in cultural anthropology.

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

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

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

695 Gross Human Anatomy (3) Skeletal, muscular, and cardiovascular systems. Dissection of cadavers. Prereq: 480 or Human Biology. 5 hrs and 5 labs.

Architecture (College of Architecture and Design)

MAJOR

DEGREE

Architecture ................................. M.Arch.

Professors:

Anderson, G., M.Arch. ....................... Illinois
Conley, G. (Emeritus), B.Arch. ............. Harvard
Davis, Marleen K., M.Arch. ................. Pennsylvania
Grier, F., M.Arch. ......................... Pennsylvania
Kaplan, M., M.Arch. ...................... Harvard
Kelso, R. M., M.S. ........................ Tennessee
Kerr, R. A., D.Sc. ......................... Southern Cal
Kinzy, S. A., Ph.D. ......................... SUNY (Buffalo)
Lauer, W. J. (Liaison), M.S.Arch. Eng. ... Iowa State
Lester, A. J. (Emeritus), M.Arch. ........... Virginia
Lizor, P., Ph.D. ............................. Pennsylvania
Moffett, M. S., Ph.D. ..................... MIT
Raburn, J. S., M.A. ......................... Texas
Robinson, M., M.Arch. .................... Pennsylvania
Rudd, J., W., M.A. ......................... Northwestern
Shell, W. S., M.S.Arch. ..................... Columbia
Watson, J. S., M.Arch. .................... Pennsylvania
Wodehouse, L. M. (On leave), Ph.D. ...... St. Andrews
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.

**Admission Requirements**

In addition to meeting the Graduate School'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 a regionally accredited college or university is required. International applicants must have an equivalent 4-year degree and a 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 a separate application for Architecture including 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. 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 with a separate application 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.

**Degree Requirements**

Track 1 requires a minimum of 48 semester hours of undergraduate preparation and 60 semester hours of graduate coursework, taking approximately 3 ½ 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 30 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. Each 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.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain graduate programs at UT Knoxville on an in-state tuition basis. The M.Arch. program in Architecture is available to residents of the states of Delaware, Kentucky, or West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

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.

405 Descriptive Analysis of Historic Buildings (3) - Identification and analysis of characteristic elements of buildings from various architectural periods. American architecture. Survey techniques.

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

413 Tennessee Architecture (3) - History of settlement patterns and building in Tennessee. Reading assignments, lectures, discussion, and field trips. Historical research using primary material.

414 History of Architectural Technology (3) - Building materials and construction techniques from antiquity to present.

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

417 The International Style (3) - Survey of architecture of early modern movement, primarily in Europe and America. 1920-1940.

419 American Architecture I (3) - North American architecture from arrival of immigrants in 1607 to 1880.

420 American Architecture, 1840-1940 (3) - Stylized periods from Gothic Revival through 19th century.

421 History of Landscape Architecture (3) - Intellectual, societal, and geographical influences that provide theoretical basis for design throughout history. Selected examples of landscape architecture analyzed in terms of design.

422 Modern East European Architecture (3) - Twentieth century architecture in Russia, Czechoslovakia, Poland, Hungary, East Germany, Romania, Bulgaria, Yugoslavia.

425 Special Topics in Architecture (1-6) - Faculty initiated courses. Topic, Jury, Prereq: Consent of Instructor. May be repeated. Maximum 12 credit hours. E

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: Computer Applications in Design I or consent of instructor. Sp

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. Sp

443 Building Energy Analysis (3) - Balancing heat flow through exterior skin of residential and small and large commercial buildings. Climate evaluation. Site planning, building size and orientation, window wall treatment, infiltration control, and other design elements. Energy use quantification methods and economic analysis of energy efficient design. Frontal and architectural program analysis of external and internal load dominated buildings. Prereq: 431.

444 Advanced Environmental Control Systems (3) - In-depth analysis of innovative concepts in design of heating, ventilating, and air conditioning. Prereq: 431.

445 Advanced Lighting (3) - In-depth analysis of innovative concepts in design of lighting. Prereq: 431.

453 Architectural Development (3) - Principles and practice of architectural development. Impact of economics, urban policy, and urban policy on 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. E

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. S/NC only. E

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

507 Seminar in Contemporary Architectural Theory (3) - Readings, discussions, lectures in contemporary architectural thought. Principles underlying cultural character of contemporary architecture. In-depth analysis of selected contemporary examples and their contributions to architectural theory and design.

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 use and expression of building.

511 Environmental Influences (3) - Modern environmental issues influencing regional character of architecture. Natural forces associated with these forces, cultural interpretation and response regarding importance and impact.

513 Cultural Aesthetics (3) - Principles underlying cultural character of architecture. Role of social, political, and economic forces which influence interpretation of factors creating building's character.

514 Seminar in Ethical Imperatives (3) - Social, cultural, philosophical, and moral issues which impact professional responsibilities. Attitudes, values, and ideas that influence formation of professional 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 (1-9) Student or instructor-initiated course. May be repeated. Maximum 9 hrs. S/NCR or letter grade.


528 Topics in Architectural History and Theory (3) Prerequisites: Architectural Design Studio: Building Groups/Complexes (5). Investigations analyzing cultural and contextual influences and precedents in architectural form, space and structure. Prereq: Consent of instructor.

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

541 Representation III—Model Making (1-3) Model making as representation: concept models, process models and presentation models. Reinforcement of previous representational skills and knowledge.

542 Representation IV—Alternatives (1) Investigations of alternative representations: plans, sections, axonometrics, isometrics. Reinforcement of previous representational skills and knowledge. Prereq: Consent of instructor.

551 Research Methods (3) Quantitative and qualitative methods of research in architectural inquiry. Systematic study and application of research techniques including hypothesis generation, hypothesis testing, and identification of techniques and methodologies and applications for architectural research and scholarship.

553 Advanced Topics in Architectural Technology (3) Prerequisites: Architectural Design Studio: Building Groups/Complexes (5). In-depth investigations and analysis of architectural theory, technology, lighting, structure, environment, mechanical, and other architectural technologies. Prereq: Consent of instructor.

562 Professional Practice (3) Management and organization of 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 professionals.

571 Architectural Design Studio: Building Groups/Complexes (5) Investigations analyzing cultural, urban, and contextual influences and precedents informing architectural form, space and structure in communal complex of buildings. Design of residential, recreational, educational, religious and communal facilities comprising distinctive/individual and modular/repetitive units. Prereq: Consent of instructor.


591 Foreign Study (1-9)

592 Off-Campus Study (1-9)

593 Independent Study (1-9)

Art (College of Arts and Sciences)

MAJOR DEGREE

Art M.F.A.

Norman Magden, Head

Professors:
Blair, Sandra J., M.F.A. Wisconsin
Brake, P. M., M.F.A. Yale
Clarke, R.A. (Emeritus), M.S. Wisconsin
Cleaver, Dale R. (Emeritus), Ph.D. Chicago
Daehnert, R. H. (Emeritus), M.F.A. Wisconsin
Darrow, J. F., Ed.D. Illinois State
Falsetti, Joseph S. (Emeritus), M.S. Ohio State
Goldenstein, M. B., M.F.A. Nebraska
Kennedy, William C., M.F.A. Wisconsin
Lee, B., M.F.A. Yale
Leland, W. E., M.F.A. Tennessee
Livingston, P. R., M.F.A. Wisconsin
Lyons, B. (Liaison), M.F.A. Arizona State
Magden, Norman, Ph.D. Case Western Reserve
Martinson, Fred, Ph.D. Chicago
Metos, Susan E., M.F.A. Michigan State
Moffatt, F., Ph.D. Chicago
Peacock, D., M.F.A. Iowa
Riesing, T. J., M.F.A. Nebraska
Stewart, F.C., M.F.A. Claremont
Yates, S., M.F.A. North Carolina (Greensboro)

Associate Professors:
Habel, Dorothy, Ph.D. Michigan
Hilles, Timothy, Ph.D. Penn State
LeFevre, Richard (Emeritus), M.F.A. Rochester IT
Neff, A., Ph.D. Pennsylvania
Staples, Carolyn, M.F.A. Michigan State
Wilson, D., M.F.A. California (San Diego)

Assistant Professors:
Brogden, Sally B., M.F.A. NY State College of Ceramics (Alfred)
Evenson, Kevin, M.F.A. Ohio State
Smith, Peter, M.F.A. RISD

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, sculpture, and watercolor. Internship studies are available with consent of the faculty.

THE MASTER’S PROGRAM

To become a candidate, the applicant must be admitted by The Graduate School and approved by the Department of Art. In addition to the admission requirements of the Grad School, the Department of Art specifically requires the following:

1. A detailed letter of intent including statement requesting assistantship, if desired.
2. Three letters of recommendation from former professors or professionals in the field.
3. An undergraduate major in art or equivalent proficiency.
4. A portfolio to be evaluated by the faculty. Further information is available by writing to the Department of Art.

M.F.A. Requirements

A minimum of 60 hours is required:
1. Successful completion of 20 hours of studio in a concentration area. An inter-disciplinary 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.)

2. A minimum of 9 hours of graduate level academic (non-studio) courses of which at least 6 hours are to be in art history.

3. Eleven hours of electives which may consist of any combination of courses offered by the University or the graduate credit.

4. Art 589, Project in Lieu of Thesis (20 hours). A third year of semi-independent study. Student must have completed all other coursework prior to registration.

The candidate’s committee will consist of a minimum of 3 members and a maximum of 6 members and will be appointed prior to registration for 599. The candidate’s committee must consist of one faculty member from the candidate’s concentration area (designated as chairperson) and one 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 M.F.A., the student must produce an exhibition and, in the presence of that work, must satisfactorily complete an oral examination.

Academic Standards

1. First-year evaluation: At the end of the first 2 semesters in residence, the student must present a portfolio for evaluation by the faculty and receive permission to continue in the program.
2. 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.
3. 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.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.F.A. program in Art is available to residents of the states of Alabama (concentration in watercolor only), Arkansas or Kentucky (concentration in graphic design only) as established by the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE MINOR IN THE HISTORY OF ART

A graduate minor in Art History may be arranged with consent of the student’s committee, the instructors involved, and the Graduate School. Prerequisite is an undergraduate Art History minor, its equivalent, and reading knowledge of French, German, or Italian, unless waived by the Art History faculty.
Art

GRADUATE COURSES

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 campus. Prereq: 481 and 482, and consent of instructor. May be repeated. Maximum 12 hrs. (Same as Anthropology 484.)

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

502 Registration for Use of Facilities (3-18) Required for the student not otherwise registered during any semester when student uses University facilities and/or office hours before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

507 Professional Practices: Teaching Internship (1) Individual study in development of skills and methodology in teaching studio courses. For students who are not G.T.A.s. Prereq: Consent of instructor. May not be used toward degree requirements. May be repeated. S/NC only.

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. 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 hrs.

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 hrs. S/NC only. E
Art Media Arts

GRADUATE COURSES


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: Introduction to Cinematography as Art and Media Arts Portfolio Review or consent of instructor. May be repeated. Maximum 9 hrs.

436 Video Art (3) Continued development of concepts and techniques for creation of video works as art form: individual projects. Prereq: Introduction to Cinematography as Art and Media Arts Portfolio Review or consent of instructor. May be repeated. Maximum 9 hrs.

437 Special Topics in Art History (3) Student- or instructor-initiated course offered at convenience of department. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

438 Special Topics in Media Arts (3) Student- or instructor-initiated course offered at convenience of department. May be repeated with consent of department. Maximum 9 hrs.

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

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

451 Photography (2-6) May be repeated. Maximum 10 hrs.

452 Photography II (2-6) May be repeated. Maximum 10 hrs.

453 Media Arts I (2-6) May be repeated. Maximum 10 hrs.

454 Media Arts II (2-6) May be repeated. Maximum 10 hrs.

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

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

595 Visiting Artist Seminar (2-6) Contemporary art issues by different visiting artists. May not be used toward art history requirement. Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs.

597 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by graduate faculty. May be repeated. Maximum 20 hrs. S/NC only. E

Art Painting

GRADUATE COURSES

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


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 hrs.

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

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

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

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

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. Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs.

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 hrs. S/NC only. E

Art Printmaking

GRADUATE COURSES

462 Intaglio III (2-6) Exploration of individual projects through advanced color printing methods and combinations with other print media. Prereq: Intermediate Intaglio or consent of instructor. May be repeated. Maximum 12 hrs.

463 Lithography III (3-6) Exploration of individual projects through advanced lithographic methods in combination with other print media. Prereq: Intermediate Lithography or consent of instructor. May be repeated. Maximum 12 hrs.

464 Screen Printing III (3-6) Individual development of screen printing problems and techniques: development of images and personal concept. Prereq: Intermediate Screen Printing or consent of instructor. May be repeated. Maximum 12 hrs.

561 Printmaking I (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods and monoprint. Prereq: 560. May be repeated. Maximum 10 hrs.

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. May be repeated. Maximum 10 hrs.

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. Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs.

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 hrs. S/NC only. E

Art Sculpture

GRADUATE COURSES

441 Advanced Sculpture (3-6) Individual development of sculptural problems and techniques. Prereq: 6 hrs. of 300 level sculpture. May be repeated. Maximum 12 hrs.

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 hrs.

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

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

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. Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs.

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 hrs. S/NC only. E

Arrowmont

GRADUATE COURSES

Courses listed below offered periodically only at the Pi Beta Phi Arrowmont School of Crafts, Gatlinburg, Tennessee. Courses may be repeated. Upon admission to the M.F.A. program at UT Knoxville, a student may apply certain graduate courses taken at Arrowmont toward the degree, subject to the approval of the student’s graduate committee.

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/Watercolor (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.
Students may elect either the thesis or the non-thesis option. Students in both programs are required to take 511. The master's program with thesis will include a minimum of 30 semester hours of approved graduate credit in speech/language pathology or a minimum of 33 semester hours of approved graduate credit in audiology, including 6 hours of 500 credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. At least two-thirds of these total hours must be at the 500 or 600 level, including no more than 6 hours of thesis and no more than 6 hours of practicum. Students in the non-thesis option program must present a total of 36 semester hours in the speech/language pathology program or 39 semester hours in the audiology program of approved graduate credit and pass a final written examination.

THE DOCTORAL PROGRAM

The Ph.D. program 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, deviant, 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:

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

The program will normally consist of three or more calendar years of graduate study beyond the master's degree with the first year being devoted primarily to formal coursework and the last year to full-time research culminating in the doctoral dissertation. The total program is a minimum of 60 semester hours, including a minimum of:

1. 24 semester hours in dissertation 600.
2. 2 semester hours in a research tool.
3. 6 semester hours in a cognate area outside the department.
4. 24 semester hours in 600-level coursework within the department of which:
   a. a minimum of 6 semester hours in the topic of major interest;
   b. a minimum of 6 semester hours in topic(s) of related interest;
   c. 3 semester hours in 611; and
   d. 3 semester hours in supervised teaching experience.
5. A comprehensive examination to demonstrate knowledge in the concentration area and an examination of research competence.
6. A final oral examination.

ACADEMIC: COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.A. program in Audiology is available to residents of the state of South Carolina. The Ph.D. program in Speech and Hearing Science is available to residents of the state of Arkansas. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES

411 Stuttering (3) Nature, appraisal and treatment. Prereq: 304 or consent of instructor.
433 Observation of Clinical Practice (1) Prereq: Speech and Language Development, Articulation Disorders, or consent of instructor.
434 Clinical Practice in Speech-Language Pathology II (1-4) Prereq: 333 and consent of instructor. Enrolment for fewer than 2 hrs must have prior departmental approval.
455 Problems in Speech Pathology (1-3) Prereq: Consent of instructor.
494 Aural Habilitation/Rehabilitation of the Hearing Impaired (3) Psychosocial aspects, amplification components/characteristics, assistive devices, speech acoustics, speech perception, speech reading, parent-infant, preschool school years of children, communication measurements/handicap/remediation of adults, effects of aging' remediation on the elderly, and case studies. Prereq: Audiology I, Phonetics and Acoustics of Speech and 473, or equivalents or consent of instructor.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when the student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only: E
504 Appraisal of Speech and Language Disorders (3) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests. Prereq: Consent of instructor.
506 Neural Bases of Speech and Language (3) Structure and function of central and peripheral nervous systems, role in speech and language. Prereq: 303.
507 Anatomy and Physiology of Hearing (3) Structure and function of the peripheral and central auditory systems, and their roles in mediating auditory processes. Prereq: 473 or equivalent or consent of instructor.
511 Introduction to Research in Speech and Hearing (3) Analysis of research techniques, fundamentals of statistics, application of statistics, and completion of a proposal and hypothetical pilot research project.
512 Clinical Practice in Audiology I (1-4) Prereq: 473 and 494. May be repeated. Maximum 9 hrs.
513 Clinical Practice in Audiology: Off-Campus Sites. (1-4) Prereq: Consent of instructor.
514 Practicum in Verbal-Tonal Habilitation (1-4) Prereq: 494, 556; or consent of instructor. May be repeated. Maximum 8 hrs.
515 Practicum in Aural Rehabilitation (1-4) Prereq: 473 and 494. May be repeated. Maximum 6 hrs.
517 Instrumentation in Audiology and Speech Pathology (3) Principles of instrumentation in audiology and speech pathology; laboratory assignments for familiarization of students with instruments for measuring hearing and speech processes.
549 Hearing Science (3) Study of psychoacoustic phenomena and how they relate to perception and diagnostic audiology. Prereq: 473, 507, and 546 or equivalents or consent of instructor.

550 Seminar in Audiology (1-3) Significant research in various areas of audiology. Prereq: Consent of instructor. May be repeated. Maximum 15 hrs.

552 Seminar in Voice Disorders (3) Current research in diagnosis and management of voice disorders. Multicultural, gender and age-related issues. Prereq: 441 or consent of instructor.

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

566 Seminar on Stuttering (3) Current research in stuttering. Prereq: 432 or consent of instructor.

571 Directed Study in Speech and Language (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

572 Advanced Seminar in Neurologically-based Communication Disorders (3) Topics vary. Prereq: 520, 524, and 526, or consent of instructor. May be repeated. Maximum 6 hrs.

573 Advanced Seminar in Language Disorders (3) Topics vary. Prereq: 520, 524, and 526, or consent of instructor. May be repeated. Maximum 6 hrs.

574 Pediatric Audiology (3) Theoretical and practical considerations in evaluation and treatment of hearing loss in infancy and childhood. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

575 Vestibular Disorders (3) Anatomy, physiology, and management of vestibular system and other systems that contribute to balance. Prereq: Consent of instructor.

576 Psycholinguistic Concepts in Speech Pathology (3) Psycholinguistic concepts and information theory in studying the normal and impaired child. Prereq: Consent of instructor.

580 Language Science (3) Seminar on theories and paradigms of research on acquisition and use of language, psycholinguistic process and language acquisition. Prereq: 520, 524, or consent of instructor. May be repeated. Maximum 6 hrs.

581 Directed Study in Language Disorders (3) Topics vary. Prereq: 520, 524, or consent of instructor. May be repeated. Maximum 6 hrs.

582 Directed Study in Audiology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

583 Directed Study in Neurology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

584 Directed Study in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

585 Directed Study in Speech Science (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

586 Directed Study in Hearing Science (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

587 Directed Study in Communication Disorders (1-3) Topics vary. Prereq: 520, 524, or consent of instructor. May be repeated. Maximum 6 hrs.

588 Directed Study in Voice Disorders (1-3) Topics vary. Prereq: 520, 524, or consent of instructor. May be repeated. Maximum 6 hrs.

589 Directed Study in Neurology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

590 Directed Study in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

591 Directed Study in Speech Science (1-3) Topics vary. Prereq: 520, 524, or consent of instructor. May be repeated. Maximum 6 hrs.

592 Directed Study in Hearing Science (1-3) Topics vary. Prereq: 520, 524, or consent of instructor. May be repeated. Maximum 6 hrs.
the ability to conduct and report on an independent investigation.


NON-THESIS OPTION

The non-thesis program will be permitted in special circumstances and involves satisfactory completion of the following requirements:

Research and Development Specialization
1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Six hours in industrial engineering (engineering management).
3. Twelve hours of electives in the major field, mathematics or engineering.
4. Three hours of an assigned project under Aviation Systems 550.
5. A comprehensive final written examination on all coursework submitted for the degree and defense of the project course paper.

Administration Specialization
1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Three hours in industrial engineering (engineering management).
3. Three hours in economics or finance.
4. Twelve hours of electives in the major field, mathematics or engineering.
5. Three hours of an assigned project under Aviation Systems 550.
6. A comprehensive final written examination on all coursework submitted for the degree and defense of the project course paper.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Aviation Systems is available to residents of the states of Arkansas, Florida, Mississippi, Virginia, or West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES

500 Thesis

501 Aviation Systems: An Overview (3) Aviationsystems, present and future. Socioeconomic base, aerospace and space propulsion technology, meteorology, air traffic control, airport community interface, and technological trends and developments pertinent to present status and future development of air transportation.

502 Registration for Use of Facilities (1-15)

503 Air Vehicles (3,3) Current capabilities and future requirements for civilian and military air vehicles. Parameters significant for air vehicle type selection. Integration of air vehicle into aviation systems. Prereq: 501.

504 Airports and the Community (3) Structure of airports and their communities. Technology and economics of cargo, baggage, ticket and passenger handling, airport management, economics and logistics. Interfaces with community. Plans, programs and developments for collection and distribution of passengers and freight from various types of airports. Types of airport developments and their projections. Prereq: 501.

505 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation. Historical and legislative development of aviation regulatory agencies, organizational structure, administrative and personnel procedures. Prereq: 501.
REQUIREMENTS FOR 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:

1. One year of general biology or the equivalent;
2. 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;
3. Two years of chemistry including one year of general chemistry and one year of introductory Organic Chemistry with laboratory;
4. At least one semester of biochemistry;
5. One year of calculus;
6. One year of physics;
7. Graduate Record Examination scores;
8. A minimum grade-point average of 3.0 on a 4.0 scale.

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.

THE MASTER'S PROGRAM

1. Biochemistry and Cellular and Molecular Biology 511-12, 515-16, and 517.
2. Completion of course requirements as determined by the candidate's faculty committee.
3. Achievement of a 3.0 or better GPA in all courses taken for graduate credit.
4. Participation in 601 and 603 during the entire period of residence. Participation in at least one journal club chosen from among 605-608 for three semesters.
5. Six hours of master's research and a thesis.
6. A final examination that covers both the thesis endeavor and the subject matter of the course requirements.

THE DOCTORAL PROGRAM

1. Biochemistry and Cellular and Molecular Biology 511-12, 515-16 and 517.
2. 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.
3. At least 8 hours of topics offered in 515 or its equivalent.
4. 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.
5. Comprehensive examination, taken before the end of the third year of study.
6. A dissertation reporting the results of original and significant research carried out during the term of candidacy.
7. 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 Ph.D. 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:

1. 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
2. Publication of at least one full-length paper in a major scientific journal as senior author.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Biochemistry and Cellular and Molecular Biology is available to residents of Delaware and Kentucky. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES

403 Advanced Genetics Laboratory (2) Experiments illustrating methods in modern genetics; techniques in classical, cytological, and molecular developmental genetics. Model organisms; Drosophila and mouse. Prereq: General Genetics and Organic Chemistry.

410 Cellular and Comparative Biochemistry (4) Electrolyte behavior; chemistry and structure of proteins; enzyme behavior and biological function; catalysis and energy capture; synthetic metabolism; nucleic acid function; protein synthesis, and biochemical genetics; regulation of biological processes. Prereq: Organic Chemistry and General Biology. 3 hrs and 1 discussion. F,Sp.


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


449 Laboratory in Physiology (2) Prereq or coreq: 440 or 445.

455 Human Genetics (3) Genetic and molecular principles and problems of human inheritance. Prereq: General Genetics.

471-81 Bioophysical Chemistry (3, 3, 3) Physical-chemical principles and applications to biological systems. 471- Thermodynamics; chemical equilibrium; solution chemistry; transport; electrochemistry; kinetics; enzyme catalysis; reactions. 481-Elementary quantum chemistry; interactions of light with biological molecules; optical and magnetic spectroscopy; light scattering; case studies of selected macromolecules. Prereq: Calculus, Organic Chemistry, General Biology or consent of instructor. (Same as Chemistry 471-81.) F,Sp.

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

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

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. S/NC only. E

511 Advanced Protein Chemistry and Cellular Biology (3) Cellular structure and function at molecular and supramolecular levels in relation to 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 nuclear 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 cycles and cell growth. Prereq: 511 or consent of instructor. (Same as Life Sciences 512.) Sp.

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

515 Experimental Techniques I (4) Modern experimental methods and instrumentation lab. cell growth; spetroscopy; microscopy; nucleic acid purification and analysis; protein assays; enzyme purification; electrophoresis; 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. F.


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. Sp.

520 Special Topics (1-2) 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 hrs. S/NC only.

523 Graduate Research Participation (3-12) Tutorial laboratory experience. May be repeated. Maximum 12 hrs. E

550 Advanced Concepts in Neurobiology/Physiology (3) Concepts related to neurobiology/physiology with information taken from current literature. Predominantly lecture format. 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 vertebrate and invertebrate animals. Prereq: 490 or consent of instructor. Recommended prereq: 410. 2 hrs and 1 lab.

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 introduction to techniques for preparation of biological samples for viewing in transmission electron microscopy. Use of microscope and associated techniques, preparation of materials for publication and special project. Admission limited only to departmentally approved graduate students. (Same as Botany 510.) 2-3 hr labs. Sp.

564 Introduction to Electron Microscopy - Scanning Electron Microscope (4) Practical introduction to techniques
of electron microscopy and to scanning electron microscopy. Use of microscope, introduction to darkroom techniques and digital image processing, preparation of samples for observation, and special project. Prereq: Consent of instructor. 2 hrs and 1 lab. Sp.

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.


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. E


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, membranes structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell biology, neurobiology, and related topics. Required every semester in residence. S/NC only. F, Sp.

604 Current Topics in Environmental Toxicology (1) (Same as Ecology and Evolutionary Biology 504) S/NC only. F, Sp.

605 Journal Club in Neurophysiology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs. S/NC only.

606 Journal Club in Structural Biology/Biochemistry (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs. S/NC only.

607 Journal Club in Cellular/Molecular Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs. S/NC only.


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

615 Special Topics in Biochemistry, Cellular, and Molecular Biology (3) Biochemical and biophysical methods, mechanisms of enzyme catalysis, gene expression, membranes structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell ultrastructure and physiology, neurobiology, and related topics. Prereq: 511-12 or consent of instructor. May be repeated. Maximum 9 hrs.

Biomedical Sciences

(College of Arts and Sciences)

MAJOR DEGREE

Biomedical Sciences..........................Ph.D.

Jeffrey Becker, Acting Director

Professor:

Olins, Donald E, Ph.D. .......... Rockefeller Popp, Raymond A, Ph.D. .......... Michigan

Research Professor:

Olins, Ada L, Ph.D. ............... New York

Assistant Research Professor:

Hausser, Loren, Ph.D. .......... California (Irvine)

Shared faculty are drawn from the Oak Ridge National Laboratory.

The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, located within the Oak Ridge National Laboratory, offers a program leading to the Doctor of Philosophy. The National Laboratory is a well-known center of basic research. The university utilizes the staff and facilities of this laboratory and thus brings directly into full-time graduate study in the life sciences the talents and experiences of that staff, as well as the most advanced research methods and technology.

The program of study, which incorporates a high faculty-to-student ratio, is based on intensive graduate courses supplemented by tutorial instruction, participation in a wide variety of seminars, and a heavy emphasis on communication skills, research training, and independent study. The program encourages students to pursue graduate studies to the limits of their abilities.

Each student's curriculum is planned to meet individual needs, with the aim of giving: (1) strength in the basic sciences; (2) perception of the biomedical sciences as a whole; and (3) experience and training in a chosen specialty.

The concentration areas available for Ph.D. dissertation work are biochemistry, biophysics, genetics, cellular, developmental and mammalian genetics, and radiation biology. Included are such subjects as immunology, protein and enzyme chemistry, nucleic acid chemistry, radiation and environmental biology, developmental biology, experimental pathology, microbial and mammalian genetics, mutagenesis, structural biology, and genomic analysis.

ADMISSION REQUIREMENTS

A Bachelor's degree or its equivalent is required. Students with M.S., D.V.M., or M.D. degrees are also encouraged to apply. Completed applications, Graduate Record Examination scores and letters of reference should be sent to the address below. The student will need preparation in biology, calculus, physics, and organic chemistry. It is recommended that deficiencies in preparation, as identified in the admission process, be eliminated prior to entrance.

Requests for application forms, information on admission, financial support, and housing should be sent to Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, ORNL, 1060 Commerce Park, Oak Ridge, Tennessee 37831.

THE DOCTORAL PROGRAM

1. Satisfactory (B grade or better) completion of the following core courses or their equivalent: Biochemistry (511); Biophysical Biochemistry (514); Genetics (515); Computing for the Life Sciences (525); and Survey of Statistical Methods (530).

2. Three semesters of Biomedical Sciences Laboratory (531-32-33) Biomedical Sciences Laboratory (530-52) Advanced Concepts in Biomedical Sciences (3,3,3) Approaches and technologies in various areas of modern biology. Students spend a semester in each of three laboratories conducting research in different areas of biomedical science. Required of all first-year students.

3. Participation in at least one of the seminars during each term of residence after the first year is strongly recommended.

4. Satisfactory completion of formal advanced courses in the areas of the student's interest. The number and nature of the required advanced courses will vary depending upon the student's background and area of specialization.

5. Passing both written and oral comprehensive examinations.

6. A dissertation reporting the results of original and significant scientific research. A minimum of 24 semester hours of course 600 is required.

7. A final oral examination on the dissertation.

8. A formal seminar presentation of the dissertation research.

GRADUATE COURSES

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or facility time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

511 Biochemistry (3) Chemistry of carbohydrates, lipids, proteins, and coenzymes; enzyme kinetics; metabolism and biosynthesis; DNA, RNA, and proteins. Energy levels and excited states of large molecules; optical instrumentation; adsorption to solid surfaces; properties of macromolecules in solutions; molecular solution; molecular conformations; inter- and intramolecular forces; principles of microscopy. Prereq: 511.

512 Genetics (3) Mendelian genetics, mitosis and meiosis; transmission genetics; mapping and linkage; genetics of phage, bacteria and eucaryotes; mapping, linkage, mutation; cytoplasmic inheritance; mechanisms of recombination, chromosome structure and replication.

525 Computing for the Life Sciences (3) Interactive computing, MINI- and micro-computing environments; Basic, Fortran, and/or Pascal languages; application of statistics, graphics, text manipulation, and computer communications.

530 Survey of Statistical Methods I (3) Same as Statistics 531.

531-32-33 Biomedical Sciences Laboratory (3,3,3) Approaches and technologies in various areas of modern biology. Students spend a semester in each of three laboratories conducting research in different areas of biomedical science. Required of all first-year students.

543-45-49 Graduate Research Participation (3,6,9) Special advanced research project not related to dissertation research. Topics chosen with consent of instructor. May be repeated.

551-52-53 Special Topics in Biomedical Sciences (3,3,3) Either tutorials or formal lectures. Potential topics: X-ray diffraction and crystallography; excited-state biophysics; physical chemistry of macromolecules; pathology; mammalian genetics; developmental biology; immunology.

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

651-52 Advanced Topics in Biomedical Sciences (3,3) Current and future research developments: protein synthesis, protein chemistry and enzyme mechanisms; cytology, and special topics. Either as tutorial or literature survey requiring substantial student preparation. May be repeated.

660 Mammalian Genetics (3) Known genetic variants affecting each organ system of experimental mammals, especially laboratory mice. Inheritance of phenotypical and biochemical traits in rodents and other laboratory animals. Prereq: 515.
Botany

(College of Arts and Sciences)

MAJOR DEGREES

Botany........................................... M.S., Ph.D.

Edward E. Schilling, Head

Professors:
Caponetti, J. D., Ph.D. .............. Harvard
Clebsch, E. E. C. (Emeritus), Ph.D. ...... Duke
DeSeel, H. R. (Emeritus), Ph.D. .... Ohio State
Evans, A. M. (Emeritus), Ph.D. ...... Michigan
Gallman, R. W. (Emeritus), Ph.D. .... Vanderbilt
Hickok, L. G., Ph.D. ............... Massachusetts
Holton, R. W. (Emeritus), Ph.D. .... Michigan
Hughes, K. W., Ph.D. ............. Utah
Mullin, B. C., Ph.D. ............. North Carolina State
Petersen, R. H. (Distinguished Professor), Ph.D. .......... Columbia
Schilling, E. E. (Liaison), Ph.D. ........ Indiana
Schwarz, O. J., Ph.D. ........... North Carolina State
Walne, P. L. (Benwood Distinguished Professor), Ph.D. .......... Texas

Associate Professors:
Amundsen, C. C., Ph.D. .......... Colorado
Pigliucci, M., Ph.D. ............. Connecticut
Smith, D. K., Ph.D. ............ Tennessee
Wofford, B. E. (Curator), Ph.D. ........ Tennessee

Assistant Professors:
Cruzan, M. B. C., Ph.D. ........ SUNY (Stony Brook)
von Amin, A. G., Ph.D. ........ East Anglia (UK)

Lecturer:
McFarland, K. D., Ph.D. .......... Tennessee

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, biology, cytology, cytogenetics, ecology, genetics, ichthyology, morphology, mycology, photobiology, physiology, proteomics, and taxonomy.

Educational services are required of each graduate degree candidate and such services 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 REQUIREMENTS

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:

1. Bachelor’s degree: a B.A. or B.S. 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.

2. General botany or general biology: 8 semester hours.

3. Advanced botany or closely allied biological sciences: 12 semester hours.

4. Physical sciences: general inorganic chemistry: 3 semester hours; organic chemistry: 3 semester hours. Physics highly recommended.

5. College mathematics: 6 semester hours. 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 work 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 the student’s progress committee during the first meeting with the student.

THE MASTER’S PROGRAM

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 Ph.D. program. However, the applicant must be equally well prepared and display an aptitude and ability for advanced study. The M.S. includes thesis and non-thesis options.

Thesis Option

The thesis program is the usual route taken by botany students for the M.S. 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:

1. 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.

2. Successful completion of 30 hours of graduate credit, at least two-thirds of which must be at the 500 level or higher.

3. Satisfactory completion of two hours at the 600 level.


5. Presentation of a 30 minute departmental seminar.

6. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.

Non-Thesis Option

1. 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.

2. Satisfactory completion of two hours at the 600 level.

3. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.

4. 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 DOCTORAL PROGRAM

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 Ph.D.

Requirements for successful completion of the Ph.D. are as follows:

1. 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.

2. Satisfactory performance on a written comprehensive examination.

3. Presentation of one or more cognate areas outside of the department totaling 6 hours of graduate credit with at least a B average.

4. Satisfactory performance on an examination in one modern foreign language (See Graduate Coordinator) or an A or B in French 302 or German 332.

5. Satisfactory completion of 6 hours at the 600 level (excluding dissertation).


7. Presentation of a dissertation seminar near the end of the doctoral program.

Note: The listed requirements for the M.S. and Ph.D. degrees 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.

MINOR IN ENVIRONMENTAL POLICY

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

GRADUATE COURSES

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

403 Plant Evolution (3) Evolutionary biology from plant perspective. Speciation, hybridization, allopatry, evolution of mating systems, phenotypic plasticity; competition of characteristics of animal and plant systems. Lectures; paper discussions on primary literature; current research in evolutionary ecology and genetics. Prereq: General Botany or Biodiversity: Organization and Function of the Cell. (Same as Ecology and Evolutionary Biology 403.)

404 Plant Molecular Biology (4) Current research in plant molecular biology techniques and procedures. Genome structure, gene expression and regulation, transformation, transposable elements, plant development. Labs: isolation of DNA and RNA, molecular hybridization, isolation and preparation of plasmids, PCR amplification of specific sequences, DNA sequencing and transformation. Prereq: Biodiversity: Organization and Function of the Cell and Genetics with grade of B or better and consent of instructor. 2 hrs and 4 labs.

412 Plant Anatomy (3) Cells, tissues and organs; development in vegetative and reproductive structures of vascular plants—seed plants. Prereq: General Botany or Biodiversity: Organization and Function of the Cell or equivalent.

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 weeklong field trips. Prereq: Field Botany or equivalent. (Same as Ecology and Evolutionary Biology 451.) Sp
500 Thesis (1-15) P/NP only. E
501 Mycology (4) Intensive survey of fungi, all major classes. Lecture, laboratory and field instruction. Occasional field trips. Prereq: 310. 3 hrs and 1 lab. Su, A
502 Registration for Use of Facilities (3-15) Required for the student to officially register during any semester when student uses University facilities for a faculty-approved project after degree is completed. May not be used toward degree requirements. May be repeated. S/N/NC only. E
503 Non-Thesis Research (2), Library, field, or laboratory research under supervision of staff member. May be repeated. Maximum 4 hrs. E
506 Physiology (4) Comparative study of major animal phyla, both freshwater and marine; morphological, developmental, ecological, taxonomic and phylogenetic aspects. Field and laboratory studies, identification, classification, experimentation. Prereq: 310 or consent of instructor. 3 hrs and 1 lab. F, A
507 Biological Illustration (3) Principles and applications of photography (B&W and color), photomicroscopy, drawing, graphics and video for research and publication of data in periodical and graphic form.
510 Introduction to Electron Microscopy - Transmission Electron Microscopy (4) (Same as Chemistry and Cellular and Molecular Biology 509.)
521-22 Advanced Plant Physiology I, II (3, 3) 521- -Plant biochemistry and metabolism: respiration, photosynthesis, carbon partitioning, and biosynthesis of specialized plant products: terpenoids, alkaloids, phenolics and plant growth regulators. 522- -Growth and differentiation of plants: molecular, cellular and organismic levels, homeostasis of development, morphogenesis of individual parts, and reproductive processes. Prereq: Introduction to Biochemistry or Biochemistry and Cellular and Molecular Biology 410 and 1 semester of Introductory Plant Physiology or Cell Biology.
530 Advanced Taxonomy of Flowering Plants (3) Evolution and classification of families of angiosperms, local flora. Prereq: 330 or equivalent. 2 hrs and 1 lab. F, A
531-32 Special Problems in Botany (1-4, 1-4) May be repeated. Maximum 12 hrs. A
544 Seminar in Botany (1-4, 1-4) Readings and discussions of current literature, intensive study of topics in botanical research. May be repeated. Maximum 6 hrs. S/N/NC only. E
560 Radio & Television Law and Regulations (3) Legal problems faced by broadcast managers. Philosophy of regulatory policy formation. Efforts at self-regulation. Sociopolitical ramifications of laws and regulations, and public pressure on stations, networks, cable and new technologies. Unique situation of broadcasting among media in terms of regulations. Prereq: Consent of instructor or admission to program. F
570 Radio & Television Research (3) Various techniques used by stations and consultants in broadcast research. Applied television research: Deciding which method to use, interpreting results, and applying research to management or decision making. Prereq: Communications 512 or 612, or consent of instructor. S
580 Seminar in Radio and Television (3) Salient issues in broadcast. Topics vary. International broadcasting, cable television, new technologies, educational and public broadcasting, broadcasting and society. Note: Consent of instructor or admission to program. May be repeated. Maximum 6 hrs. (Same as Information Sciences 581.) F
591 Independent Study (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
592 Internship (3) Full-time (30-40 hrs per week) work experience in news, production, or sales and management with non-university professional organization. Educational experience beyond that available at university. Final term paper. No retroactive credit for previous work experience. Prereq: Junior or senior standing, completion of at least 15 hrs of broadcasting courses, GPA 3.0 or better, and consent of department head.

Business Administration

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

503 Non-Thesis Research (2), Library, field, or laboratory research under supervision of staff member. May be repeated. Maximum 4 hrs. E

506 Physiology (4) Comparative study of major animal phyla, both freshwater and marine; morphological, developmental, ecological, taxonomic and phylogenetic aspects. Field and laboratory studies, identification, classification, experimentation. Prereq: 310 or consent of instructor. 3 hrs and 1 lab. F, A

507 Biological Illustration (3) Principles and applications of photography (B&W and color), photomicroscopy, drawing, graphics and video for research and publication of data in periodical and graphic form.

510 Introduction to Electron Microscopy - Transmission Electron Microscopy (4) (Same as Chemistry and Cellular and Molecular Biology 509.)

521-22 Advanced Plant Physiology I, II (3, 3) 521- -Plant biochemistry and metabolism: respiration, photosynthesis, carbon partitioning, and biosynthesis of specialized plant products: terpenoids, alkaloids, phenolics and plant growth regulators. 522- -Growth and differentiation of plants: molecular, cellular and organismic levels, homeostasis of development, morphogenesis of individual parts, and reproductive processes. Prereq: Introduction to Biochemistry or Biochemistry and Cellular and Molecular Biology 410 and 1 semester of Introductory Plant Physiology or Cell Biology.

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

531-32 Special Problems in Botany (1-4, 1-4) May be repeated. Maximum 12 hrs. A

544 Seminar in Botany (1) Readings and discussions of current literature and/or selected topics in botanical research. May be repeated. Maximum 8 hrs. S/NC only.

551-562 Methods and Instrumentation in Laboratory Investigation (1) Project experience and theoretical background in various research methods, ion exchange resins, adsorption spectrophotometry, electron microscopy, potentiometry, zonal and ultracentrifugation, gas chromatography, automatic analyzers, microscopy, culture methods, use and detection of radioisotopes. Prereq: Chemistry 350, 360; Physics 121, 122. May be repeated. Maximum 8 hrs. S/N/NC only.

555 Methods and Instrumentation in Field Investigation (1) Appropriate methods and instrumentation. Topics vary. May be repeated with consent of instructor. Maximum 5 hrs. S/N/NC only.

600 Doctoral Research and Dissertation (3-16) P/NP only. E

606-07 Advanced Topics in Botanical Sciences (1) Experimental botanical science: nomenclature, morphology and systematics of vascular plants, cryptogamic botany, cytology and cell biology, genetics, plant physiology, palynology, ecology. May be repeated. Maximum 12 hrs.

635 Environmental Assessment and Sustainable Development in Third World Countries (3) (Same as Ecology and Evolutionary Biology 635) Prereq: 410. 3 hrs and 1 lab. F

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

ACADEMIC STANDARDS

A graduate student in the College of Business Administration whose grade-point average falls below 3.0 will be placed on probation. A student on probation will be dropped from the program unless his/her cumulative graduate grade-point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next semester's coursework as established by the degree program.
THE MBA PROGRAM

The MBA program is designed for students with undergraduate degrees in the social and natural sciences, the humanities, and professional fields such as engineering, business, agriculture, and architecture. The MBA program is a two-year program with students beginning in the fall of each year and graduating in the spring of two years hence. During the summer between the first and second year, students must complete an internship with a company using those skills acquired during the first year of the MBA program.

The MBA program consists of a common first-year core and a wide selection of second year concentration/elective courses. The first-year core develops a general management foundation upon which specialization is developed in the second year electives. The objective of the program is to develop leaders able to enhance the success of their organizations.

The program consists of two 15-credit-hour MBA core courses in the first year and 24 credit hours of concentration/elective courses in the second.

Admission Requirements

Applications are accepted for full semester only. The application deadline for fall semester is March 1. Applications by U.S. citizens and permanent residents received after March 1 will be considered as space allows.

To be considered for admission, the applicant's file must be complete. A completed file includes the Graduate School Application, transcripts of prior college work, the MBA program application, two completed applicant recommendation forms, and the Graduate Management Admission Test (GMAT) score report. The first items should reach the Graduate School one month before the MBA application deadline to allow for processing. Additional information is required by The Graduate School for international students.

For admission to the MBA program, consideration is given to (1) the applicant's academic record with particular attention to the last two years of undergraduate work and previous graduate studies; (2) scores on the GMAT and the Test of English as a Foreign Language (TOEFL) for those whose native language is not English; (3) work experience and other activities that demonstrate potential for leadership; and (4) recommendations from professors and work supervisors.

The admission decision is based on all factors which make up the total application; therefore, there is no automatic cut-off for either grade point averages or GMAT scores. However, admission preference will be given to applicants with full-time work experience after obtaining the undergraduate degree.

Prerequisites

College-level mathematics through at least one course in college-level calculus, taken within the past 5 years, with a grade of B or better, is the only prerequisite requirement for entry into the program. Students whose undergraduate training does not include calculus should arrange to take it at UT Knoxville or another accredited institution prior to the fall semester of entry into the program. Those electing the management science or statistics concentration must have completed two years of college-level calculus.

MBA Core

The MBA core consists of two 15-hour courses, one taken each semester. The courses are taught by the MBA core faculty in an integrated fashion through a year-long simulation requiring students to learn the functional fundamentals (accounting, finance, management, marketing) when they need to apply them to solving a specific business problem. The topics introduced in this course follow three major themes: the functional fundamentals (learned within a cross-functional framework); the role of the firm in society (with attention to stakeholders, value, economics, and the ethics/legal environment of the firm); and personal and team development. Students will be exposed to the assessment and delivery of customer value, statistical process control, continuous systems improvement, and the role of quality in competitive organizations.

Students in the first-year core undertake active learning within a team-based environment. Many core requirements are experiential: exercises in which self-discovery within a team setting is an important element of the learning process. Individualized support is provided for developing both written and oral communication skills.

Concentration and Electives

A concentration area may be indicated on the MBA Program Application or this declaration may be deferred until after matriculation. In any event, selection must be made after completion of the first year. Requests for changes in concentration area must be submitted for approval to the Office of Graduate Business Programs.

Among the 24 credit hours in the concentration/electives block, at least 9 but not more than 12 must be in one of the following concentration areas. For specific courses required in concentration areas, see the appropriate field of instruction.

- Economics
- Environmental Management
- Finance
- Forest Industries Management
- Global Business
- Logistics and Transportation
- Management
- Marketing
- Manufacturing Management
- New Venture Analysis and Entrepreneurship
- Statistics

The remaining elective courses must be in other departments outside the concentration area, normally selected from MBA courses offered in other departments of the college. Courses outside the College of Business Administration as well as courses listed in the Graduate Catalog numbered below 500 may be included in this block only with written prior permission via formal petition to the Office of Graduate Business Programs.

Transfer Credits

Graduate level courses taken at other institutions accredited by the American Assembly of Collegiate Schools of Business that otherwise conform to University policy may be credited toward MBA degree requirements within the following limits:

Concentration Area: 3 hours (provided at least 6 hours of work at this institution are included in the concentration area).

Elective Area: 3 hours (provided at least 6 hours of work at this institution are included in the concentration area).

Because of the fully integrated nature of the first-year curriculum, no credit hours are transferred into this core curriculum. The maximum number of hours that may be transferred to elective and concentration areas is 6 semester hours. Transfer credit will be considered upon formal petition to the Director of Graduate Business Programs.

Other Requirements

The Application for Admission to Candidacy must be approved by the MBA faculty members and the department head in the student's area of concentration and the Associate Dean in the College of Business Administration. It should be submitted to the Graduate Office at least one full semester prior to the date the degree is conferred. (Admission to candidacy in the fall semester permits graduation in the following spring semester.)

To qualify for the degree, the student must achieve a B average (3.0) or above in MBA core courses required in his/her program, a B average or higher in courses comprising the concentration area, and a B average or higher in the overall program. Each student must write a satisfactory analysis of a comprehensive case administered at the end of the first year.

BUSINESS ADMINISTRATION CONCENTRATIONS

For complete listing of MBA program requirements, see above.

MBA Concentration: Global Business, New Venture Analysis and Entrepreneurship

In recognition of the growing globalization of business activity and the importance of the international environment to successful management of every firm, the MBA program offers a concentration in global business. The concentration comprises at least two courses taken from Economics 424, Logistics 507, Management 571, and departmental special topics courses with international content; and at least one but not more than two additional courses from the above list, or from a list of electives as approved by the Director of Graduate Business Programs. Students pursuing a concentration in global business are strongly encouraged to pursue it as a second concentration in addition to one of the traditional departmental concentrations. Students pursuing this concentration are also strongly encouraged to pursue an international or internationally related internship for the summer between their first and second years in the MBA program. Students are expected to participate in a foreign exchange or field experience if at all possible, especially for those with no previous foreign experience. Language training is advised but not required, and beginning language courses are not typically available for graduate credit.

The concentration in new venture analysis and entrepreneurship is comprised of three specifically designed courses which are interdisciplinary in nature. This concentration strives to build a strong academic foundation for both entrepreneurial and intrapreneurial activities. The new venture analysis and entrepreneurship concentration is offered in recognition of the growing trend in American business today towards new product/venture
development. The new venture analysis/entrepreneurship concentration courses may be combined with two elective courses in another area (management or marketing) to achieve a dual concentration.

Minimum course requirements are Finance 551, Management 551, and Marketing 550. These course descriptions are listed under their fields of instruction.

PRE-MBA PROGRAM

The College offers a joint BA/MBA program with the College of Arts and Sciences. Students in this program take their first three years of coursework in Arts and Sciences, and their last two years in the College of Business Administration. Within their first three years, students fulfill all general education requirements for the BA degree, both upper and lower division along with a minor offered by one of the Arts and Sciences departments. They may use one Economics course only to fulfill distribution requirements, and they are required to take a year of calculus as the only prerequisite to the MBA.

Admission requirements are higher than those normally expected of MBA applicants. Desired qualifications include a minimum 3.4 GPA and a GMAT score of 600 or higher.

Students interested in the program are counseled initially in the Arts and Sciences Advising Center regarding admission standards and arts and sciences requirements. At the end of their second year, they have a conference with the Director of Graduate Business Programs and are advised of their prospects for formal admission. Students who are likely candidates are advised to take the Graduate Management Admission Test in October of their third year, and to submit an application to the MBA program. The admission decision is made by January of the third year.

Upon admission, students begin MBA coursework in the fourth year and are awarded a BA degree at the end of that year. Upon successful completion of the fifth year (minimum of 30 semester hours of graduate credit), the student receives the MBA degree.

DUAL J.D.-MBA PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferment of the Master of Business Administration degree (concentration in manufacturing management) and the Master of Science degree with a major in Industrial Engineering (concentration in manufacturing systems engineering). The dual program saves the student one or two semesters over the time that would be required to earn both degrees independently.

Admission Requirements

Applicants for the J.D.-MBA program must make separate application to, and be competitively and independently accepted by, the College of Law, The Graduate School and College of Business Administration for the MBA degree, and by the Dual Program Committee.

Students who have been accepted by both colleges may apply for approval to pursue the dual program no later than the second semester of their third year. Such approval will be granted, provided that dual program students be admitted to both programs prior to the second semester of their third year. Students interested in entering the dual degree program should submit a letter of application to the Dual Program Committee.

Upon receipt of the application, the Dual Program Committee will determine eligibility and assign students to advisors who will be responsible for course approval and supervision of the student's progress through the dual program.

Curriculum

A dual program candidate must satisfy the graduation requirements of both colleges. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual program.

The College of Law will award up to 9 semester hours of credit toward the J.D. for acceptable performance in approved graduate-level courses offered by the College of Business Administration. The College of Business Administration will award up to 9 semester hours of credit toward the MBA for acceptable performance in approved courses offered in the College of Law. The approval of courses is the responsibility of the Dual Program Committee and the student's assigned advisor.

Students may begin their studies in either the J.D. or the MBA program, but not in both programs at the same time. Students are required to complete the first year of the J.D. curriculum by the end of the first year of the MBA program. During the first year in the J.D. program, students must register through the College of Law. For any term in which students take MBA courses, even though they are also taking law courses, they must register through The Graduate School. The Graduate School registration form must be approved by the Director of Graduate Business Programs.

Awarding of Grades

Grades for graduate business courses accepted by the College of Law and grades for law courses accepted by the College of Business Administration will be converted to either Satisfactory or No Credit, and will not be included in the computation of the student's grade average or class standing in the college in which such grades are converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of

Business Administration will award a grade of Satisfactory for a law course in which the student has earned a 2.0 grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used on a regular graded basis for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

Approved Dual Credit

MBA courses to be counted toward the J.D. program must include 9 semester hours approved by the College of Law. Law courses to be counted toward the MBA must be selected from those approved by the Director of Graduate Business Programs.

DUAL M.S.-MBA PROGRAM

The College of Business Administration and the College of Engineering offer a coordinated program leading to the conferred of the Master of Business Administration degree (concentration in manufacturing management) and the Master of Science degree with a major in Industrial Engineering (concentration in manufacturing systems engineering). The dual program saves the student one or two semesters over the time that would be required to earn both degrees independently.

Admission Requirements

Applicants for the M.S.-MBA program must make separate application to, and be competitively and independently accepted by, The Graduate School for the Master of Business Administration degree program and the Master of Science degree program with a major in Industrial Engineering, and by the Dual Program Committee.

Students will initially apply for the MBA program, indicating on that application the intent to pursue the dual M.S.-MBA program in manufacturing (refer to the MBA program for separate instructions). During the second semester of the first year, students will revise the Graduate School registration form to reflect the intent to pursue the dual program. The Dual Program Committee will make the final determination of admission to the dual program.

Applications by U.S. citizens and permanent residents received after the MBA application deadline (March 1) will not be considered. Additional information is required, and different application dates are established by The Graduate School for international students.
Curriculum

The curriculum in the first academic year of the dual M.S.-MBA program is the two-semester core of the MBA program (two 15-hour courses, one per semester). A 1-hour seminar course each semester in in manufacturing will also be taken concurrently during the first two semesters (not for graduate credit). A 12-hour design or industrial project will be completed in the summer term of the first year. This will be part of a summer internship in industry, and the project will be academically supervised by a faculty member associated with the dual program.

During the second year, 27 hours of coursework will be completed in the manufacturing systems engineering concentration in Industrial Engineering plus an additional 9 hours of graduate courses in the College of Business Administration acceptable in meeting the requirements of the MBA program. Fifteen hours will be taken during each of the first two semesters of the second academic year. A culminating 6-hour integrated case study requiring use of most previous material, and a final examination as required by the Dual Program Committee, will be taken during the first session of summer term of the second year.

The dual degree candidate must satisfy the curriculum and graduation requirements of the Department of Industrial Engineering and the College of Business Administration. Dual degree students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation in either degree program for courses in the other degree program, except as such courses qualify for credit without regard to the dual degree program. The M.S. and the MBA degrees will be awarded upon successful completion of the requirements of the dual program.

Approved Dual Credit

A maximum of 6 semester hours of approved graduate-level courses completed in the College of Business Administration may be counted toward the M.S. degree program with a major in Industrial Engineering. A maximum of 15 semester hours of approved graduate-level courses completed in the Department of Industrial Engineering may be counted toward the MBA degree program. The approval of courses is the responsibility of the Dual Program Committee and the student's assigned advisor.

PROFESSIONAL MBA PROGRAM

The professional MBA is provided for fully employed individuals. The weekend track of the MBA results in the same Master of Business Administration degree as the full-time MBA and executive MBA.

The professional MBA program is a 24-month program completed in 16 months. Classes meet all day on Saturdays and occasionally on Friday afternoon and/or Sunday afternoon. It offers an integrated core curriculum with an applied project in each semester. The program begins in the fall semester with an intensive week of classes, then continues with weekend classes throughout the following calendar year. The final fall semester also includes an intensive week of courses in addition to weekend classes.

Admission Requirements

All participants begin and complete the program together in one twelve-month period. Sessions begin in January of each year. Final deadline for applications is October 10 of the preceding calendar year. For applicants who wish to make plans early in the preceding year, there is an advance registration deadline of August 1. International students and students whose native language is not English must meet special requirements for admission to the Graduate School of UT Knoxville, and they are advised to make inquiries well in advance of the program application deadline. To be considered for admission, the applicant must have a bachelor's degree and 10 or more years of work experience. Applicants must submit a complete application file including the Graduate School Application, official transcripts of prior college work, the executive MBA program application with evaluations from his/her company, and the Graduate Management Admissions Test (GMAT) score report. Transcripts from other institutions often take four to six weeks to arrive, so applicants should request these far in advance of the deadline.

For admission to this program, primary consideration is given to the applicant's work history and the recommendation from the sponsoring organization and the GMAT. There is no cut-off for either grade-point averages or GMAT scores; however, admission to the program is competitive, and applicants will be evaluated on their ability to operate on a par with other highly achieving participants.

Curriculum

The program is taught by a core faculty of 10 professors assisted by other faculty on an ancillary basis. The core faculty develop the entire curriculum and teach it in an integrated, interdisciplinary manner.

The MBA program for executives is completed in three terms and requires registration for 15 hours in each term. The first term is comprised of Executive Core I and Management Project I; it includes two residence sessions. The second term is comprised of Executive Core II and Management Project II; it includes two residence sessions the first of which will be in an international venue. The third term is comprised of Executive Core III and Management Project III. It includes two residence sessions.

The core courses are a full-term curriculum with reading and study, case work and problem solving, as well as analyses and applications within the sponsoring organization during the off-campus periods. The topics introduced within these courses follow five major themes: the functional fundamentals (learned within a cross-functional framework); continuous improvement from a systems-thinking perspective; the role of the firm in the global environment; organizational culture and change management; and personal and team development.

The management project is carried out as an independent project with faculty advisor. It involves the diagnosis and analysis of some significant aspect in the sponsoring organization and is based on applying major themes in the core courses. The written project and presentation to senior management and faculty serves as the comprehensive examination. The off-campus work requires substantial and regular contact with faculty.

Transfer Credits

Because of the integrated nature of the curriculum, no credit hours for courses already taken may be substituted for those in the executive program of the MBA.

Executive MBA in Taiwan

The executive MBA taught in Taipei, Taiwan is designed for professionals residing in Taiwan and other nearby countries. Its target audience and objectives are the same as those on the Knoxville campus, except that the sequence of material has been changed to accommodate the schedules of faculty teams traveling to Taiwan. The executive track of the MBA in Taiwan results in the same Master of Business Administration degree as the full-time MBA and executive MBA on the Knoxville campus.
The Taiwan executive MBA is three semesters of 15 credit hours each, including the same core and project courses described for the Knoxville program. Between each semester, there is a term when students are not enrolled. The program begins in the Summer term, continues in Spring semester of the following calendar year and is completed in the Fall semester of that same year. All participants begin and complete the program together.

Each semester is comprised of two periods of concentrated class work with a continuous program of reading, study, and on-the-job applications between class periods. The class will most necessarily during the semesters in which they are not enrolled for purposes of discussing the readings and assignments and for assisting one another. The first five periods will be taught in Taiwan. The sixth class period is a three-week residency on the Knoxville campus.

Admissions Requirements for the Executive MBA in Taiwan

To be considered for admission, the applicant must have the equivalent of a U.S. bachelor's degree and 10 or more years of work experience. Applicants must submit a complete application file including the Graduate School application, official transcripts of prior college work, and the executive MBA program application with a recommendation from their company. Admission to the program is competitive. Primary consideration is given to the applicant's work history and the recommendation from the applicant’s manager, and applicants will be evaluated on their ability to operate on a par with other high achieving participants.

Each international participant who has not taken the Test of English as a Foreign Language (TOEFL) within the previous two years must take and pass it with a score of 550 or higher. This test may be taken before enrolling in the program but must be successfully completed prior to the international study period in the U.S. To allow for registration of scores and receipt of the I-20, participants should arrange to take the TOEFL at least 5 months before the international study period.

Executive MBA for Physicians

The physician track of the executive MBA is custom designed for physicians. Its objectives are the same as the general executive track of the MBA on the Knoxville campus. The curriculum content is like that of the Knoxville executive MBA, except that it is focused on executive education within the health care industry. The physician track of the executive MBA program results in the same Master of Business Administration degree as the full-time MBA and executive MBA programs on the Knoxville campus.

The physician program is three semesters of 15 credit hours each, including the same core and project courses described for the Knoxville program. The program begins in the Spring semester, continues into the Summer term, and is completed in the Fall semester of that same year. All participants begin and complete the program together.

Each term begins with an intensive residential period of concentrated class work with subsequent interactive sessions between faculty and students using distance learning technologies. In addition, a fourth and final residence period at the end of the Fall term will conclude the educational experience.

Admission Requirements for the Executive MBA for Physicians

To be considered for admission, the applicant must have an M.D. degree and 5 or more years of work experience. Applicants must submit a complete application file including the Graduate School Application, official transcripts of prior college work, and the executive MBA program application. Admission to the program is competitive. Applicants will be evaluated on their ability to operate on a par with other high achieving participants and on their future management potential.

THE DOCTORAL PROGRAM

The primary objective of the Ph.D. in Business Administration is to prepare a select number of qualified students for careers in university-level teaching and research for responsible positions in business and government.

Admission Requirements

Students seeking a Ph.D. degree must be recommended for acceptance by the College of Business Administration to The Graduate School. Application is based on the applicant's standing compared with other applicants and with the number of vacancies in each department. The Graduate School requires the Graduate School Application, transcripts from all previous college work, and additional information from international students. The college requires the Ph.D. application, scores from the GMAT, and four written recommendations. All materials should be received by the College of Business Administration not later than March 1. Late applications are considered only if space is available.

Under exceptional circumstances, a student may be considered for acceptance into the Ph.D. program without having a master’s degree. An applicant in this situation should have outstanding undergraduate background and should represent a deep and sincere commitment to the pursuit of a career in research and instruction.

Program of Study

The Ph.D. normally requires at least three years of full-time coursework beyond the baccalaureate degree, with two years of residence on the Knoxville campus.

1. Students must complete at least three years of full-time coursework beyond the baccalaureate degree, with two years of residence on the Knoxville campus.

2. Students are required to have a sound and broad base on which to build their Ph.D. coursework. The departmental doctoral advisor will work with the student to determine what, if any, courses need to be completed. All such work is subject to approval by the temporary doctoral advisory committee and the Director of Graduate Business Programs.

Specific concentrations may have prerequisites.

3. Research Tools: A minimum of 9 semester hours of graduate research methods must be completed. At least 6 semester hours in statistics courses beyond Statistics 531 are required. The remaining 3 semester hours may be completed in additional statistics courses (not to include Statistics 531) or in other areas such as research methodology, management science, computer science, econometrics, and psychometrics.

4. Concentrations: The concentration is the focal point of the Ph.D. program. Students are expected to master the literature and research techniques in the concentration area and to do quality research as evidenced by the preparation of an acceptable dissertation. A minimum of 12 semester hours of coursework is required, including at least 9 hours of doctoral seminars. Graduate work taken in the concentration at other institutions is considered by the temporary doctoral advisory committee in approving the specific coursework required.

Available concentrations are: accounting, finance, logistics/transportation, management (operations management and strategic management), marketing, and statistics. See the appropriate fields of instruction for specific course requirements.

5. A minimum of 9 semester hours of graduate coursework is required in an area
outside, but complementary to, the concentration. The student may choose the cognate from one of the following: one of the six concentration/business areas listed above, economics, or a related area in another school or college of the University.

**Comprehensive Examinations**

Comprehensive written examinations over the concentration area are administered to each student seeking candidacy for the Ph.D. degree. This examination is administered in two sessions of approximately four hours each. Students qualify in the cognate area by completing a one-, two-, or four-hour examination on an equivalent area jointly approved by the student’s major professor and the student’s advisor in the cognate area. Comprehensive examinations are generally offered during the fall and spring terms. Comprehensive examinations must be taken within five years of matriculation.

When either the concentration or cognate area examination is passed, the remaining examination must be passed within the next 13 months.

**Doctoral Committee**

A doctoral student is advised to give serious attention early in the program to the composition of his/her doctoral committee. In accordance with Graduate School policy, the student and the major professor identify a doctoral committee composed of at least four faculty members, three of whom, including the chair, must be approved by the Graduate Council to direct doctoral research. When the doctoral committee has been formed, the temporary doctoral advisory committee ceases to exist.

**Admission to Candidacy**

Students may apply for admission to candidacy for the Ph.D. after maintaining at least a "B" average in coursework, successful completion of comprehensive examinations, and acceptance of a research proposal for the dissertation by the student’s doctoral committee.

Admission to candidacy must be approved at least one full semester prior to the date the degree is conferred. (Admission in the fall permits graduation in the following spring semester.)

Application for admission to candidacy must include a listing of all courses taken in each of the fields required for the degree (business functional areas, basic disciplines, concentration and cognate area). Graduate courses accepted from other institutions must be included. Under "Other Requirements," the first academic term is indicated. The application must be approved by the student’s doctoral committee and the Associate Dean before submission to The Graduate School.

**Dissertation**

Minimum of 24 semester hours: The student must complete a dissertation embodying the results of original research demonstrating the ability to do scholarly writing. The dissertation is supervised by the candidate’s doctoral committee, which must certify its completion and acceptability after oral defense of the candidate's research effort.

The dissertation normally must be completed within three years of the student's advancement to candidacy.

**GRADUATE COURSES**

**502-03 Business Core for Master of Accountancy I, II (3,3)** Development of roles and responsibilities of accountant as business adviser. Development and delivery of customer value, continuous system improvement, leadership and decision-making process control, human resource management, role of quality in competitive organizations, performance measurement, financial planning, and corporate strategy. Prerequisite: Admission to M.Acc. program.

**504 Core I (15)** Development of roles and responsibilities of business manager. Functional fundamentals (accounting, finance, marketing, operations, human resource management) through real-time case analysis. Knowledge is applied to projects of real-world enterprise. Continuous systems improvement and delivery of customer value: role of finance, marketing, operations, human resource management, and corporate strategy. Prerequisite: Admission to MBA program or consent of Director of Graduate Business Programs.

**505 Corso I (15)** Continuation of 504. Functional fundamentals through year-long case study work on organizational behavior, global competition, managing technology, ethics and social responsibility, and strategic planning. Capstone integrated business simulation. Prerequisite: 504 or consent of Director of Graduate Business Programs.

**506 Information Infrastructure Strategy and Design (3)** Information strategy involving structured and unstructured systems, using internet and intranet networks. Design of structured system using upper CASE tools and unstructured system using grooveware which is internet accessible with access control.

**510 Customer Responsive Management (3)** Customer relationship management method to develop demanded product features and services. Development of customer relationship management and customer loyalty and satisfaction programs. Prerequisite: Admission to executive program of MBA.


**561 Management Project (3)** Company project. Preliminary investigation of a strategic issue, proposal, initiative, program or significant organizational change to enhance organizational effectiveness in sponsoring organization. Work within firm under guidance of faculty to develop proposal which delineates issue and scope of project. Proposal is reviewed by faculty and渎据. Prerequisite: Admission to executive program of MBA and cooperation of sponsoring organization.

**562 Management Project (3)** Company project. Continuation of 561. Proposal, initiative, program or significant organizational change to enhance organizational effectiveness in sponsoring organization. Work within firm under guidance of faculty member. Prerequisite: 561.

**563 Management Project III (3)** Company project. Continuation of 562. Proposal, initiative, program or significant organizational change to enhance organizational effectiveness in sponsoring organization. Work within firm under guidance of faculty member. Prerequisite: 562.

**593 Directed Independent Study (3)** Cross-disciplinary topic of mutual interest to student and faculty. Available only by arrangement with sponsoring faculty member. May require approval of Director of Graduate Business Programs. May be repeated. Maximum 6 hrs. S/NC or letter grade.

**599 Executive-In-Residence (3)** Interaction with corporate executives from w.d. spectrum of business disciplines and discussion of domestic and international strategic planning as applied in major corporations. Prerequisite: MBA core and consent of instructor.

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**Chemical Engineering**

(Graduate School of Engineering)

**MAJOR**

**DEGREES**

Chemical Engineering.................. M.S., Ph.D.
John R. Collier, Head

Professors:
Bieszczalski, Paul R., Ph.D., Purdue Collier, John R. (Liaison), Ph.D., Case Western Counce, Robert M., Ph.D., Tennessee Culberson, Oran L., Emeritus, Ph.D., Texas Cummings, Peter T., Distinguished Scientist, Ph.D, Melbourne Frazier, George C., Jr. (Condra Prof.), Ph.D., Johns Hopkins Holmes, John M., Emeritus, Ph.D., Tennessee Hsu, Hsi-Wen (Emeritus), Ph.D., Wisconsin Moore, Charles F., Alumni Prof., Ph.D., Louisiana State Peretz, Joseph J., Emeritus, Ph.D., Ph.D., Northwestern Prados, John W. (University Prof.), PE, Tennessee Sheth, Atul (UTS), Ph.D., Northwestern Thomas, Carl O. (Emeritus), Ph.D, Tennessee

Associate Professors:
Bruns, Duane D., Ph.D., Houston Wang, Tae-Wei, Ph.D., MIT Weber, Frederick E., Ph.D., Minnesota

Assistant Professors:
Frymier, Paul D., Ph.D., Virginia Koffer, David J., Ph.D., Minnesota

Graduate programs lead to the degrees of Master of Science and Doctor of Philosophy in Chemical Engineering with concentrations in chemical engineering, chemical bioengineering, advanced control systems, and polymer science and engineering.
THE MASTER'S PROGRAM

Thesis Option: The standard master's program includes a thesis and leads to the Master of Science. Minimum departmental requirements are as follows:
1. A total of at least 21 hours in graduate coursework in chemical engineering and related areas excluding thesis. The minimum requirements are 15 hours in chemical engineering; 3 hours in other engineering, scientific, or business areas (as approved by the departmental faculty); and 3 hours chosen from either of these two categories.
3. Active participation in graduate seminars in the department. Resident students must register for CHE 501 every semester it is offered.
4. A final oral examination covering the thesis, related fields and graduate coursework.

Non-Thesis Option: Under certain conditions, a candidate may apply for a non-thesis program. To be eligible, a candidate must show evidence of significant professional experience after the baccalaureate degree; at least five years of industrial experience or research publications would be examples of such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the non-thesis option are as follows:
1. A total of at least 33 hours in graduate courses in chemical engineering and related areas. The minimum requirements are 18 hours in chemical engineering; 6 hours in other engineering, scientific, or business areas (as approved by the departmental faculty); and 9 hours chosen from either of these two categories.
2. Completion of a critical review of the literature and other sources in an area related to chemical engineering (CHE 580).
3. A written comprehensive examination over the major field and an oral examination covering the review paper and related areas.

THE DOCTORAL PROGRAM

Students applying for entrance into the doctoral program must submit evidence of ability to perform and report independent research to the satisfaction of the department. The master's thesis may be offered as such evidence.

Department requirements consist of the satisfactory completion of:
1. Graduate courses in chemical engineering, amounting to approximately 24 semester hours, at least 9 of which must be in 600-level courses.
2. Supportive courses in related scientific and engineering fields amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include chemistry, mathematics, physics, and engineering.
3. The comprehensive examination, consisting of a written part and an oral part. The written part covers thermodynamics, reactor analysis, and transport phenomena and separations.
4. Active participation in graduate seminars conducted by the department. Resident students must register for CHE 501 every semester it is offered.

GRADUATE COURSES

403 Introduction to Optimization (3) Principles and applications of optimization techniques to chemical process design: unconstrained and equality constrained optimization techniques, linear programming, dynamic programming, and geometric programming. Prereq: Mathematics 241.


467 Honors: Engineering Internship in Process Control (4) Selected students work in small groups on industrial problems in process dynamics and control. Directed by faculty and engineers from host company. Prereq: Process Dynamics and Control and consent of instructor.

477 Honors: Applied Process Automation Laboratory (3) Interfacing flexible batch continuous processes to automation systems. Top down analysis with bottom up implementation, hierarchical structures and distributed, computer-based concepts used to design automation solutions: human-machine-interfaces. Workstations with modern industrial equipment, computer-aided design and visualization environment. Prereq: Process Dynamics and Control and consent of instructor.


485 Hydrocarbon Processing (3) Physical and chemical properties of selected petroleum and those processes utilized in conversion of raw materials into various fuels and selected chemical feedstocks. Prereq: Mass Transfer and Separation Processes, Organic Chemistry.

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

501 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. S/N/C only. F, Sp

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when the student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E

505 Engineering Analysis (3) Formulation and solution of problems in chemical engineering and materials areas, ordinary and partial differential equations; types of ODE, PDE and numerical solution methods; computer simulation and visualization; variational methods; introduction to numerical methods. (Same as Materials Science and Engineering 505.)

507 Application of Linear Algebra in Engineering Systems (3) Fundamental concepts of linear algebra to problems in engineering systems: steady state and dynamic systems. Geometric and physical interpretations of relevant concepts; least square problems, LU, QR, and SVD decompositions of system matrix; eigenvector problems and similarity transformations in solving difference and differential equations; numerical stability aspects of various algorithms; application of linear algebra concepts in control and optimization studies; Introduction to linear programming. Computer projects. Prereq: Gradate standing or consent of instructor. (Same as Electrical Engineering 507 and Mechanical Engineering 507)

531 Advanced Chemical Engineering Thermodynamics (3) Phase equilibrium in ideal and nonideal solutions; composition relationship of phases, solution behavior and application to macrocyclics; introduction to microscopic approach to thermodynamics. F


541 Fluid Mechanics and Polymer Processing (3) (Same as Materials Science and Engineering 541)

542 Diffusive and Stagnwise Mass Transfer Operations (3) Analysis of mass transfer channelling, coupled mass transfer and reaction, mass transfer operations in packed towers and agitated vessels, membrane separations. Equilibrium stage calculations to mass transfer operation, emphasizing nonlocal and multicomponent systems.

547 Introduction to Transport Phenomena (3) Unified treatment of mass, momentum, and heat transfer. Differential and integral balances in deriving governing equations. Analogies between processes. Use of dimensionless approach in scaling systems up or down. Applications involving transfer, and simultaneous chemical reactions. F

551 Chemical Reactor Analysis (3) Rate models for heterogeneous reactions, properties of porous catalysts, catalyst deactivation, fluid-fluid and fluid-solid reactors.

561 Process Modeling and Simulation (3) Theories and models for nonideal systems, rate of simulation. Model development from basic principles. Model development from plant test, use of models in operation, optimization and control. Prereq: Consent of instructor.

575 Applied Microbiology and Bioengineering (3) Course content includes combining basic concepts in microbiology, biochemistry, and chemical engineering to develop a student's understanding of the biochemistry of certain microorganisms and their role in biotechnological processes. Systems used may include fermentation, wastewater treatment, and bioconversion processes. Prereq: Consent of instructor.

581 Industrial Pollution Prevention (3) Principles and practical aspects of industrial waste minimization. Regulatory environment, waste minimization strategies, economic impact of pollution control, on-site treatment of industrial wastewater, analysis of alternative waste minimization and pollution control technologies. Prereq: Graduate standing in engineering or consent of instructor. (Same as Environmental Engineering 581 and Engineering Science and Mechanics 585.)

585 Process System Reliability and Safety (3) (Same as Nuclear Engineering 585)

590 Special Topics in Chemical Engineering (3) May be repeated. Maximum 6 hrs.

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

631 Advanced Topics in Statistical Thermodynamics and Molecular Dynamics (3) Statistical thermodynamics, molecular simulation methods and computer simulations, Monte Carlo and molecular dynamics calculations, statistical mechanics of fluids, macromolecules and biological systems. Prereq: 532.

641 Advanced Diffusional Operations (3) Fixed and fluidized bed operations, recent developments in separation processes. Prereq: 642.

642 Advanced Topics in Polymer Processing (3) (Same as Materials Science and Engineering 642)

647 Advanced Transport Phenomena (3) Theory of mass, momentum, and energy transport in reactive and non-reactive systems. Formulation of transport models useful for application to analysis and design of separation processes, and chemical and biochemical reactions. Prereq: 505, 547.


661 Advanced Topics in Process Dynamics and Control (3) May be repeated. Maximum 6 hrs.

675 Microbial Systems Analysis (3) Identification and analysis of complex microbial systems using perturbation analysis methods. Structuring of important mechanistic processes, state variables, and regulation at several levels (reactor or macro, ecological, cellular, physiological and molecular). Experimental methods for data gathering, signal resolution and processing, statistical signal analysis model development (deterministic, sto-
Chemistry
(College of Arts and Sciences)

MAJOR DEGREES
Chemistry .................................................. M.S., Ph.D.

Michael Sepaniak, Head

Professors:
Adcock, J. L., Ph.D. ........................................ Texas
Alexander, D. (Hochst-Celanese), Ph.D. ................... California
Baker, D. C. (Paul and Wilma Ziegler Prof.), Ph.D. ............. Illinois
Bartmess, J. E., Ph.D. ..................................... Northwestern
Bloor, J. E. (Emeritus), Ph.D. .............................. Manchester
Bull, W. E. (Emeritus), Ph.D. ............................... Illinois
Chambers, J. Q., Ph.D. ..................................... Kansas
Compton, R. N., Ph.D. ...................................... Tennessee
Cook, K. D., Ph.D. .......................................... Wisconsin
Dean, J. A. (Emeritus), Ph.D. .............................. Michigan
Eastham, J. F. (Emeritus), Ph.D. ............................ California
Fletcher, W. H. (Emeritus), Ph.D. .......................... California
Grimm, F. A., Ph.D. ......................................... Cornell
Guilasch, G. (Distinguished Scientist), Ph.D. .................... Illinois

Kabalka, G. W. (Robert H. Cole Prof.), Ph.D. .................... Purdue
Kleinleider, D. C. (Emeritus), Ph.D. ......................... Princeton
Kopec, J. D., Ph.D. .......................................... Yale
Lietzke, M. H. (Emeritus), Ph.D. .............................. Wisconsin
Magid, L. J., Ph.D. .......................................... Tennessee
Magid, R. M., Ph.D. .......................................... Yale
Pagni, R. M., Ph.D. .......................................... Yale
Peterson, J. R. (Emeritus), Ph.D. ............................. California
Schweitzer, G. K. (Distinguished Prof.), Ph.D. ................. Illinois
Sepaniak, M. J., Ph.D. ...................................... Iowa State
Smith, W. T. (Emeritus), Ph.D. .............................. Ohio State
Van Hook, W. A. (Paul and Wilma Ziegler Prof.), Ph.D. ...... Illinois
Wehry, E. L. (Emeritus), Ph.D. .............................. Purdue
Williams, T. F. (Distinguished Prof.), Ph.D. .................... London
Woods, C. III, Ph.D. ........................................ NC State
Wunderlich, B. (Distinguished Scientist), Ph.D. ................. Northwestern

Associate Professors:
Barnes, C. E., Ph.D. ........................................ Stanford
Feijerle, C. S., Ph.D. ........................................ Colorado
Schell, F. M., Ph.D. ......................................... Indiana
Xue, Z. G., Ph.D. .......................................... California

Assistant Professor:
Badmam, M. D., Ph.D. ...................................... Massachusetts
Gilman, S. C., Ph.D. ........................................ Penn State
Hinde, Robert J., Ph.D. ...................................... Chicago
Young, D. G., Ph.D. ........................................ Ohio State

Students majoring in Chemistry for the master's or doctoral degree are required to present a prerequisite one year each of general, analytical, organic, and physical chemistry with a satisfactory record. At least one-half year of inorganic chemistry is also recommended. Students lacking any of these prerequisites may be admitted with appropriate deficiencies that must be removed without graduate credit. Applicants are required to take the general Graduate Record Examination.

Students minoring in Chemistry are required to present as a prerequisite two years of chemistry including quantitative analysis.

THE MASTER'S PROGRAM
The department offers concentrations in six areas for the M.S.: analytical chemistry, environmental chemistry, inorganic chemistry, organic chemistry, polymer chemistry, and physical chemistry.

The requirements for the M.S. in Chemistry consist of the satisfactory completion of:
1. Research and a thesis 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. (No more than 2 hours may be applied to the course requirements.)
3. Prescribed remedial courses based on performance on entrance examinations.
4. Sufficient graduate coursework 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: 530-31-32, 550-51-52, 570-72-73, 590-94-95, or three courses from 510-11-12-20. At least 14 hours of this coursework must be at the 500 level or above.
5. A final oral examination.

THE DOCTORAL PROGRAM
The department offers concentrations in eight areas for the Ph.D.: analytical chemistry, chemical physics (in cooperation with the Department of Physics), environmental chemistry, inorganic chemistry, organic chemistry, polymer chemistry, and theoretical chemistry.

The requirements for the Ph.D. 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 remedial courses based on performance on entrance 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 501 and one of the following sequences: 510-11-12, 530-31-32, 550-51-52, 570-72-73, and 590-94-95.
6. A final oral examination.

The Ph.D. program with 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 plus 6 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
430 Advanced Inorganic Chemistry (3) Atomic and molecular structure, bonding theories, description of chemical elements, kinetics and mechanism of inorganic reactions, applications of modern techniques for characterization, coordination and organic chemistry, and theoretical interest. Current trends. Prereq. Inorganic Chemistry. Prereq. course 461 or 463. 3P.


471-81 Biophysical Chemistry (3,3) (Same as Biochemistry and Cellular and Molecular Biology 471-81.)

473-83 Physical Chemistry (3,3) Students may not receive credit for both 471 and 473 for both 481 and 483. Properties of gasses; first, second, and third laws of thermodynamics; chemical equilibria; simple phase equilibria; properties of solutions; introduction to statistical thermodynamics; 483-Kinetics of chemical reaction; introduction to quantum mechanics and applications to electronic structure of atoms and molecules: molecular spectroscopy. Prereq. General Chemistry. Elements of Physics or Fundamentals of Physics: Electricity and Magnetism, and Calculus III. 3P.

479-99 Physical Chemistry Laboratory (2,2) Experiments on topics discussed in 471-81 and 473-83. Prereq. or coreq. Corresponding courses 471 or 473 and 479 or 489 for 479, 1 lab. 479: 4, 499: 4P.

484 Advanced Physical Chemistry (3) Chemical dynamics, statistical thermodynamics, quantum mechanics of atomic and molecular systems, crystal structure and solid state. Prereq. 481 or 483. 3P.

500 Thesis (1-15) F/P/N only: E

501 Chemistry Seminar (1) Lectures and discussion on current research. May be repeated. Continuous registration required for resident graduate students. S/N only. 3P.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and for faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. 3P.

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 hrs. S/N only. 3P.

510 Analytical Spectrometry (3) Principles and practice of optical and mass spectrometric techniques in quantitative chemical analysis. Prereq. 1 yr of physical chemistry. 3P.

511 Analytical Separations (3) Principles and practice of chemical separations based on extraction, chromatographic, and electrophoretic phenomena. Prereq. 1 yr of physical chemistry. 3P.

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. Prereq. 1 yr of physical chemistry. 3P.

520 Chemical Instrumentation (3) Principles of analog and digital systems in chemical instrumentation; design in construction of chemical instruments. Prereq. Consent of instructor. 3P.

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. Prereq. 1 yr of physical chemistry. 3P.

531 Characteristics of Organic Compounds (3) Description of chemical elements; structure, reactions, kinetics, mechanisms, equilibria, and spectra of coordination, organometallic, bioorganic compounds. 3P.

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. Prereq. 530. 3P.
Child and Family Studies
(College of Human Ecology)

MAJORS
Child and Family Studies ................... M.S.

Human Ecology ................................ Ph.D.

Ernest W. Brewer, Interim Head

Professors:
Blanton, Priscilla, Ed.D. ..................... Tennessee
Buehler, Cheryl, Ph.D. ........................ Minnesota
Cunningham, Jo Lynn, Ph.D. ................ Michigan State
Fox, Greer, Litton, Ph.D. ..................... Michigan
Moran, James D., Ph.D. ..................... Oklahoma State
Nordquist, V. Mick, Ph.D. ................... Tennessee
Steele, Connie (Emeritus), Ed.D. ......... Texas Tech
Twardosz, Sandra, Ph.D. .................... Kansas

Associate Professors:
Allan, Jan, Ph.D. ................................ Purdue
Malla, Julie, Ph.D. ............................. Iowa State
Smith, Delores, Ph.D. ........................... Oklahoma State
Tegano, Deborah, Ph.D. ...................... Virginia Tech

Assistant Professors:
Groves, Melissa, Ph.D. ....................... Virginia Tech
Morrison, Lane, Ph.D. ......................... Tennessee

The Department of Child and Family Studies provides coursework in human development and family studies. Integration of these areas creates a unique perspective for the study of individuals and families. Each graduate student's program of study is carefully planned in conjunction with a faculty committee to establish a program consistent with program requirements and a student's individual goals. All programs are characterized by a broad array of coursework, varied research experiences, and opportunities for experiences in applied settings.

ADMISSION REQUIREMENTS

A completed file for review includes a departmental application, Graduate Record Examination (GRE) scores for the general section, and completion of three Graduate School Rating Forms by individuals who can attest to the applicant's potential for graduate education. Forms may be obtained from the department or Dean's Office, College of Human Ecology.

Admission to the program is contingent upon faculty evaluation of GRE scores, undergraduate/graduate GPA, rating forms, work experience, and the match between student's goals and department's focus.

Prerequisites for admission to the master's program are 9 semester hours of upper division undergraduate social science.

Prerequisites to the doctoral program are a master's degree from a regionally accredited institution or equivalent completion of the 18 hour core in the CF's master's program (or appropriate substitutions), 3 hours of computational-based, graduate-level statistics, 3 hours of graduate-level research methods, and completion of a thesis as part of the master's degree. The department provides a remedial mechanism for doctoral students who have earned a master's degree but have not met the other prerequisite requirements.

THE MASTER'S PROGRAM

The Master of Science degree with a major in Child and Family Studies provides a broad foundation in the understanding of how children develop and how families function in today's society. Two concentrations are available in child and family studies or in early childhood education.

Child and family studies requires a minimum of 36 credits of coursework and 18 credits in core coursework and 18 credits in specialization.

Core requirements are: 510, 511, 540, 550, 562, and 565. Students then choose either the thesis option (research) or the non-thesis option (practice, internship, and comprehensive exam required). Students who plan to pursue a doctoral degree are best served by selecting the thesis option. The following are required in the thesis option: 570, 583 or 537, and 6 credits of Thesis 500. Students who plan to work with children and families in the community are best served by selecting the non-thesis option. Specializations within the practice option include: child and family life practice, family mediation, gerontology, child and family policy, families of children with disabilities, and child and family program administration. Each of these specializations includes 6 credits of specified relevant coursework and a supervised internship (564 and 565). Specific coursework within each specialization is on file in the Department of Child and Family Studies. Interested students should contact the Graduate Coordinator in Child and Family Studies.

The early childhood education concentration is designed for students seeking initial teacher licensure in early childhood education (Pre-K through Grade 3). This program is based on an undergraduate degree in child development or equivalent coursework. A non-thesis option only is available. All students in the early childhood education licensure program must enroll in Human Ecology 574, 575, 591, and Holistic Teaching/Learning 505 (or equivalent Child and Family Studies course). Students select 12 hours from 510, 511 or 512; three courses from 511, 520, 521, 522, 525, 530, 540, 590; 3 hours of 500-level statistical methods or interpretation of statistics or research methods (requirement may be met with 569); and written comprehensive examination (6 credits).

Students seeking the M.S. with a major in Child and Family Studies must file a plan of study with the department head after 15 hours of graduate credit.

THE PH.D. CONCENTRATION

The department participates in the doctoral program with a major in Human Ecology, concentration in child and family studies. Two themes are highlighted: the integration of human development and family studies within the context of human ecology and related areas, and concentration in a selected area of study. A doctoral program that is concurrently specialized and integrative in nature reflects the complexity of the disciplinary subject matter, provides a broader context to formulate theoretical questions, and broadens the empirical literature for addressing those questions.
520 Curriculum and Program Development in Early Childhood Education (3) 
Description, analysis, and evaluation of curriculum models, teaching methods, administrative style, and supervision of personnel. Experiences in designing and evaluating early childhood programs for young children: special needs, infancy-age 8. Prereq. or coreq.: 510 or 512.

521 Organizational Management in Early Childhood Education (3) 
Designing, implementing, and evaluating educational environments. Applications of skills in organizational management, interpersonal leadership, and supervision of staff. Prereq.: 510 and 512 or equivalent or consent of instructor.

522 Naturalistic Interventions for Parents and Teachers of Young Children (3) 
Common problems faced by parents and teachers; methods available to modify problem behavior. Prereq.: 510 or equivalent or consent of instructor.

525 Seminar on Play (3) 
Comparison and contrast of theoretical frameworks and research methodologies on play. Prereq. or coreq.: 510 or equivalent.

530 Families of Handicapped Children (3) 
Developmental nature of families' experiences in caring for handicapped children, especially during infancy and early childhood. Prereq.: 510 and 511 or consent of instructor.

535 Child and Family Policy (3) 
Key policy issues related to children and families: custody disputes, poverty, and welfare reform. Parental kidnapping, abuse and neglect, child care, and adoption practices and families. Basic elements of family impact analysis. Prereq.: 510 or equivalent.

540 Parent-Child Relations (3) 
Influence of parents on children, effects of children on parents, reciprocal interaction between parents and children, applications of systems models, impact of child abuse and divorce on children. Prereq.: 550 and 510 or equivalent or consent of instructor.

550 Research and Theory in Marriage and Family Life (3) 
Use of family concept frameworks and application of theoretical models to understanding research literature on marital relations.

552 Diversity in Children and Families (3) 
Diversity in family configurations in contemporary U.S. society. Variations of family patterns by race, ethnicity, religion, and social class; social dynamics of family formation, composition, and patterns. Prereq.: 550. F.A.

555 Children, Divorce and Remarriage (3) 
Children's and adults' adjustment to transitions involved in parental divorce, single-parenthood, and remarriage. Prereq.: 550. F.A.

560 Human Sexuality (3) 
Prerequisites: 510 or equivalent. F.A.

562 Families and Children Coping with Stress (3) 
Processes that children and families undergo during significant life changes. Prereq.: 510 or equivalent. F.A.

563 Family Life Education Programs (3) 
Planning, implementation and evaluation of programs in marital, parental, and family relationships, and parenthood education. Prereq.: Consent of instructor. (Same as Human Ecology 563.)

564 Practicum in Human Development or Family Studies (3) 
School and community programs: education for human development and family living. Prereq.: Consent of instructor. S/N/C only. F.A.

565 Practicum in Human Development or Family Studies (3) 
School and community programs: education for human development and family living. Prereq.: 510 or equivalent of instructor. S/N/C only. F.A.

566 Approaches to Family Intervention and Counseling (3) 
Various theoretical approaches for family intervention and counseling. Structural, experiential, and social learning practices. Prereq.: 510 or equivalent of instructor. S/N/C only. F.A.

567 Family Violence (3) 
Theory and research on violence, maintenance and cessation of violent behaviors in intimate family contexts, and assessment of responses to violent family behaviors, perpetrators, victims, and family systems. Prereq.: 550. F.A.
Civil and Environmental Engineering

(College of Engineering)

MAJORS

Civil Engineering ................. M.S., Ph.D.
Environmental Engineering ........ M.S.
(Ph.D. through Civil Engineering)

Gregory D. Reed, Head

Professors:

Bennett, R. M., PE, Ph.D. .......... Illinois
Burdelie, E. G. (Fred N. Peabody Prof.), PE, Ph.D. .......... Illinois
Chatterjee, A., PE, Ph.D. .......... NC State
Davis, W. T., Ph.D. .......... Tennessee
Deatherage, J. J., Ph.D. .......... Tennessee
Drumm, E. C., PE, Ph.D. .......... Arizona
Goodpasture, D. W., PE, Ph.D. .......... Illinois
Greco, W. L. (Emeritus), Ph.D. .......... Michigan State
Heathington, K. W. (Emeritus), Ph.D. .......... Northwestern
Humphreys, J. B. (Emeritus), Ph.D. .......... Texas AM
Johnson, H. L. (Emeritus), M.S. .......... Tennessee
Miller, W. A. (Granger Prof.), PE, Ph.D. .......... Georgia Tech
Peck, B. W. (Emeritus), Ph.D. .......... Illinois
Reed, G. D. (Lajson), PE, Ph.D. .......... Arkansas
Robinson, R. B. (Fisher Prof.), PE, Ph.D. .......... Iowa State
Smoot, J. L., PE, Ph.D. .......... VPI
Tschantz, B. A. (Cordra Prof.), PE, Ph.D. .......... New Mexico State
Walker, C. R. (Emeritus), M.S. .......... MIT
Wegmann, F. J., Ph.D. .......... Northwestern

Associate Professors:

Chow, K. G., Ph.D. .......... Northwestern
Cox, C. D., Ph.D. .......... Penn State
Han, L. D., Ph.D. .......... California
Mauldon, M., Ph.D. .......... California
Miller, T. L., PE, Ph.D. .......... Tennessee
Richards, S. H., PE, Ph.D. .......... Tennessee
Robinson, K. G., Ph.D. .......... VPI

Assistant Professors:

Jackson, N. M., PE, Ph.D. .......... Oregon State

THE MASTER'S PROGRAM

The Master of Science programs in Civil Engineering and Environmental Engineering are offered to graduates of recognized undergraduate curricula.

Departmental requirements provide that for a major in Civil Engineering, the Bachelor's degree must be in civil engineering, or certain undergraduate prerequisite courses must be taken before admission to candidacy for the Master of Science in Civil Engineering.

Civil Engineering

The Department of Civil and Environmental Engineering offers two options for the Master of Science with a major in Civil Engineering.

**Thesis Option:** A minimum of 30 semester hours, including 6 hours of thesis, is required.

**Non-Thesis Option:** A minimum of 33 semester hours, including a 3-hour special problems is required. The special problem will culminate in a written report which must be approved by the student's major professor.

**Environmental Engineering**

For a Master of Science with a major in Environmental Engineering, normally a Bachelor's degree in a field of engineering is required.

The Department of Civil and Environmental Engineering offers both thesis and non-thesis options for work toward the Master of Science degree in Environmental Engineering.

**Thesis Option:** The student must present a minimum of 30 semester hours of approved graduate courses. The major shall include 6 semester hours of thesis and a minimum of 12 semester hours of approved environmental engineering coursework. A minor may be selected but is not necessarily required.

**Non-Thesis Option:** The student must present a minimum of 33 semester hours of approved graduate courses. The major shall include a minimum of 18 semester hours of approved environmental engineering coursework. A minor may be selected but is not necessarily required.

Either option must be approved by the student's major professor. A student's program must include a minimum of 9 semester hours of advanced design-ing engineering design courses selected from a list provided by the student's committee.

Normally, the graduate program of study will be adjusted by the head of the department and the student's committee to suit the individual academic objectives.

THE DOCTORAL PROGRAM

A graduate program leading to the Doctor of Philosophy is offered in Civil Engineering.

Specific departmental requirements for the Ph.D. degree include the following:

1. A minimum of 72 semester hours beyond the Bachelor's degree, exclusive of credit for the M.S. thesis. Of this number, a minimum of 24 semester hours in 600 Doctoral Research and Dissertation will be required.

2. A minimum of 24 semester hours of graduate courses in civil engineering, exclusive of dissertation credit, at least 5 of which must be 600-level courses.

3. Supporting courses in related scientific and engineering fields, amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 3 of these hours must be beyond those required by the civil engineering undergraduate requirements.

4. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.

5. Upon completion of at least one-half of all coursework, each student must pass a comprehensive examination.

6. After completion of the dissertation, prior to graduation, each student must pass a comprehensive examination administered by a faculty committee.

MINOR IN ENVIRONMENTAL POLICY

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Environmental Engineering (concentration in air quality or waste management) is available to residents of the state of Alabama. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

Civil Engineering

GRADUATE COURSES

421 Portland Cement Concrete Mix Design and Analysis (3) Aggregate properties and tests, tests of portland cement and concrete, mix design methods, admixtures, and nondestructive testing. Prereq: 221, 2 hrs and 1 lab.

451 Highway Engineering (3) Design, construction, operation, and maintenance of highway facilities; application of various engineering principles and techniques to process of planning, locating and design of highway facilities; both geometric and pavement design. Prereq: 210, 215, 352.

452 Traffic Engineering (3) Characteristics of driver, vehicle, roadway and their interaction; traffic studies; basic considerations of traffic circulation and control, lighting capacity analysis, roadway safety analysis and design. Prereq: 210, 215, 352.

453 Airport/Railroad Planning and Design (3) Airport master planning and railroad engineering. Runway configuration, airfield capacity, geometrical and terminal layout and design. Railroad capacity, geometrical and system layout and design. Prereq: 210, 251, 382.

461 Analysis of Framed Structures (3) Determination of dead, live, and earthquake loads for buildings; vertical and lateral load resisting systems; analysis of building frames. Prereq: Structural Analysis II.

472 Steel Design (3) Design of plate girders and composite beams; consideration of members subjected to combined stresses; design of typical framed building connections. Prereq: 471.

474 Reinforced Concrete Design (3) Design of continuous beams, floor slabs, and columns with combined axial loads.
500 Thesis (1-15) P/NP only. E

502 Registration for Use of Facilities (3-15) 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. S/NC only. E

510 Urban Systems: Engineering and Management (3) Urban systems using systems theory, urban management, water supply and sewage, regulation and planning. Prereq: Graduate standing or consent of instructor.

511 Pavement Design (3) Design and construction of pavements. Prereq: 520 or consent of instructor.

521 Computer-Aided Structural Analysis (3) Fundamentals of computational methods used in structural analysis; matrix and finite element methods; practical application of structural analysis software. Prereq: Introduction to Soil Behavior or consent of instructor.

539 Geotechnology Seminar (3) Seminar topics in geotechnical and geological engineering. Research contributions and case studies by graduate students and engineers and scientists from industrial and government consulting companies. Prereq: Graduate standing and consent of advisor. May not apply toward degree. May be repeated. S/NC only.

540 Construction Management (3) Management and organization of heavy and building construction projects. Prereq: Construction Methods and Equipment.

541 Construction Management II (3) Management and organization of heavy and building construction projects. Prereq: Construction Methods and Equipment.

543 Construction Estimating (3) Project costs, estimating techniques, market cost conditions, and feasibility of design to cost. Prereq: Introduction to Construction Management.

545 Traffic Engineering-Characteristics (3) Driver-vehicle-roadway system; traffic flow modeling; elements of transportation/highway safety. Prereq: Graduate standing.

552 Traffic Engineering-Operations (3) Signs, signals and signal control; short-term operations; control of pedestrian traffic; traffic volume and accident data. Prereq: 551 or 555.

555 Public Transit Planning (3) Characteristics of transit systems; conventional and paratransit; operational design of transit systems; route planning and scheduling; cost analysis; mode choice models: performance evaluation; transit surveys and organization and financing. Prereq: 554 or graduate standing.

556 Public Transit Planning (3) Characteristics of transit systems; conventional and paratransit; operational design of transit systems; route planning and scheduling; cost analysis; mode choice models: performance evaluation; transit surveys and organization and financing. Prereq: 554 or graduate standing.

557 Transportation Planning and Operations with Microcomputer Applications (3) Transportation system management techniques and application of micro-computers for transportation analysis. Prereq: 551 and 555.

562 Structural Systems (3) Structural system design and analysis; load, wind, and earthquake loads on buildings, bridges, and similar structures. Prereq: Introduction to Structural Design.

563 Statically Indeterminate Structures (3) Elastic analysis of statically indeterminate structures. Prereq: Introduction to Structural Design.

564 Fracture Analysis (3) Fracture analysis of concrete and steel structures. Prereq: 561 or 551.

566 Reliability of Constructed Systems (3) Development of safety factors and probability-based design codes. Monte Carlo methods; construction system reliability; evaluation of existing infrastructures. Prereq: 550, Introduction to Structural Design or consent of instructor.

571 Behavior of Steel Structures (3) Behavior of structural steel members due to static and fatigue loading; relation between research results and current specifications for design. Prereq: 571.
556 Hazardous Waste Management (3) Analysis and design of operations and processes for hazardous waste disposal and processing: regulations, analysis, industrial applications. Prereq: Consent of Instructor.

570 Air Quality Management/Pollution Control (3) Introductory course on concepts of air pollution, analysis ofrelationships among sources, meteorology, effects, stack sampling, emission control systems. Prereq: Consent of Instructor.

571 Design of Air Pollution Control Systems (3) Design and evaluation of systems used to control emission of gaseous and particulate air pollutants. Comprehensive design of specific devices and systems. Prereq: 570.

572 Air Quality Dispersion Modeling (3) Diffusion in atmosphere; application of atmospheric dispersion models and evaluation of meteorological and air quality data. Prereq: 570.

573 Sampling of Air Pollutants (3) Standard sampling methods for particulate and gaseous air pollutant emissions from industrial processes; ambient air monitoring instrumentation and techniques. Prereq: 570.

575 Applied Microbiology and Biocengineering (3) Same as Chemical Engineering 575, Microbiology 575, and Agricultural Engineering 575.5.

581 Industrial Pollution Prevention (3) (Same as Chemical Engineering 581 and Environmental Science and Engineering 582.)

590 Special Problems in Environmental Engineering (1-6) Enrollment limited to environmental engineering students in non-thesis programs. Prereq: Graduate standing. May be repeated. Maximum 6 hrs. S/NC only.

595 Special Topics (1-4) Problems and topics related to current developments in field. May be repeated.

602 Advanced Surface Water Hydrology (3) Advanced topics in surface water hydrology; solutions to St. Venant equations of unsteady flow for complex channel systems; dam breach modeling. Prereq: 520.

615 Industrial Waste Unit Operations and Processes (3) Theoretical design and laboratory modeling of industrial waste treatment processes and operations. Prereq: 551, 553. Preregistration or coregistration: 552. 2 hrs and 1 lab.


653 Pollution Fate Modeling and Risk Assessment (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of air, water, and earth materials in environment. Concepts of assessing risk posed by presence of those chemicals. Prereq: 551.

691 Special Topics in Environmental Engineering (3) Selected advanced problems of current interest. Prereq: Consent of Instructor. May be repeated.
they must complete the Graduate Record Examination, rating forms, and application forms as required by the College of Communications. Minimum requirements for admission to full potential candidate status normally include a 3.0 (4.0 system) grade-point average in undergraduate studies and scores at or above the fiftieth percentile in verbal, quantitative and analytical aptitude on the Graduate Record Examination. All application materials are screened by an admissions committee authorized by the faculty of the College of Communications.

New students normally are admitted to the programs only at the beginning of fall semester. However, under special circumstances, a student may be admitted at the beginning of spring semester in a temporary non-degree status. Applications for full admission must be received by May 1. Applications for financial aid are due by March 1.

A baccalaureate degree in communications or a related field is recommended. Admission is possible with other baccalaureate degrees. However, all applicants without the appropriate background are required to take up to 18 semester hours of prerequisite and corequisite courses as determined by the department in which the student is enrolled. Students may take a proficiency test on any prerequisite course, subject to review by the master's or doctoral committee of the College of Communications.

Students who have had no courses in their major area of concentration may expect to spend four or more full-time semesters in the program, including a media internship.

THE MASTER'S PROGRAM
The Master of Science with a major in Communications is intended for students who desire a career in the mass media with an emphasis on communications management and a deeper understanding of the communication process and social role of the mass media. The program follows a broad-based multi-media approach and allows the student to concentrate in one of five fields: advertising, broadcasting, journalism, public relations or speech communication. Both thesis and non-thesis options are available.

The prospective student who is interested only in areas identified in the areas listed above is advised to enroll for a second baccalaureate rather than an advanced degree.

Students planning to pursue a doctoral degree with a major in Communications may be accommodated in the M.S. program through special academic advising.

Degree Requirements
The M.S. program emphasizes communications management in the areas of advertising, broadcasting, journalism (publications), and public relations. For the thesis option, a minimum of 31 hours of approved graduate work is required. The non-thesis option requires 34 hours.

1. Ten hours of core courses—Communications 610, 612, 620, 640, 641; 6 hours of statistics; and three of the following courses: Communications 622, 632, 642, and 662.
2. Fifteen hours in a primary concentration (advertising, broadcasting, information sciences, journalism, public relations, or speech communication) supplementing the core. Courses may be taken in one or more of the Departments of Advertising, Broadcasting, Speech Communication, and/or the Schools of Information Sciences and Journalism.
3. Twelve hours in a secondary concentration (outside the College of Communications).
5. Twenty-four hours of dissertation.

All courses require the approval of the student's advising committee. Admission to candidacy must be attained at least two semesters prior to graduation and requires successful completion of a written comprehensive examination.

Each doctoral student's progress will be reviewed annually by the Doctoral Committee of the College of Communications. Results will be reported to the student by his/her program advisor, who will convey the committee's recommendation concerning the student's remaining in the program (non-candidacy) and suggestions for improvement in performance. Candidates without prior teaching experience must register for Communications 521, Tutorial in Communications Teaching.

Planned course offerings in the College of Communications for a full calendar year are available the preceding November. This information is available from the Graduate Studies Office, 426 Communications Building, 974-6651. See also courses listed under Advertising, Broadcasting, Information Sciences, Journalism, and Speech Communication.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Communications is available to residents of Arkansas, Kentucky, and Louisiana. The Ph.D. program is available to residents of the states of Alabama, Arkansas, Louisiana, Maryland, Virginia, or West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

ACADEMIC STANDARDS
A student in the College of Communications whose graduate grade-point average, not including incomplete grades, is below 3.0 at any time after the end of 12 hours of graduate credit will be placed on probation. A student on probation will be dropped from the program unless he or she raises his or her cumulative graduate grade-point average to 3.0 or higher at the end of the probationary period. The probationary period is defined as the next 12 semester hours of graduate coursework attempted that is specified in the student's degree program. Exceptions to this policy may be made only with the approval of the Associate Dean for Graduate Studies of the College of Communi-
**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>640</td>
<td>Communications Theory I (3) Selected research hypotheses, and theories in literature of mass communication theory.</td>
<td>Prerequisite: Consent of instructor or admission to program.</td>
</tr>
<tr>
<td>641</td>
<td>Communications Theory II (3) Selected topics in theory. Critical evaluation of extant theory, derivation of hypotheses, and advanced theory construction.</td>
<td>Prerequisite: Consent of instructor or admission to program.</td>
</tr>
<tr>
<td>642</td>
<td>Qualitative Research (3) Theory and application of qualitative research methods to social science and communications research. Theoretical considerations underlying symbolic interactionism as translated into research strategies of participant observation, life history, interviewing, archival analysis, and case studies.</td>
<td>Prerequisite: Consent of instructor or admission to program.</td>
</tr>
<tr>
<td>652</td>
<td>Mass Communications Law and Legal Research (3) Legal restrictions under which mass media operate. Finding, interpreting and analyzing sources of legal information.</td>
<td>Prerequisite: Consent of instructor or admission to program.</td>
</tr>
</tbody>
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**Comparative and Experimental Medicine**

(Office of the Vice Chancellor for Academic Affairs)

<table>
<thead>
<tr>
<th>Major</th>
<th>Degrees</th>
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<tbody>
<tr>
<td>Comparative and Experimental Medicine</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>L. N. D. Potgieter</td>
<td>Director</td>
</tr>
</tbody>
</table>

**ADMISSION REQUIREMENTS**

Admission requirements of The Graduate School of UT Knoxville apply. In addition, all applicants must furnish three letters of recommendation from individuals who are familiar with their scholastic or professional records.

**Master of Science Degree Program**

Applicants must have a baccalaureate degree with coursework in chemistry, organic, inorganic, physical, and biological sciences. Advanced study in biology such as biochemistry, immunology, mammalian anatomy, histology, cell biology, or other appropriate biomedical courses from an accredited university is recommended.

Applicants for admission to the Master of Science degree program with an undergraduate background in biology include no formal training in the biomedical field beyond the baccalaureate degree will be required to score at least 1,000 on the quantitative and verbal portions of the Graduate Record Examination.

**Doctor of Philosophy Degree Program**

Applicants generally will be expected to have a master's degree in one of the biological sciences and a Graduate Record Examination score of at least 1000 for the quantitative and verbal sections, or a professional degree in one of the medical sciences, (e.g., M.D., D.D.S., D.V.M.).

An individual having a baccalaureate degree with a strong background in the physical and biological sciences may be admitted upon presenting evidence of exemplary performance on the Graduate Record Examination.

Exceptional veterinary students at UT Knoxville may be admitted to the Comparative and Experimental Medicine graduate program but will be enrolled officially as veterinary students. During summers such students may take advantage of registering for graduate programs.
courses to be counted as elective courses in the veterinary program.

THE MASTER'S PROGRAM

All students must take at least 4 credit hours in 500- or 600-level courses in basic mechanisms of disease and at least 7 credit hours of 500-level biochemistry or cell biology. See listings under Biochemistry and Cellular and Molecular Biology program for information on these courses. In addition, students must complete a minimum of 8 hours of coursework in a specified discipline, 5 or more hours of electives, and 6 hours of Thesis 500. Exceptions to accommodate students with specific interests must be approved by the joint Graduate Coordinating Committee after application, in writing, to the director. The graduate committee (at least 3 members) is chosen after the first term and must include at least one member from the College of Veterinary Medicine and at least one member from the Graduate School of Medicine. If a minor is declared, one member must be from the minor discipline. A final oral examination is given at the end of the program.

THE DOCTORAL PROGRAM

All students must take at least 4 credit hours in 500- or 600-level courses in basic mechanisms of disease and at least 7 credit hours of 500-level biochemistry or cell biology. See listings under Biochemistry and Cellular and Molecular Biology program for information on these courses. In addition, students must complete a minimum of 8 hours of coursework in a specified discipline. Exceptions to accommodate students with specific interests must be approved by the joint Graduate Coordinating Committee after application, in writing, to the director. Areas of emphasis may include hematology, oncology, comparative pathophysiology, pharmacology, toxicology, immunology, infectious diseases, or biochemistry of disease. At least 24 hours of coursework, including a minimum of 6 hours at the 600 level, and 24 hours of Dissertation 600 are required for a total of 48 hours. For students with professional degrees, a minimum of 18 hours of coursework beyond the professional degree is required for a total of 42 hours.

The doctoral committee (at least 4 members) is chosen during the first year. Three of the four members, including the chair, must be approved by the Graduate Council to direct doctoral research. At least one member must be from the College of Veterinary Medicine and at least one member from the Graduate School of Medicine. A comprehensive examination is given at the completion of coursework. A seminar and final oral defense of the dissertation culminate the program.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program is available to residents of Georgia. The Ph.D. program is available to residents of the state of Florida. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

Comparative and Experimental Medicine—Graduate School of Medicine

GRADUATE COURSES

Participating departments include: Anesthesiology, Medical Science, Medical Biology, Obstetrics and Gynecology, Pathology, Pediatrics, Radiology, and Surgery.

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May be used toward degree requirements. May be repeated. SNC only. E

508 Graduate Research Participation (1) Advanced research techniques while conducting individual biomedical research projects under supervision of faculty. Open to all graduate students. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. SNC only. E

521 Principles of Oncology (3) Lectures, classroom discussion, and case reports surveying major topics of oncology. Prereq: Biology 220-30 or consent of instructor.

541 Molecular Basis for Metabolic Disease (4) Diseases at the molecular level. Changes in molecular events in cells that lead to disease and occur as a result of disease. Prereq: Consent of instructor.

545 Clinical Genetics (3) Human genetic disorders: new developments in cytogenetics, molecular genetics, clinical diagnoses and prevention. Prereq: Biology and genetics background or consent of instructor.

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

609 Mechanisms of Disease (4) Advanced topics in pathobiology and mechanisms of various cells, tissues, and organs to injury and other metabolic derangements. Selected topics.

Comparative and Experimental Medicine—Veterinary Medicine

GRADUATE COURSES

Participating departments include: Animal Science, Comparative Medicine, Microbiology, Pathology, Large Animal Clinical Sciences, and Small Animal Clinical Sciences. Several faculty in the Department of Microbiology hold joint appointments in the College of Veterinary Medicine. See Microbiology under Fields of Instruction for additional courses.

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

501 Special Topics in Comparative and Experimental Medicine (1-6) Specialized experience in comparative and experimental medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

502 Registration for Use of Facilities (3-15) 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. SNC only. E

503 Predictive Toxicology (3) Principles and techniques of predictive toxicity: structure-activity relationships, expert systems, neural nets and molecular similarity. Prereq: Consent of instructor.

508 Laboratory Animal Care and Use (2) Review of basic laboratory animal care and use as prerequisite to conducting research using animal subjects. Compliance issues and techniques. Prereq: Consent of instructor.

509 Experimental Animal Surgery (3) Competence in performing surgical manipulations. Prereq: Consent of instructor.

510 Wildlife Diseases (3) (Same as Wildlife and Fisheries Science 510) F

511 Nutritional Aspects of Companion Animal Health (2) (Same as Animal Science 536) F

512 Mammalian Organogenesis (3) (Same as Animal Science 551) F

520 Anatomy of Domestic Carnivores (4) (Same as Animal Science 552) F

544 Comparative Hematology (3) (Same as Animal Science 544) F

561 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamics-properties of drugs: mode of action, pharmocologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncrasies, and clinical applications. Prereq: Consent of instructor. F

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

609 Mechanisms of Disease (4) Advanced topics in pathobiology and mechanisms of various cells, tissues, and organs to injury and other metabolic derangements. Selected topics.

510 Special Topics in Comparative and Experimental Medicine (1-6) Specialized experience in comparative and experimental medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

502 Registration for Use of Facilities (3-15) 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. SNC only. E

503 Predictive Toxicology (3) Principles and techniques of predictive toxicity: structure-activity relationships, expert systems, neural nets and molecular similarity. Prereq: Consent of instructor.

508 Laboratory Animal Care and Use (2) Review of basic laboratory animal care and use as prerequisite to conducting research using animal subjects. Compliance issues and techniques. Prereq: Consent of instructor.

509 Experimental Animal Surgery (3) Competence in performing surgical manipulations. Prereq: Consent of instructor.

510 Wildlife Diseases (3) (Same as Wildlife and Fisheries Science 510) F

511 Nutritional Aspects of Companion Animal Health (2) (Same as Animal Science 536) F

512 Mammalian Organogenesis (3) (Same as Animal Science 551) F

520 Anatomy of Domestic Carnivores (4) (Same as Animal Science 552) F

544 Comparative Hematology (3) (Same as Animal Science 544) F

561 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamics-properties of drugs: mode of action, pharmocologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncrasies, and clinical applications. Prereq: Consent of instructor. F

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

609 Mechanisms of Disease (4) Advanced topics in pathobiology and mechanisms of various cells, tissues, and organs to injury and other metabolic derangements. Selected topics.
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's advisor must verify that an acceptable set of coursework 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 oral exam on the problems before a committee of three or more faculty members, at least two of whom must be Computer Science faculty.

Master's Minor in Computer Science
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.

The DOCTORAL PROGRAM
A student seeking admission to the Ph.D. program is expected to meet the following requirements:

1. 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.

2. 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 Graduate School.

3. The student should satisfy the same background requirements as for the master's program. See the departmental brochure for details.

The student must reach agreement on the problem topic with a faculty advisor and must 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.

The student must satisfy the same background requirements as for the master's program. See the departmental brochure for details.

Instructor: Meyo, J. Wallace (Liaison), M.S., M.S., Tennessee

THE MASTER'S PROGRAM
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. 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 a thesis course in Computer Science and pass an oral exam on the thesis before a committee of three or more faculty members, at least two of whom must be Computer Science faculty.

Computer Science
(College of Arts and Sciences)

MAJOR DEGREES
Computer Science M.S., Ph.D.
Robert C. Ward, Head

Professors:
Dsogawa, Jack, Ph.D........ New Mexico
Langston, Michael A., Ph.D.......... Texas & M
Porre, J. H., Ph.D............. Georgia Tech
Sherman, Gordon R. (Emeritus), Ph.D. Purdue
Thomson, Michael G., Ph.D........ Duke
Ward, Robert C., Ph.D............ Virginia

Associate Professors:
Berry, Michael W., Ph.D........ Illinois
Gregor, Jens, Ph.D........... Aalborg (Denmark)
Maclennan, Bruce J., Ph.D....... Purdue
Vander Zanden, Bradley, Ph.D........ Cornell
Vose, Michael D., Ph.D........ Texas

Assistant Professors:
Plank, James S., Ph.D........... Princeton
Raghavan, Padma, Ph.D........ Penn State
Straight, David W., Ph.D.......... Texas
Wolski, Richard, Ph.D.......... UC Davis

Instructor:
Meyo, J. Wallace (Liaison), M.S., M.S., Tennessee

430 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 hrs.

460 Advanced Topics in Software Systems (3) Operating systems, compilers, parallel computation, software engineering, design of virtual machines and programming languages. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

470 Advanced Topics in Scientific Computation (3) Numerical methods, supercomputers and computer modeling and visualization of physical systems. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

471 Numerical Analysis (3) (Same as Mathematics 471.)

480 Advanced Topics in Theoretical Computer Science (3) Theory of computation, complexity theory, formal languages and graph theories and its applications. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

484 Special Topics in Computer Science (1-3) May be repeated. Maximum 9 hrs.

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

502 Registration for Use of Facilities (3-15) 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. S/N only. E

521 Artificial Intelligence (3) Heuristic search, automatic theorem proving, symbolic methods, semantic information processing, representation theory. Prereq: Discrete Structures and Problem Solving.

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.


532 Boolean Algebra, Logic Design and Microprocessors (3) Boolean algebras, combinational and sequential logic design. Microprocessors. Hardware lab. Prereq: One yr college mathematics beyond algebra and trigonometry.


538 Computer Networks (3) Design and operation of networks. Hardware and software systems; communications subsystems. Prereq: System Programming and 532.


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.


571-72 Numerical Mathematics (3) (Same as Mathematics 571-72.)

Comparative Medicine
See College of Veterinary Medicine and Comparative and Experimental Medicine

Computer Science
(Graduate Program in Computer Science)

Instructor:
Wolski, Richard, Ph.D................ UC Davis

Instructor:
Ward, Robert C., Ph.D............ Virginia

Instructor:
Singer, Gordon R. (Emeritus), Ph.D. Purdue

Instructor:
Dongarra, Jack, Ph.D................ New Mexico

Instructor:
Berry, Michael W., Ph.D........ Illinois

Instructor:
Gregor, Jens, Ph.D........... Aalborg (Denmark)

Instructor:
Maclennan, Bruce J., Ph.D....... Purdue

Instructor:
Vose, Michael D., Ph.D........ Texas

Instructor:
Plank, James S., Ph.D........... Princeton

Instructor:
Raghavan, Padma, Ph.D........ Penn State

Instructor:
Straight, David W., Ph.D.......... Texas

Instructor:
Wolski, Richard, Ph.D.......... UC Davis

Instructor:
Meyo, J. Wallace (Liaison), M.S., M.S., Tennessee

THE DOCTORAL PROGRAM
A student seeking admission to the Ph.D. program is expected to meet the following requirements:

1. 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.

2. 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 Graduate School.

3. The student should satisfy the same background requirements as for the master's program. See the departmental brochure for details.

Original research reported in a dissertation of high quality is emphasized. The minimum hour requirements are 24 hours of course 800 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 UTK. 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.
**THE MASTER'S PROGRAM**

The requirements for the major in Textiles, Retailing and Consumer Sciences are listed below.

### Retail and Consumer Sciences (Thesis)

**Major (Required RCS courses):** 510, 511, 541, 550, 562, 590  
**Cognate Area**  
- 6  
- 6  
**Total** 34

### Retail and Consumer Sciences (Non-Thesis)

**Major (Required RCS courses):** 510, 511, 541, 550, 562  
**Cognate Area**  
- 6  
- 6  
**Statistics**  
- 3  
**Electives**  
- 9  
**Total** 36

### Textile Science (Thesis Option)

**RCS 552**  
- 3  
**Research Methods**  
- 3  
**TS 590**  
- 12  
**Textile Science courses**  
- 1  
**Cognate Area**  
- 6  
**Statistics**  
- 3  
**Total** 34

*Must include RCS 562 or equivalent; or 3 hours of laboratory techniques in materials analysis and characterization.

### Textile Science (Non-Thesis Option)

**Nonwovens Core (Required TS courses):** 510, 521, 526, 528, 595  
**Related Courses**  
- 9  
**Statistics**  
- 3  
**Professional Project, TS 501**  
- 3-6  
**Total** 30-33

The major in Recreation, Tourism and Hospitality Management requires 33-36 hours for the thesis option and 36-39 hours for the non-thesis option depending upon the specific concentration. For all thesis concentrations, individuals not possessing an undergraduate degree in the discipline or having appropriate full-time work experience will be required to take 590 (graduate internship). Requirements for each concentration are:

### Hospitality Management

All students (28 hours): Hotel and Restaurant Administration 532, 537, 542; Nutrition 541; Hotel and Restaurant Administration/Nutrition electives (12 hours); related area (6 hours); statistics (3 hours);  
- 9  
**Thesis Option (6 hours):** 500;  
- Non-Thesis Option (9 hours): 536; Hotel and Restaurant Administration/Nutrition elective (3 hours); elective (3 hours).

For a description of courses in the hospitality management concentration, see Nutrition.

### Recreation Administration

All students (27 hours): 415 or 440, 510, 515, 540, 541; Safety Education 443; Sport
of dissertation. Transfer students with a master's degree from another institution are required to complete at least 42 hours (including dissertation hours) from UTK.

**ACADEMIC STANDARDS**

1. Evaluation of student progress will normally occur prior to enrollment for thesis hours (or the non-thesis option) and during the second semester of full-time enrollment in the program. The review of the student will be undertaken by the faculty with consideration given to factors such as GPA (minimum 3.0), portfolio evaluation, and demonstrated research capability.

2. If progress or performance is deemed insufficient, the faculty may recommend probation with specific goals set for a specified time or termination.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Textiles, Retailing and Consumer Sciences is available to residents of the state of Mississippi. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records. For the Ph.D., see Human Ecology.

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**Hotel and Restaurant Administration**

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 Thesis (1-15)</td>
<td>P/NP only</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>502 Registration for Use of Facilities (3-15)</td>
<td>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. S/NC only.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>530 Computer-Assisted Foodservice and Lodging Management (3)</td>
<td>Application of computer technology to foodservice and lodging industry; inventory, cost accounting, production, menu analysis, room management, and sales planning and analysis.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>531 Advanced Financial Management (3)</td>
<td>Financial planning, operations and evaluation techniques used in foodservice and lodging management; developing budgets, accounting systems, and financial reports.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>532 Advanced Human Resource Management (3)</td>
<td>Identifying labor needs; development and maintenance of work force.</td>
<td>E</td>
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<tr>
<td>533 Advanced Food Production and Delivery System Management (3)</td>
<td>Analysis of food production and delivery systems; application of quantitative methods and models to optimize decisions.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>534 Special Topics in Foodservice and Lodging Administration (1-3)</td>
<td>Lecture/discussion format. Contemporary developments and trends in industry.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>535 Directed Study in Foodservice and Lodging Administration (1-3)</td>
<td>Problems selected for study by faculty with guidance of instructor.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>537 Seminar in Foodservice and Lodging Administration (1)</td>
<td>May be repeated. S/NC only.</td>
<td>E</td>
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</tbody>
</table>

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**Recreation and Tourism Management**

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>415 Development and Maintenance of Leisure, Sport, Tourism Services (3)</td>
<td>Principles of planning, designing, outfitting and operating leisure and sport-related facilities such as aquatic centers, tennis complexes, activity centers.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>420 Advanced Topics in Foodservice Administration (1-3)</td>
<td>Individual study and group discussion of topics related to current problems.</td>
<td>E</td>
<td></td>
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<tr>
<td>430 Organization and Administration of Leisure and Tourism Services (3)</td>
<td>Principles of administration applied to provision of leisure services offered by public, private and/or commercial enterprises. Organizational structures, personnel management, evaluation, legal authority, introduction to budgeting and fiscal procedures.</td>
<td>E</td>
<td></td>
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<tr>
<td>440 Dimensions of Commercial Recreation and Enterprises (3)</td>
<td>Nature and function of recreation in private, commercial, and industrial settings. Survey of development and management of commercial goods and services offered in leisure market. Factors influencing participation, management considerations, and research in commercial recreation and tourism.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>450 Specialized Study in Leisure Education (1-6)</td>
<td>Special interest leisure activities; developing positive attitudes toward leisure. Demonstrates how leisure contributes to one's mental and physical health.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>470 Tourism and Leisure Industries (3)</td>
<td>Symbiotic relationship between tourism and various sectors of leisure industry. Use of resources, both natural and developed, and economic impacts of ventures. Socio-cultural impacts on venues as well as venues impact on local population.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>500 Thesis (1-15)</td>
<td>P/NP only</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>502 Registration for Use of Facilities (3-15)</td>
<td>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. S/NC only.</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>510 Perspectives and Trends in Leisure Services (3)</td>
<td>Basic role of leisure delivery systems in today's society. Scope of leisure services, determinants of leisure behavior, developmental features of leisure and recreation. Current trends, problems, laws, and issues affected by and/or affecting delivery of leisure services.</td>
<td>E</td>
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**Textile Science**

Students enrolled in the Ph.D. program in Human Ecology with a concentration in textile science take one common course which provides a foundation for the integration of textiles and apparel in the context of the near environment. A required departmental research seminar exposes students to research being conducted in all areas of study in the department. Requirements include:

- Textile Science Courses: 18
- RCS 552: 3
- TS 550: 2
- Cognate Area: 9
- Statistics (500-600 level): 6
- Research Methods: 6
- Electives: 14
- Dissertation: 24
- Total: 82

Note: Students must take a maximum of 9 hours at the 600-level in the College of Human Ecology, exclusive
Retail and Consumer Sciences

GRADUATE COURSES

411 Entrepreneurship and Small Business Management (3) Concepts of entrepreneurship within a single ownership and other business organizations; risk taking and risk management; management of small business; current issues and problems. Prereq: Retail Buying, Principles of Marketing.

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

501 Professional Project (3-6) Application-oriented, capstone project to show competence in major academic area. Enrollment limited to retail and consumer sciences students in non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities. Other than regular class time before degree is completed. May not be used toward degree requirements. May be repeated, S/NP only. E

510 Fiber Science (3) Physical properties, mechanical properties and microstructure of synthetic fibers; relation to end-use properties. Prereq: Organic Chemistry and Thermal Physics or equivalent.

520 Optical Microscopy (4) Basic compound and polarizing microscopy for imaging; optical properties measurements, and structure identification. Prereq: Fundamentals of Physics: Wave Motion, Optics and Modern Physics or equivalent. 3 hrs and 2 labs.

521 Nonwovens and Technology (3) Nonwoven fabric technology; different web forming processes; and relationships among the chemical, morphological and mechanical properties of fibers and orientation in webs to final performance of bonded structures. Prereq: Organic chemistry or consent of instructor.

522 Laboratory Methods in Nonwovens Processing and Characterization (0) Laboratory experience in nonwovens fabrication processes and characterization techniques. Effect of processing conditions on structure development and properties of different types of webs. Prereq: 510 and 521.

552 Economics of Textile Complex (3) Economics consideration of U.S. textile complex. Quantitative approaches to industry structure, production, marketing, distribution and institutions within both global and domestic settings. Current and future international issues and impacts. Prereq: Calculus III or equivalent; microeconomics. F,A


590 Research Seminar (1) Research topics in textile science. May be repeated. S/NC only. E

593 Directed Study (1-3) Individual problems in textile science. Prereq: 9 hrs textile graduate coursework. May be repeated. Maximum 9 hrs.

595 Advanced Topics in Textile Science (1-3) Lecture. Group discussion on specialized topics. Prereq: 9 hrs textiles graduate coursework or consent of instructor. May be repeated. Maximum 9 hrs.

600 Dissertation (3-15) P/NP only. E


615 Retail and Consumer Sciences Literature and Thought (3) Evaluation of retail and consumer sciences literature with emphasis upon research literature, development of scholarly thought, and interpretation of potential areas of further study. Prereq: 562, Marketing 501, Economics 501. F,A

616 Research Methods, Models and Measurement in Retail and Consumer Sciences (3) Quantitative methods and analytical concepts in research process. Mathematical and statistical formulation of retail and consumer sciences phenomena, utilizing models, model building and measurement constructs. Prereq: 562, Statistics 538. S,SP


641 Retail Consumer Behavior (3) Theories and concepts from social science in relation to ultimate consumer's behavior. Prereq: 6 hrs of sociology or psychology or consent of instructor.

651 The Consumer and Public Policy (3) Public policy issues within consumer environments. Analysis of past and present policies within economic, social, legal and business frameworks. Implications of consumer issues and policy alternatives. Literature review and research focus. Prereq: 550 or consent of instructor.

695 Advanced Topics in Retail and Consumer Sciences (3) Lecture, group discussion, individual research on advanced topics and research areas of current significance to retail and consumer science. Prereq: Graduate hours in consumer sciences. May be repeated. Maximum 9 hrs.

Textile Science

GRADUATE COURSES

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

501 Professional Project (3-6) Application-oriented, capstone project to show competence in major academic area. Enrollment limited to textile science students in non-
Counselor Education and Counseling Psychology

(Majors of Education)

Admission Requirements

Admission requirements include up-to-date scores from the GRE, the unit admissions application form and letters of recommendation. For the doctoral program, a writing sample is also required.

Graduate Courses

410 Gender Role Development: Implications for Education and Counseling (3) Theories and research: development of gender roles and their relevance to identity and behavior in socio-psychological, educational, and counseling settings. (Same as Women's Studies 410.) F, Su

431 Personality and Mental Health (3) Various perspectives of mental health with application to education and other social institutions. E

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any academic term. May be repeated. S/NC only. F, Su

503 Problems in Use of Thesis (2-3) May be repeated. Maximum 9 hrs. S/NC only. E

504 Special Topics (1-3) May be repeated. Maximum 9 hrs. S/NC only. F, Su

518 Educational Specialist Research and Thesis (3) May be repeated. P/NP only. E

520 Statistics and Research Design: Conceptual (3) Consumer-oriented, conceptual treatment of statistics, research design, and quantitative basis of testing. E

525 Formal Measurement in Education and Counseling (3) Principles of test construction and item analysis. Survey of standardized tests of intelligence, achievement, aptitude, vocational interest, attitudes, and personality. Prereq: 520 or equivalent. F, Su

535 Ethical, Legal, and Professional Issues in Counseling (3) Professional practice issues in school and community counseling and related fields: education, research, standards of practice, credentials, policy, and legislation. Prereq: Admission to counseling program or consent of instructor. S, A

550 Introduction to Personnel Counseling Programs (3) History, philosophy, ethical standards, counselor role in relating to school staff and mental health professionals, and ethics of profession. F

551 Theory and Practice of Counseling (3) Psychological bases of helping relationships: development of counselor and client self-awareness; counseling theory and techniques. F, Su

552 Career Development: Vocational Theory, Research and Practice (3) Historical development and societal factors in career roles. F

553 Career and Educational Information Systems and Resources (3) Use of print and non-print media: Consumer-oriented, conceptual treatment of statistics, research design, and quantitative basis of testing. E

554 Group Dynamics and Methods (3) Theories and types of group counseling: descriptions of group practices, methods, dynamics, and facilitative skills, supervision of leadership skills. E

555 Practicum in Counseling (3) Supervised practice and application of counseling skills with individual clients. Prereq: Admission to program. 431, 525, 551 and consent of instructor. May be repeated. Maximum 2 hrs. S/NC only. E

556 Seminar in Community Agency Counseling (1) Orientation to professional organizations, codes of ethics, certification requirements, and role identity of community agency counselors. May be repeated. Maximum 2 hrs. S/NC only. F, Sp

559 Internship in Community Agency Counseling (1-6) Supervised practicum employment at academic unit approved human services agency. Prereq: Admission to counseling psychology program, 555 and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E

561 Development and Operation of School Counseling Programs (3) Management of comprehensive school counseling programs to include needs assessment, program goals, resource identification, evaluations, and use of computer-based program management software. Prereq: 550. Sp, Su

565 Facilitation of Task Groups (3) Technical and social aspects of group dynamics in context of task group situations. Application of counseling techniques to facilitation of work teams. Prereq: 551, 554, or consent of instructor.

566 Approaches to Family Intervention and Counseling (3) (Same as Child and Family Studies 556.)

700 Cross-Cultural Counseling: Theory and Research (3) Theory and research on issues and problems in counseling of clients from different cultural backgrounds in U.S. and abroad.

701 Individual Cognitive Assessment in Counseling (3) Basic concepts and applications in individual assessment of intelligence, proficiency in administrative interpretation of Wechsler, adults and children, Stanford-Binet. Prereq: 550 and 552 and admission to counseling program or consent of instructor. S/NC only. Sp, A

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Exercise Science 585, Nursing 585, Public Health 585, Psychoeducational Studies 585, Social Work 585, and Sociology 585.)

593 Independent Study (1-3) May be repeated. S/NC or letter grade. E

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

621 Directed Research (1-3) Instructor- or student-initiated group investigations; empirical and theoretical problems in educational and counseling psychology. Prereq: Minimum 12 hrs. S/NC only. E

624 Special Topics (1-3) Instructor-initiated courses offered at convenience of academic unit on topics of interest. May be repeated. Maximum 15 hrs. S/NC or letter grade. E

625 Advanced Study in Personality (3) Theory, research and conceptual analysis of studies with application to education and counseling. Prereq: 431 or equivalent. F

635 Ethical, Legal, and Professional Issues in Psychology (3) S, A

650 Seminar in Counseling Education (1) Professional issues related to role and function of counselor educator. Prereq: Admission to doctoral program in counseling education. May be repeated. Maximum 2 hrs. S/NC only. F

655 Practicum in Counseling Education (3) Supervised practice and application of counseling skills with clients. Prereq: Admission to counselor education program and consent of instructor. May be repeated. Maximum 6 hrs. Sp

659 Internship in Counseling Education (1-6) Supervised employment in academic unit approved internship sites in counselor education. May be repeated. Maximum 12 hrs. S/NC only. E

661 Education Implications of Neuropsychology (3) Theory and assessment: Common syndromes and their behavioral and cognitive manifestations. Prereq: 516 and 541 or equivalent. Individual assessment course, or consent of instructor. Sp, A

682 Applied Research Design (3) Planning of empirical investigations, collection of data, and drawing of inferences from evidence gathered. Prereq: Two-course sequence in statistics. F


671 Personality and Vocational Assessment (3) Use and interpretation of personality and vocational measures in
The unit derives its intellectual identity and orientation from disciplines such as anthropology, history, philosophy, psychology, and sociology, and from more specialized forms of inquiry such as ethnography, semiotics, literary theory, hermeneutics, linguistics, and feminist theory. As a unit founded upon and devoted to interdisciplinary inquiry, Cultural Studies in Education seeks to bring its disciplines to the service of students and faculty throughout the college as aids to understanding diverse cultural and historical contexts that shape beliefs, values, and practices. The main charge of the unit is to examine critically the social practices, institutions, "helping" agencies, and other social sites where disenfranchised and marginalized groups struggle for greater control over their futures.

**GRADUATE COURSES**

500 Thesis (1-15) P/NP only. E
501 Special Project (3) Culminating experience for non-thesis major. Research study suitable for publication, or practicum requiring special written work. Prereq: 532.
502 Registration for Use of Facilities (3-15) 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. S/NC only. E
503 Problems in Lieu of Thesis (2-3) May be repeated. Maximum 9 hrs. S/N or only. E
504 History of Olympics: Ancient and Modern (3) Examination of various aspects of ancient and modern Games. Ancient Olympics 776 BC to 393 AD: Panhellenic Games. Modern Olympics, 1896 to date: political, social, class, gender, and economic issues that influence Games. F
514 Advanced Philosophy of Sport (3) Metaphysical theories of sport. Various conceptual, moral, aesthetic, and political issues. F
515 Social Theories of Sport (3) Liberal, democratic and Marxist social theories of sport. (Same as Sociology 539.) F
526 Philosophy of Education (3) Truth, knowledge, and valuation in relation to work of schools. F
530 Psychology of Sport (3) Social psychological factors influencing human behavior in sports context; discussion of contemporary theory, research, and methodology. Prereq: General psychology course or consent of instructor. F
534 Motor Behavior and Skill Acquisition (3) Topical exploration and application of human movement behavior to acquisition and performance of skills; discussion of current research and methodology. F
539 Development of Education Thought (3) Historical and philosophical approaches to life and living of influential educators: Plato, Quintilian, Comenius, Rousseau, Pestalozzi, Froebel, Dewey. Prereq: Graduate status and consent of instructor. F
540 Foundations of Educational Policy (3) Relationship between theory, policy, and practice; educational policies that arose from philosophical and practical considerations relative to human nature, to educational purpose, to content of curriculum and to methods and techniques for conducting educational enterprise. F
541 Special Topics (1-3) Advanced study in selected disciplinary or professional areas of physical education and/or sport. May be repeated. F
542 Sociological Aspects of Sport (3) Social and cultural factors influencing sport and physical education. Prereq: Consent of instructor. F
545 Educational Sociology (3) Sociological analysis of American education system. Societal issues that affect educational system and potential solutions offered by various programs. Open to juniors, seniors, and graduate students. F
546 Topics in History of Education (3) May be repeated. F
547 Topics in Philosophy of Education (3) May be repeated. F
548 Topics in International Education (3) Historical, philosophical, and sociological foundations; selected nations and their cultures. May be repeated. F
550 Introduction to Qualitative Research in Education (3) Fundamentals of qualitative research methods and development of skills needed for qualitative research. F
559 Cultural Studies Seminar (1) Two semester sequence (Fall and Spring). Ongoing discussion about cultural studies; presentations, videos, and readings. Prereq: Admission to doctoral program with concentration in cultural studies in education. May be repeated. Maximum 4 hrs. S/N only. F
559 Issues in Cultural Studies (3) Discourse, schools, and selected principal contemporary issues in field. Prereq: Admission to doctoral program with concentration in cultural studies in education. F
562 Justice, Schools, and Sports (3) Social justice issues: education and sport practices. Social justice, moral commitments to others in educational and sport settings, and equal opportunity to acquire social goods and benefits. Prereq: Admission to doctoral program with concentration in cultural studies in education. F
563 Seminar in Curriculum and Instruction (1) Required 2 consecutive semesters. F
564 Seminar in Educational Leadership (3) Interdisciplinary team-taught seminar. Readings selected by faculty and participants from classic studies and current periodical literature in anthropology, sociology, philosophy, and educational values. Part of graduate program for Ph.D. program. Prereq: Graduate student in education. F
568 Seminar in Philosophy of Education (3) Selected philosophical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. F
569 Seminar in History of Education (3) Selected historical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. F
571 Advanced Seminar in the Social Foundations of Education (3) Interdisciplinary team-taught seminar. Readings selected by faculty and participants from classic studies and current periodical literature in anthropology, sociology, philosophy, and educational values. Part of graduate program for Ph.D. program. Prereq: Graduate student in education. F
579 Advanced Studies in Educational Anthropology and/or Sociology (3) Ethnographic methods applied to formal and non-formal educational settings. Analysis of educational research in field. Prereq: 451, 2 courses in cultural anthropology, or consent of instructor. F
580 Ethnographic Research Methods in Education (3) Design, implementation and analysis of ethnographic research in education. Critical reading and evaluation of

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### Cultural Studies in Education

**College of Education**

**MAJORS**

- Human Performance and Sport Studies
- Social foundations
- Human Performance and Sport Studies
- Doctor of Philosophy

**DEGREES**

- M.S.
- Ph.D.

**Professors:**

- Allison, C. B., Ph.D.
- DeSensi, J. T. (Liaison)
- Ed.D.
- North Carolina (Greensboro)
- Howard, Robert (Emeritus), Ph.D.
- Ohio State
- Malik, Anand, Ed.D.
- Columbia
- Mead, B. J. (Emeritus), Ph.D.
- Purdue
- Morgan, W. J., Ph.D.
- Minnesota
- Paul, Joan, Ed.D.
- Alabama
- Phillips, Madge M. (Emeritus), Ph.D.
- Iowa
- Wisniewski, Richard (Emeritus), Ph.D.
- Wayne State
- Wrisberg, C. A., Ph.D.
- Michigan

**Associate Professor:**

- Fleming, Cynthia, Ph.D.
- Duke

**Assistant Professor:**

- Wright, Handel K., Ph.D.
- Toronto

The Cultural Studies in Education unit participates in graduate programs leading to degrees, majors, and concentrations in:

- Master of Science
- Education
- Social foundations
- Human Performance and Sport Studies
- Sport studies
- Doctor of Philosophy
- Educational studies
- Cultural studies in education

See Education Under Fields of instruction for full description of all degree requirements.
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.

**REQUIREMENTS FOR ADMISSION**

Applications are accepted once a year. The deadline for receipt of all application materials is 15 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 a B.A. or B.S. degree in one of the life sciences and have taken a significant number of college-level courses in mathematics, 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 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 1550. Submission of scores on appropriate (e.g., biology, mathematics) advanced GRE examinations are recommended but not required. Applicants are also expected to have an overall grade-point average of at least 3.0, and 2.7 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.

Applicants must be matriculated to both the Graduate School and the department. The departmental application requires submission of three 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 Affairs Committee, Department of Ecology and Evolutionary Biology, The University of Tennessee, Knoxville, TN 37996-1610.

**THE MASTER'S PROGRAMS**

In addition to general requirements of the Graduate School, aspirants for the Master of Science 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 thesis committee; and (3) satisfactorily complete and defend a research thesis.

**THE DOCTORAL PROGRAMS**

In addition to general requirements of The Graduate School, 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 these 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 desired. 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.

**MINOR IN ENVIRONMENTAL POLICY**

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

**GRADUATE COURSES**

403 Plant Evolution (3) (Same as Botany 403.)

411-412 Minicourse in Ecology and Evolutionary Biology (3) 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 hrs may apply toward departmental major.

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 coastal required. Prereq: General Biology and General Chemistry; General Ecology 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 458.)


461 Special Topics in Organismal Biology (3) Evolution, ecology, biogeography, classification, and anatomy of selected animal and plant taxa. Prereq: General Ecology or consent of instructor.

470 Aquatic Ecology (3) Introduction to the physiological nature of inland waters with description of biotic communities and their interrelationships. Prereq: General Chemistry and General Ecology 2 hrs and 1 lab.

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: General Genetics and General Ecology.

500 Thesis (1-15) P/NC only. E

502 Registration for Use of Facilities (3-15) 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. S/NC only. E

503 Ecology and Evolutionary Biology Seminar (1) Advanced topics in ecology, behavior, and evolutionary biology. Senior departmental majors only. Required of all first- and second-year graduate students. May be repeated. Maximum 4 hrs. S/NC 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 hrs. S/NC only.


507 Basic Concepts in Ecology (3) Contemporary issues in ecology. Prereq: Admission to program in Ecology and Evolutionary Biology. Required of all first year students.

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. S/NC 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.

513 Foundations: Readings in Behavior (1-2) 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.


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. Prereq: Consent of instructor. 4 hrs combined lecture and lab.

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. Prereq: 540 or consent of instructor. 4 hrs combined lecture and lab.

542 Insect Structure and Function (3) Integrated study of morphology and physiology of insects at tissue and cellular level of insects. Prereq: Consent of instructor.

543 Aquatic Insects (3) Taxonomy and biology of aquatic insects; immature forms. Prereq: Consent of instructor. 2 hrs and 1 lab.

544 Fresh Water Invertebrate Zoology (3) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Prereq: Comparative Invertebrate Biology or equivalent and consent of instructor. 3 hrs lab and field study.

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.)

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 temperate environments across North America over past 2.5 million years. (Same as Geological Sciences 556.)

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 toxicodynamics. Reproductive effects, 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, both single-gene and quantitative genetic approaches. Prereq: 573 and statistics course.

577 Landscape Ecology (3) Ecological structure, function, and change through time of landscape mosaic: quantitative measures of landscape heterogeneity; responses of organisms to landscape heterogeneity. Prereq: General Ecology or equivalent or consent of instructor.

581-582 Mathematical Ecology (3-3) (Same as Mathematics 581-582.)

593 Zoogeography (3) Processes determining geographic distribution of animals and distribution and composition of animal communities. Prereq: Ecology course or consent of instructor.

586 Mathematical Evolutionary Theory (3) (Same as Mathematics 586.)

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/NC only.

601 Advanced Topics (1-3) Reading and discussion of recent advances. Consult the departmental listing for offerings. May be repeated with consent of department. Maximum 9 hrs.

604 Current Topics in Environmental Toxicology (1) Critical reviews of research problems and methods in environmental toxicology, behavioral toxicology, biochemical and ecological effects, biostatistics and epidemiology. Prereq: Biochemistry and Cellular and Molecular Biology 410, Organic Chemistry or consent of instructor. May be repeated with consent of department. Maximum 4 hrs. (Same as Biochemistry and Cellular and Molecular Biology 604.) S/NC only.

607 Seminar in Ecology and Evolutionary Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

635 Environmental Assessment and Sustainable Development in Third World Countries (3) Concepts and methods of environmental impact assessment and risk assessment. Sustainable development and environmental issues and policies in developing countries. Prereq: General ecology or equivalent. (Same as Botany 635 and Planning 635.)

681-682 Advanced Mathematical Ecology (3-3) (Same as Mathematics 681-682.)
time will result in dismissal from the doctoral program the next time offered. A comprehensive examination must retake the examination the following year if grade is below B or retake the examination the following year if grade is below B. Students electing the non-thesis option are required to pass a final comprehensive examination. The thesis option requires 30 hours of coursework at the 400 level or above. Of these, at least 24 hours (at least 18 hours of which are in economics) must be at the 500 level or above. Of the minimum of 18 hours in economics at the 500 level or above, 12 hours must consist of 511, 512 and 513, 514, and the remaining 6 hours must be in one field of economics. Of the 30 hours, a maximum of 9 hours in courses approved by the department may be taken in fields other than economics. Students electing the non-thesis option are required to pass a final comprehensive examination. The thesis option requires 30 hours of coursework at the 400 level or above, including at least 24 hours at the 500 level or above, 6 hours of which may be thesis hours. Of the remaining 18 hours at the 500 level or above, at least 15 hours must be in economics and must include 511, 512, 513, and 514. A maximum of 6 hours may be in an area other than economics.

The Doctoral Program

Admission to the Ph.D. program is based on promise of outstanding scholarship as demonstrated by previous academic performance, by scores achieved on the general portion of the GRE, and by recommendations. The program requires a minimum of 48 hours of coursework beyond the bachelor's degree or 24 hours beyond the master's degree, at least 24 hours of 500 Doctoral Research and Dissertation, and successful completion of the following:

1. Students are required to complete the following core requirements:
   a. Economic Theory: Microeconomic theory and macroeconomic theory by a qualifying exam taken not later than the beginning of the fourth semester of study.
   b. History of Economics: Completion of 515 or 615 with a grade of B or better, or by qualifying examination.
   c. Quantitative Methods: Completion of 581, 582 and 583 with grades of B or better, or by qualifying examination.

   Students failing a qualifying examination must retake the examination the next time offered. A qualifying examination may be taken a third time only with approval of the department. Failing a qualifying examination for a third time will result in dismissal from the doctoral program.

2. Students are required to demonstrate competence by comprehensive examination in at least two fields of specialization in economics. Students failing a comprehensive examination must retake the examination the next time offered. A comprehensive examination in a specific field may be taken a third time only with approval of the department.

3. Students are required to complete with a grade of B or better two elective courses in economics at the 500 level or above, outside the core subject areas and outside the fields of specialization.

4. Students are required to complete a doctoral dissertation and to defend it successfully before the faculty.

Minor in Environmental Policy

The program is designed to give master's and doctoral level graduate students an opportunity to develop an interdisciplinary specialization in environmental policy. While administered through the Economics Department, the program is coordinated by a committee of representatives from the following participating departments and programs:

- Agricultural Economics and Rural Sociology
- Botany
- Civil and Environmental Engineering
- Ecology and Evolutionary Biology
- Economics
- Forestry
- Wildlife and Fisheries
- Geography
- Management
- Political Science
- Sociology

Students may request admission to the minor following admission to a graduate program in one of the following participating departments and programs. Students in good standing in one of these programs may apply for admission to the minor in environmental policy. The coordinating committee will consider the admission of interested students. Applicants should have a background in both natural and social sciences evidenced by prior coursework or experience.

One course in environmental studies from the student's major discipline and one course in quantitative methods are required. These requirements may be fulfilled before or after admission to the minor. All students admitted to the minor will be required to register for at least three hours of Economics 579, Environmental Policy Research Workshop, and to complete successfully the following:

1. Ecology and Evolutionary Biology 520 or Plant and Soil Sciences 414 or Geography 433 or an equivalent course approved by the coordinating committee.
2. Six hours of coursework outside the major discipline approved by the coordinating committee.
3. Doctoral students seeking a minor in environmental policy must also complete, in addition to above, a policy-relevant dissertation approved by the coordinating committee.

Business Administration Concentration

For complete listing of MBA program requirements, see Business Administration. MBA Concentration: Economics. Minimum course requirements are as approved by the area MBA faculty advisor.

Academic Common Market

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program is available to residents of the state of Kentucky. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

Graduate Courses

400 Special Topics (3) Topics vary. Prereq. Determined by department. May be repeated.

413 Macroeconomic Fluctuations (3) Analysis of historical data, methods of analyzing macro-economic fluctuations, theoretical explanations of cycles, and role of monetary and fiscal policies in aggregate economy. Major writing requirement. Prereq. Intermediate Macroeconomics or consent of instructor.

415 History of Economics (3) Same as History 415.

424 Political Economy of World Development (3) Topics vary. Latin America, Asia, Soviet Union and Eastern Europe. Analysis of major economic strategies, policies, and problems. Prereq. 201. This course includes a major writing requirement. May be repeated when topic varies. Minimum 9 hrs.


462 Economics of Resources and Environmental Policy (3) Economic analysis of environmental policy and allocation of resources. Benefits and costs of development of natural resources and impacts of growth on environment. Major writing requirement. Prereq. 201.

471 Public Finance: Optimal Government Functions and Expenditure Analysis (3) Problems of collective consumption, external effects, public investment, social decision making. Major writing requirement. Prereq. 201.

472 Public Finance: Taxation and Intergovernmental Relations (3) Analysis of individual taxes and of tax systems, non-tax sources of revenue, fiscal federalism. Major writing requirement. Prereq. 201.

482 Introduction to Mathematical Economics (3) Application of basic mathematical tools: calculus, matrix algebra, etc. to major topics of economic theory. Prereq. Intermediate Microeconomics with B or better and Calculus.

500 Thesis (1-15) P/NP only, E

502 Registration for Use of Facilities (3-15) 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. S/N/C only, E


513-14 Macroeconomic Theory (3,3) Determination of national income, prices, and employment. Results using Keynesian, non-market-clearing, monetarist, and rational expectations paradigms.


525 Economic History of Europe (3) Nature and functioning of economic systems and policies in history of Western civilization, major issues of method and interpretation. Prereq. Graduate standing in economics or consent of instructor.

526 Economic History of the U.S. (3) Interpretation of American economic structure and policies from colonial times. Prereq. Graduate standing in economics or consent of instructor.

537 Managing in a Regulated Economy (3) Economic effects of antitrust and public utility, international, and environmental regulation on business. Development of decision making skills in area of governmental-business relations.

577 Environmental Economics and Policy Management (3) Interdisciplinary perspective on goals of sustainable economic development and environmental quality. Development of decision making tools and conflict resolution.


### Education

**MAJORS**

<table>
<thead>
<tr>
<th>College Student Personnel</th>
<th>M.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counseling</td>
<td>M.S.</td>
</tr>
<tr>
<td>Education</td>
<td>M.S.</td>
</tr>
<tr>
<td>Educational Psychology</td>
<td>M.S.</td>
</tr>
<tr>
<td>Human Performance &amp; Sport Studies</td>
<td>M.S.</td>
</tr>
<tr>
<td>Leadership Studies in Education</td>
<td>M.S.</td>
</tr>
</tbody>
</table>

The College of Education offers the Master of Science, Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees in cooperation with eleven individual units:

- Counselor Education and Counseling Psychology (CECP)
- Cultural Studies in Education (CSE)
- Education in the Sciences (ESMRT)
- English Education (LCHE)
- Foreign Language/ESL Education (LCHE)
- Grade/Secondary Education (GSSED)
- Mathematics Education (ESMRT)
- Mental Health Counseling (CECP)
- School Counseling (CECP)
- Social Foundations (CSE)
- Special Education: Early Childhood (IECE)
- Special Education: Pre-K-12 (IECE)
- Special Education: Rehabilitation and Human Services (RDHS)
- Special Education: Teacher Education (RDHS)
- Special Education: Vocational Rehabilitation (RDHS)
- Special Education: Waiver Program (IECE)

**DEGREES**

- **M.S. Education**
- **M.S. Counseling**
- **M.S. Human Performance & Sport Studies**
- **M.S. Leadership Studies in Education**

**Counseling**

The master's degree with a major in Counseling offers concentrations with abbreviated unit designations in:

- Mental Health Counseling (CECP)
- Rehabilitation Counseling (RDHS)
- School Counseling (CECP)

The program includes thesis and non-thesis options. The concentration in mental health counseling is fully accredited by the Council for Accreditation of Counseling and Related Educational Programs (CACREP) and requires completion of 60 hours of coursework plus supervised practicum and internship experiences working with clients. The concentration in rehabilitation counseling is fully accredited by the Council on Rehabilitation Education, Inc. and requires 54 semester hours, including internship. A minimum of 12 hours of Rehabilitation, Deafness, and Human Services courses is required. The concentration in school counseling is fully accredited by the Council for Accreditation of Counseling and Related Educational Programs and requires 48 hours of coursework, including supervised practicum and internship experiences working with clients. A final examination is required of all students.

**Education**

The master's degree with a major in Education has two tracks. Track 1 is intended for students who are licensed to teach English, elementary education, foreign language, mathematics, natural science, social science, early childhood education, modified and comprehension special education, or education of the deaf and hearing impaired. (Non-licensed applicants to Track 1 will be reviewed on a case-by-case basis and must have a strong disciplinary background and professional goals which can be fostered through participation in this non-licensure program.) Track 2 is designed for students seeking initial teacher licensure in one of the above fields. Thesis and non-thesis options are available for both tracks.

**Track 1 - Concentrations (with abbreviated unit designations) are available in:**

- Art Education (LCHE)
- Curriculum, Assessment, and Instruction (ESMRT)
- Education of the deaf and hard of hearing (RDHS)
- Elementary Education (HTL)
- English Education (LCHE)
- Foreign Language/ESL Education (LCHE)
- Instructional Technology (ESMRT)
- Mathematics Education (ESMRT)
- Modified and Comprehensive Special Education (HTL)
- Reading Education (HTL)
- Science Education (ESMRT)
- Social Foundations (CSE)
- Special Education: Early Childhood (IECE)

**Track 2 - Concentrations (with abbreviated unit designations) are available in:**

- English Education (HTL)
- Foreign Language/ESL Education (LCHE)
- Instructional Technology (ESMRT)
- Mathematics Education (ESMRT)
- Modified and Comprehensive Special Education (HTL)
- Reading Education (HTL)
- Science Education (ESMRT)
- Social Foundations (CSE)
- Special Education: Early Childhood (IECE)

**The thesis option requires the completion of 30 hours, including 6 hours of Thesis 500. The non-thesis option requires the completion of 33 hours of coursework (36 hours for special education concentrations). Both options**
require a minimum of 12 hours in the major discipline (18 hours for special education concentrations).

**Track 2 - Concentrations (with abbreviated unit designations) are available in:**
- Art education (LCHE)
- Education for the deaf and hard of hearing (RDHS)
- Elementary teaching (HTL and IECE)
- Modell and comprehensive special education (HTL)
- Secondary teaching (ESMRT, HTL, and LCHE)

**Special education: early childhood (IECE)**

**The thesis option requires completion of 36 hours, plus 8 hours of Thesis 500 for a total of 42 hours. The non-thesis option requires 36 hours, including 24 hours of prescribed licensure coursework and 12 hours in the academic discipline as approved by the student's committee.**

For both tracks, a comprehensive written examination is required. An oral exam is given over the thesis.

**Educational Psychology**

The master's degree with a major in Educational Psychology is offered with concentrations (with abbreviated unit designations) in:
- Adult education (PE)
- Individual & collaborative learning (PES)

Both programs include thesis and non-thesis options. The major in Educational Psychology requires 36 hours. The concentration in adult education requires a minimum of 12 hours in adult education courses. A final examination is required of all master's degree students.

**Human Performance and Sport Studies**

The master's degree with a major in Human Performance and Sport Studies offers concentrations (with abbreviated unit designations) in:
- Exercise science (exercise physiology; biomechanics/sports medicine) (ES)
- Sport studies (SPA)

Applicants must submit a unit admission application and 3 letters of recommendation. Both thesis and non-thesis options are available. The non-thesis option requires 32 hours, including a project, and a course in research design or an approved specialized research class. The thesis option requires the completion of 30 hours, including 6 hours of Thesis 500. Both options require a minimum of 12 hours of sport studies, exercise science, or sport management courses.

**Leadership Studies in Education**

The master's degree program with a major in Leadership Studies in Education offers a concentration in educational administration and supervision (LSE), requiring a minimum of 36 hours, including 6 hours of Thesis 500, for the thesis option, or 33 hours for the non-thesis option.

The concentration in educational administration and supervision consists of a minimum of 18 hours of coursework in Educational Administration and Supervision. A final oral examination is required for the thesis option, with a written exam at the option of the committee. A final written comprehensive examination is required for the non-thesis option, with an oral exam at the option of the committee. Students entering either of these options must complete the introductory core consisting of Educational Administration and Supervision 513, 515, 516, and 535 or a demonstrated computer proficiency. These courses are prerequisites to other courses in the unit.

**THE SPECIALIST IN EDUCATION PROGRAM**

The Educational Specialist degree program with a major in Education encompasses concentrations (with abbreviated unit designations) in:
- Curriculum, assessment, and instruction (ESMRT)
- Educational administration & supervision (LSE)
- Elementary education (HTL)
- Foreign language/ESL education (LCHE)
- Instructional technology (ESMRT)
- Mathematics education (ESMRT)
- Reading education (HTL)
- School counseling (CCEP)
- School psychology (PES)
- Science education (ESMRT)
- Social science education (HTL)

The instructional and curricular concentrations require completion of a minimum of 30 hours of coursework beyond the master's degree, including 8 hours in core courses, 18 hours in specialized courses, and 6 hours to be determined by the student's committee. The educational administration and supervision concentration requires the completion of a minimum of 60 hours beyond the baccalaureate, including a 6-hour cognate within or external to the college, and a highly recommended internship. Both thesis and non-thesis options are available. The school counseling concentration requires a minimum of 22 hours beyond the master's degree but not fewer than 60 hours beyond the baccalaureate, including practicum and internship experiences. The school psychology concentration requires the completion of a minimum of 66 semester hours beyond the baccalaureate. Refer to Degree Requirements under The Graduate School for complete program requirements.

**THE DOCTOR OF PHILOSOPHY PROGRAM**

The intercollegiate Ph.D. program with a major in Education provides fourteen concentrations. The units participating in the Ph.D. program are Counselor Education and Counseling Psychology; Cultural Studies in Education; Education in the Sciences, Mathematics, Research, and Technology; Exercise Science; Holistic Teaching/Learning; Inclusive Early Childhood Education; Language, Communication, and Humanities Education; Leadership Studies in Education; Performing Arts and Dance; Rehabilitation; ‘Deafness, and Human Services.

The program requirements are:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Minimum Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Area</td>
<td>15</td>
</tr>
<tr>
<td>Foreign or Computer Language (demonstrate proficiency)</td>
<td>6</td>
</tr>
<tr>
<td>General Core Requirements</td>
<td></td>
</tr>
<tr>
<td>Option A</td>
<td></td>
</tr>
<tr>
<td>— History and philosophy of education, (both areas must be represented)</td>
<td>4</td>
</tr>
<tr>
<td>— Learning theory and curriculum (both areas must be represented)</td>
<td>4</td>
</tr>
<tr>
<td>— Administrative/Leadership theory</td>
<td>2</td>
</tr>
<tr>
<td>— Trans-college seminar: two consecutive semesters</td>
<td>2</td>
</tr>
<tr>
<td>Option B</td>
<td></td>
</tr>
<tr>
<td>— Philosophy of education</td>
<td>3</td>
</tr>
<tr>
<td>— History of education</td>
<td>3</td>
</tr>
<tr>
<td>— Administrative theory</td>
<td>3</td>
</tr>
<tr>
<td>— Learning theory</td>
<td>3</td>
</tr>
</tbody>
</table>
To earn initial teacher licensure, students must complete undergraduate prerequisites, gain admission to The Graduate School as a degree seeking student, and the following 24 hours of coursework:

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>575 Internship</td>
<td>575 Internship</td>
</tr>
<tr>
<td>6 hrs</td>
<td>8 hrs</td>
</tr>
</tbody>
</table>

Further details concerning the teacher licensure program and the Track 2 master's degree program are available through the College of Education Advising Center (Claxton Addition, Room 214).

### MINOR IN GERONTOLOGY

Graduate students in the units of Counselor Education and Counseling Psychology, Exercise Science, or Psychoeducational Studies, may pursue a minor in gerontology. This interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to Human Ecology for specific requirements.

### ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Counseling is available to residents of Kentucky. The M.S. program in Education is available to residents of the states of Kentucky, Louisiana (concentration in education of the deaf and hard of hearing), and Maryland, South Carolina, Virginia, or West Virginia (concentration in education of the deaf and hard of hearing). The M.S. program in Human Performance and Sport Studies is available to residents of Arkansas and Maryland; and Alabama, South Carolina, or Virginia (concentration in sport management only). The Ed.D. program in Education (concentration in educational psychology only) is available to residents of Kentucky. The Ph.D. program in Education is available to residents of the state of Arkansas (concentration in counseling psychology, educational administration and supervision/higher education, educational psychology, or school psychology). Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

### GRADUATE COURSES

#### 510 Advanced Educational and Clinical Procedures (3-6)
Integration of advanced educational and clinical procedures; skills and knowledge for implementing instruction and for consulting with other persons in treatment of exceptional individuals. May be repeated. Maximum 6 hrs.

#### 517 Seminar (1-3)
Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/N or letter grade. E

#### 532 Instructional Research: Analysis and Application (3)
Analysis of research findings into instructional performance. Prereq: Consent of instructor. F, Su

#### 540 Topics in Improvement of Instruction (1-3)
Special conferences, workshops, and in-service programs. May be repeated. Maximum 6 hrs. S/N only. E

#### 562 Direction and Supervision of Student Teaching (3)
Roles and responsibilities of cooperating teachers and student teacher; objectives and policies of student teaching program; elements of clinical supervision; overview of research. F, Su

#### 568 Teacher-Parent-Community Relations (3)
Techniques for effective relations between parents and teachers; examination of roles and expectations; parental involvement; volunteer programs; influence of community on educational process. Prereq: Consent of instructor. Sp, Su

#### 574 Analysis of Teaching for Professional Development (2)
Strategies to document and analyze effectiveness of teaching and of professional development. Study and application of various approaches. Coreq: 575. F

#### 575 Professional Internship in Teaching (1-8)
Intensive teaching and learning-related experiences in professional settings in public schools. Enrollment limited to postbaccalaureate students in pre-internship program. Prereq: Admission to Teacher Education program. May be repeated. Maximum 12 hrs. S/N only. F, Sp

#### 576 Practicum in Classroom Teaching (1-8)
Teaching and learning-related experiences in elementary and secondary school settings. Specific hours are determined by school level assignment determined by licensure or certification requirements. May not be used for probationary licensure year. May not be used toward degree requirements. Maximum 12 hrs. S/N only. E

#### 589 Field Experience (1-3)
Application of curricular and instructional principles, methods, and materials in schools. Prereq: Program prerequisites and consent of instructor. May be repeated. Maximum 9 hrs. S/N only. E

#### 591 Clinical Studies (4)
Group and individual seminar activities during full-time internship. Application and evaluation of professional core competencies. Completion and presentation of portfolio and analysis of teaching project. Coreq: 575.

#### 601 Trans-College Seminar (1)
Introduction to Ph.D. program in Education: research required. Admission to graduate program. May be repeated. Maximum 3 hrs. S/N only. E

#### 618 Interpretation and Application Curriculum and Instruction Research (3)
Analysis of research in curriculum and instruction, newer methodologies and strategies, utilization of research to improve curriculum and instruction practice, application of research principles in context of specific professional assignments. Prereq: Consent of instructor. Sp

#### 635 Teacher Education in America (3)
For students preparing to enter teacher education. Brief historical development, program analysis and evaluation, current issues, and future directions. F
the preparation of various other professionals who desire to utilize educational research and instructional technology.

GRADUATE COURSES

475 Utilization of Instructional Media (3) Basic concepts of communication and instructional development for improving instruction through use of media. (Same as Information Sciences 475.) E

485 Teaching Mathematics, Grades 7-12 (3) Preparation of teaching plans, evaluation, materials for teaching mathematics; teaching simulation and directed observation in schools. PreReq: Admission to Teacher Education Program. F

496 Teaching Science Grades 7-12 (3) Methods, materials, recent trends in science and environmental education programs for secondary schools. PreReq: Admission to teacher education. F

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

502 Registration for Use of Facilities (3-15) 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. S/NC only. E

503 Problems in Locus of Thesis (2-3) May be repeated. Maximum 9 hrs. S/NC only. E

518 Educational Specialist Research and Thesis (3) May be repeated. P/NP only. E

520 Techniques of Research in Education (3) Study and application. F

521 Computer Applications in Classroom (3) Computer applications and peripherals in school and classroom. Appropriate for all grades and subjects as well as non-school institutional situations. PreReq: Microcomputer and Instructional Design, Applications of Instructional Technology in Elementary and Middle School Teaching, or Introduction to Instructional Computing. E

522 Programs and Materials in Elementary School Mathematics (3) Examination, development and use of materials for creating an active learning environment for teaching mathematics in elementary and middle schools. PreReqs: 530, 543, or equivalent. Su

530 Teaching Mathematics to Young Children: K-4 (3) Unit planning, daily planning, grouping and other strategies for teaching mathematics. For those with little preparation in teaching elementary school mathematics. F

531 Teaching Science in Elementary and Middle Schools (3) Recent trends in science, materials and instruction in teaching elementary school science. PreReq: Course in teaching elementary school science or consent of instructor. Su

535 Program Evaluation in Education (3) Issues and practices in planning and conducting program and curriculum evaluation in various settings. Fundamentals of design, measurement, philosophy, ethics, and underlying values; role of use of evaluation in educational organizations. PreReq: Consent of Instructor. (Same as Higher Education 534.) F, Sp, Su

541 The High School Curriculum (3) Identification of problems associated with curriculum study. Tennessee curriculum framework, assessment of trends in programs of local, regional, and national significance. E

543 Teaching Mathematics in Middle School: 5-8 (3) Unit planning, daily planning, grouping and other strategies for teaching mathematics. For those with little preparation in teaching middle school mathematics. F

547 The Junior High and Middle School Curriculum (3) Curriculum and instruction design for junior high and middle school. Characteristics of students, curriculum designs, instructional patterns, and organization of instruction in junior high school. F

559 Curriculum Planning and Development (3) Foundations and principles of curriculum planning and development. Historical analysis of curriculum theory, principles of planning and development, and classroom applications for improved learning. F

560 Student Assessment (3) Processes for assessing and reporting student progress; interpretation and use of achievement test data. Methods of achievement testing other than tests and measurements; portfolios, performance tasks, exhibitions. E

561 Educational Statistics (3) Applications of descriptive and inferential statistics to educational and instructional problems. Use of electronic calculators in educational research. PreReq: One year of college mathematics, an elementary course in statistics, or consent of instructor. E

565 Instructional Trends and Issues in Science Education (3) Analysis of current trends in science instruction, instructional issues facing elementary, secondary, and college science educators, and development of learning theory to improve teaching physical, biological, and environmental science. PreReq: 496, Holistic Teaching/Learning 422, or equivalent. Su

566 Administering Instructional Media Programs (3) Leadership roles and responsibilities of professional media administrator in variety of organizational settings.

569 Advanced Production of Audiosoftware (3) Hand and mechanical lettering, flat picture mounting, laminating, overhead projection, audio production, TV studio orientation, sync-singing, multi-screen presentations, and printing techniques. (Same as Information Sciences 560.)

572 Nature of Mathematics and Science Education (3) Teaching and administration of mathematics and science based upon student conceptions of nature of mathematics and science. E

573 Instructional Design and Interactive Multimedia (3) Basic instructional design and development of interactive multimedia programs and associated applications. Use of appropriate programming language and Macintosh as computer platform.

577 Introduction to Data Processing in Curriculum and Instruction (3) Analysis of current capabilities in educational computing and data processing. Curriculum, instructional design, and classroom management applications from microcomputers to supercomputers. PreReq: Consent of instructor.

580 Techniques for Research in Curriculum and Instruction (3) Fundamentals of research methodology applicable to curriculum, instruction, and other areas of educational inquiry. Critical reading of research and design of studies for needs of proposed development. E

581 Seminar in Mathematics Education (3) Current issues influencing instruction in mathematics, science, and social studies, in schools, elementary through college. Related teaching methodologies. Opportunities for work on special problems. PreReq: 485 or equivalent. F

582 Teaching Enrichment Mathematics in Middle and Junior High Schools (3) Topics to enrich middle and junior high mathematics. Geometric, topological, and combinatorial topics. Problem solving activities. Opportunities for work on special projects. PreReq: 485 or equivalent.

583 Teaching Mathematics in Senior High Schools and Community Colleges (3) Topics appropriate for college preparatory and college preparatory programs in mathematics. Special problems related to enrichment, problem solving, and use of microcomputers. Opportunities for work on special projects. PreReq: 485 or equivalent.

586 Teaching Probability & Statistics (3) Teaching of probability and statistics in schools. Opportunities for work on special problems. PreReq: 485 or equivalent.

588 Instructional Theory and Design (3) Relationship of instruction, curriculum, instruction design, instructional methods, and related learning theories; instructional models and teaching styles. E

593 Independent Study (1-3) May be repeated. E

594 Supervised Readings (1-3) May be repeated. E

595 Special Topics (1-3) May be repeated. E

596 Curriculum Trends and Issues in Science Education (3) Analysis of elementary and secondary curriculum projects for biological, physical, and environmental sciences. Impact of current learning theories on future curriculum development projects. PreReq: Holistic Teaching/Learning 422, or equivalent. PreReq or coreq: 565 or consent of instructor. Su
Electrical and Computer Engineering

(College of Engineering)

MAJOR DEGREES

Electrical Engineering ................... M.S., Ph.D.
T. V. Blalock, Acting Head

Professors:
Abdi, Mongi A., Ph.D. ............. Tennessee
Alexeff, Igor (Emeritus), PE, Ph.D. .. Wisconsin
Bailey, J. Milton (Emeritus), Ph.D. .......... Georgia Tech
Birdwell, J. Douglas, Ph.D. .......... MIT
Bishop, Asa O., Jr., Ph.D. ............... Clemson
Blight, T. Vaughn (Emeritus), Ph.D. .......... Tennessee
Bodenheimer, Robert E. (Emeritus), Ph.D. .... Northwestern
Bose, Bimal K. (Condra Chair of Excellence), Ph.D. .......... Calcutta
Boudin, Donald W., PE, Ph.D. .......... Vanderbilt
Gonzalez, R. C. (Emeritus), Ph.D. .......... Florida
Goode, Joseph M. (Emeritus), PE, Ph.D. .......... Georgia Tech
Green, Walter L. Ph.D. .......... Texas A & M
Hung, James C. (Emeritus), PE, Ph.D. .......... New York
Karim, Mohammad A. (Lisieus), Ph.D. .......... Alabama
Kennedy, Eldredge J. (Emeritus), PE, Ph.D. .......... Tennessee
Lawler, J. S., Ph.D. .......... Michigan State
Neff, Herbert P. (Emeritus), PE, Ph.D. .......... Auburn
Pace, Marshall O., PE, Ph.D. .......... Georgia Tech
Pierce, J. Frank (Emeritus), PE, Ph.D. .......... Pittsburgh
Pujol, Alfonso Jr. (UTSI), Ph.D. .......... Vanderbilt
Roberts, M. J., Ph.D. .......... Georgia Tech
Rochelle, Robert W. (Emeritus), Ph.D. .......... Maryland
Roth, J. Reece, Ph.D. .......... Cornell
Symonds, Frederick W. (Emeritus), Ph.D. .......... Nottingham
Tillman, James D. (Emeritus), Ph.D. .......... Auburn

Associate Professors:
Bomar, Bruce W. (UTSI), Ph.D. .......... Crility, Paul B., Ph.D. .......... New Mexico State
Joseph, Roy D. (UTSI), Ph.D. .......... Case Western
Koch, Daniel, Ph.D. .......... Missouri (Rolla)
Newport, Danny, Ph.D. .......... Tennessee
Rochelle, James M., Ph.D. .......... Tennessee
Walker, Alvernon, Ph.D. .......... NC State
Waller, J. Wayne, Ph.D. .......... Tennessee

Assistant Professors:
Montoya, Tom P., Ph.D. .......... Georgia Tech
Smith, L. Montgomery (UTSI), Ph.D. .......... Tennessee
Smith, Philip W. .......... Virginia
Whitaker, Ross T., Ph.D. .......... North Carolina

The Department of Electrical and Computer Engineering offers graduate degrees leading to the Master of Science and a Doctor of Philosophy with a major in Electrical Engineering. Graduate students are able to conduct research in a wide variety of electrical engineering areas including communication, computer engineering, computer vision and robotics, electromagnetics, electro-optics, image processing, information processing, intelligent control, microelectronics, mixed-signal VLSI, monolithic sensors, industrial plasma engineering, power electronics and systems, sensor fusion, and signal processing. The department supports a strong joint program in mixed-signal VLSI and monolithic sensors with the Oak Ridge National Laboratory, Instrumentation Laboratory, and the Department of Nuclear Engineering jointly offer a master's degree program in the field of fusion energy. Students may have the opportunity to do their master's thesis at the Fusion Energy Division of ORNL or at the Plasma Science Laboratory, affiliated with the Electrical and Computer Engineering Department. Departmental graduate programs are also available at the Space Institute, Tullahoma. Some of the electrical engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in the department's graduate program. Further information about these various programs is available from the department.

The Departmental Graduate Committee is responsible for administering, promoting, and advancing the general well-being of the graduate program. Departmental actions regarding a graduate student may be appealed in writing, first to the departmental graduate committee and then to the department faculty.

THE MASTER'S PROGRAM

Graduate work leading to the Master of Science with a major in Electrical Engineering may be completed during one academic year of full-time study, or two to three years of part-time study.

Admission Requirements
Applicants for admission to the M.S. degree program are expected to have completed a bachelor's degree in Electrical Engineering with an average of at least 3.0 out of 4.0 both overall and in the senior year. All applicants whose native language is not English, including those who have earned degrees at U.S. institutions, must score at least 550 on the TOEFL exam to be considered for admission to the program.

Students who hold the bachelor's degree in a field other than electrical engineering are also expected to have a minimum cumulative grade point average of 3.0 and a minimum senior year average of 3.0 in that field. The department will require that selected undergraduate courses be taken to make the background of these students comparable to that of students who hold a bachelor's degree in Electrical Engineering. These undergraduate courses may include electrical engineering courses from the sophomore and junior years and one senior electrical engineering sequence of the student's choice. The specific set of undergraduate courses required will be chosen in view of the applicant's prior education and experience. The student will be admitted under non-degree status until the required undergraduate courses are successfully completed with a 3.0 average.

Master's Degree Requirements
Students may choose between a thesis option and a project (non-thesis) option M.S. program. All students must file a Master's Program Plan with the departmental graduate committee specifying which option they have selected. A semester-by-semester schedule of the courses they intend to take, and the members of the student's master's committee. Students may change between the thesis and project options, one time, by filing an amended Master's Program Plan.

Thesis Option: Specific requirements of the thesis option are a minimum of 30 semester hours including:
1. Electrical Engineering 503 and 504.
2. Six semester hours of mathematics at the 400 level or above selected from a list approved by the graduate committee, or 6 semester hours of EE courses at the 500 level or above, or 6 semester hours of non-EE courses approved by the student's committee.

3. One foreign language if the student's committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.

4. A comprehensive examination on a qualifying examination and a comprehensive examination. The qualifying examination is prepared by the Electrical Engineering faculty and consists of 2 four-hour written examinations covering courses required in the undergraduate electrical engineering curriculum through the junior level. The qualifying examination is offered twice each year (January and August) and is to be taken at the student's convenience. A minimum of 18 hours of coursework must be completed after the student has taken the qualifying examination the first time.

A comprehensive examination is required by The Graduate School in this department. The comprehensive exam is administered by the student's committee; the exam results are reported to the graduate committee for approval; and the exam is filed in the department. The comprehensive exam is given when the student is ready to apply for admission to candidacy. The comprehensive exam consists of both written and oral parts. The written part consists of at least two sections: a complete review of the literature in the student's dissertation topic, and a review of the major tools to be used in the dissertation work. The student's committee may require additional written sections. The students must demonstrate a mastery of the dissertation area, ability to think analytically and creatively, skill in using academic resources, and ability to complete the dissertation satisfactorily. The oral part consists mainly of a professional presentation of a proposal for dissertation work and its defense. The committee may cover additional topics in the oral part.

5. Participation in departmental seminars.


GRADUATE COURSES

Note: Courses required in the Electrical Engineering undergraduate curriculum may be used toward a graduate degree in Electrical Engineering except when required by the program.

400 Senior Design (5) Major design project focusing on students' professional practice, accumulated background of curricular components, and recent developments in field. Directed to topics within field of electrical engineering, communication, and computer engineering. Projects which require laboratory work. Prereq: Linear System Analysis, Electric Energy System Components, Electrical Circuits, Analog Communication Amplitude and Frequency Modulation.

411 Digital Signal Processing and Filter Design (3) Discrete-time signals and systems, sampling, discrete Fourier transforms, analog and digital filter characteristics, non-recursive and recursive filters, and design and CAD tools for filter design. Level 1 design projects which require laboratory work. Prereq: Frequency-Domain Analysis of Signals and Noise, Linear System Analysis, Systems and Power Laboratory.

412 Linear Control System Design (4) Classical and modern techniques for design and compensation of linear feedback control systems. Bode design, root locus design, state variable pole placement design. Level 2 design projects which require laboratory work. Prereq: 411.

421 Electric Energy Systems (3) Structure and operation of electrical energy grid, load forecasting, planning, control, reliability, voltage levels, islanding, and electrical energy systems. Prereq: Linear System Analysis, Electric Energy System Components, Systems and Power Laboratory.


432 Electronic Amplifiers (4) Feedback amplifier principles; bandwidth in amplifier design, low-noise preamplifier design and amplifier design, linear regulated power supply design and switching regulator principles. Radio frequency amplifier design; oscillator principles. Laboratory experiments and design projects. Level 2 design projects which require laboratory work. Prereq: 431.

441 Digital Communications (3) Discrete Fourier Transforms, Binary and M-ary Signaling, digital communication in present of noise, matched filtering and equalization. Information theory. Level 1 design projects. Prereq: Analog Communication Amplitude and Frequency Modulation.


443 Antennas and Propagation (3) Antenna theory: fundamental antenna properties and parameters (directivity, gain, patterns, etc.) and signal propagation. Theory and design of linear and loop antennas, arrays, and other simple antennas. Level 1 design projects. Prereq: Digital System Analysis, Analog Communication Amplitude and Frequency Modulation.

451 Microprocessors and Microcontrollers in Electrical Engineering (3) Project oriented course using microcomputer for real-time computer-aided design and development system with cross-assemblers, file management, and simulation capability. Interfacing and hardware/software tradeoffs in interactive computer applications. Grade dependent upon number of project completed, lab reports, programming work, and design projects. Level 1 design projects which require laboratory work. Prereq: 451.

452 Organization and Design of Digital Systems and Computers (4) Considerations for hardware organization of computer and digital systems: ALU and CPU structures, control unit organization, storage systems, and I/O interfaces; design of programming and control unit and different interrupt structures. Level 1 design projects which require laboratory work. Prereq: 451.

453 Physics of Fusion Energy (3) High temperature plasma physics relevant to fusion plasma, principles of fusion reactors, and engineering and physics constraints on fusion reactor design. Level 2 design projects. Prereq: Senior standing. Non-majors require consent of instructor. (Same as Nuclear Engineering 453.)
614 Optimal Control (3) Deterministic and stochastic dynamic programming in continuous and discrete time, minimum principle and matrix minimum principle, computational methods in optimal control. Prereq: 611.

617 Special Topics in Systems Theory I (3) Topics of current interest to students and faculty: large-scale systems, model order reduction, algebraic and geometric system theories, and advanced design methods. Prereq: 503 and consent of instructor.

618 Special Topics in Systems Theory II (3) Topics of current interest to students and faculty: large-scale systems, model order reduction, algebraic and geometric system theories, and advanced design methods. Prereq: 617.

623 Advanced Power Electronics and Drives (3) Phase-controlled cycloconverters, cycloconverter-fed ac drives, resonant converters, vector and scalar control of synchronous machines, static Kramer drives, static Scherbius drives, VSCF generation, modern control theory in ac drives.

624 Electrical Insulation (3) Principles, testing, and case studies. Basic principles of aging, losses, charging, conduction, and breakdown in vacuum, gas, liquid, solid, and composite insulation systems. Testing with low-voltage instrumentation, pulse height analysis, optics, acoustics, and bridges; associated statistics and distributed parameter effects. Students study drawn from active research on power systems, electronic circuits and devices, shielding, and stress grading. Prereq: 503, 504, and consent of instructor.

631 Advanced Topics in Electronic Instrumentation I (3) Based on particular interests of students. Fundamental physical processes in instrumentation transducers: thermoelastic, magnetoelectric, electromechanical and quantum-mechanical devices. Prereq: 531-32 and consent of instructor.


643 Detection and Estimation Theory (3) Detection theory; coding theory; system identification. Signals with unknown parameters; optimal filter synthesis; adaptive systems; sequential detection; suboptimal detection. Prereq: 504 or consent of instructor.

644 Coding and Information Theory (3) Structure of algebraic and probabilistic codes; linear codes, convolutional codes, error-correcting codes, decoding methods; identification schemes; deterministic, stochastic, and hierarchical methods. Prereq: 643.

651 Computer-Aided Design of VLSI Systems I (3) Fabrication of microelectronic devices; computer architecture design; algorithmic state machines; partitioning; structured design methodology. Prereq: 551-52 or consent of instructor.

652 Computer-Aided Design of VLSI Systems II (3) Computer-aided design tools; design and implementation of fully custom very large scale integrated (VLSI) circuits; design for testability; testing of fabricated chips. Prereq 651.

653 Advanced Plasma Physics I (3) Basic concepts of high-temperature plasmas. Mott and hydrodynamic concepts and kinetic descriptions of plasma, plasma transport, plasma waves, equilibrium, and stability. Prereq: Physics 541-2, 561-2 or 583-4, or consent of instructor. (Same as Physics 585.)


671 Image Processing and Robotics (3) Three-dimensional scene modeling and recognition, multi-sensor systems. Prereq: 572 or 573 or consent of instructor.

672 Image Processing and Robotics II (3) Stereovision, shape theory. Prereq: 671.

673 Image Processing and Robotics III (3) Time-varying imagery, path planning and navigation. Prereq: 672.

691 Advanced Graduate Seminar (1) Research in department. May be repeated. S/NC or letter grade.

692 Special Topics (1-3) Advanced topics of current interest to Ph.D. students in Electrical Engineering. May be repeated. Maximum 9 hrs.

**Engineering Science**

See Mechanical and Aerospace Engineering and Engineering Science

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**English**

(College of Arts and Sciences)

**MAJOR**

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<td>English</td>
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D. Allen Carroll, Head

**Professors:**

Adams, Percy G. (Emeritus), Ph.D. .......... Texas
Barton, Edward W., Ph.D. .......... Illinois
Carroll, D. Allen, Ph.D. .......... North Carolina
Cox, Don R., Ph.D. .......... Missouri
Currey, Kenneth (Emeritus), Ph.D. .......... Yale
Drake, Robert Y., Jr. (Lindsay Young Prof.), Ph.D. .......... Yale
Ensor, Allison R., Ph.D. .......... Indiana
Finneran, Richard J. (Hodges Chair of Excellence), Ph.D. .......... North Carolina
Fisher, John H. (Emeritus), Ph.D. .......... Pennsylvania
Garner, Stanton B., Jr., Ph.D. .......... Princeton
Gill, J. E., Ph.D. .......... North Carolina
Goslee, David F., Ph.D. .......... Yale
Goslee, Nancy M. (Distinguished and Lindsay Young Prof.), Ph.D. .......... Yale
Hoffman, Thomas J., Ph.D. .......... Cambridge
Hutchinson, George, Ph.D. .......... Indiana
Kallet, Marilyn, Ph.D. .......... Rutgers
Keene, Michael, Ph.D. .......... Texas
Kelly, Richard M. (Lindsay Young Prof.), Ph.D. .......... Duke
Leggett, B. J. (Distinguished Prof.), Ph.D. .......... Florida
Leki, Iona, Ph.D. .......... Illinois
Lofaro, Michael A., Ph.D. .......... Maryland
Malander, Charles J. (Lindsay Young Prof.), Ph.D. .......... Michigan
Penner, A. Richard (Emeritus), Ph.D. .......... Colorado
Reese, Jack E. (Univ. Prof.), Ph.D. .......... Kentucky
Sanders, Norman J. (Emeritus), Ph.D. .......... Shakespeare Institute
Schneider, Daniel J. (Emeritus), Ph.D. .......... Northwestern
Scora, Dorothy M., Ph.D. .......... North Carolina
Shurr, William (Emeritus), Ph.D. .......... North Carolina
Stillman, Robert, Ph.D. .......... Pennsylvania
Trabern, Joseph B., Jr., Ph.D. .......... Princeton
Wier, Allen, M.A. .......... Bowling Green
Wheeler, Thomas V., Ph.D. .......... North Carolina
White, Jon M. (Emeritus), M.A. .......... Cambridge
Wright, Nathalia (Emeritus), Ph.D. .......... Yale

**Associate Professors:**

Atwill, Janet, Ph.D. .......... Purdue
Benson, Linda D., Ph.D. .......... Oregon
Dumas, Bethany K., Ph.D. .......... Arkansas
Dunn, Allen, Ph.D. .......... Washington
Hirst, Russell, Ph.D. .......... Rensselaer

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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 M.A., as well as a special concentration in writing.

Detailed information about the master's and doctoral programs, and about individual graduate courses, may be obtained by writing to 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 website through the College of Arts and Sciences homepage at www.arts.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.

**THE MASTER'S PROGRAM**

**Requirements**

**Coursework:** A minimum of 24 semester hours in English beyond the B.A., to include 6 hours at the 600 level; 12 additional hours at the 500-600 level (Only 3 hours of 693 Independent Study may be applied toward the M.A.), 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.

**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:

1. Completion of the second year of a language at college level with a grade of C or better.
2. Completion of French 302 or German 332 at UT Knoxville with a grade of B or better.
3. Passing of the regular Ph.D. foreign language examination as currently administered at UT 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 M.A., 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 Projects: One of the following writing projects for six hours of credit:

1. A thesis, using research to analyze some aspect of a writer or rhetorical theory.
2. 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 M.A. 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.

THE DOCTORAL PROGRAM

Requirements

A student must successfully complete a program of study, normally 6 full semesters as outlined below, approved by the candidate’s committee or the Director of Graduate Studies in English.

Coursework: At least 51 semester hours beyond the B.A. (of which at least 24 semester hours must be beyond the M.A.) 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 M.A. and 3 after the M.A.); a special three-hour course in teaching composition; and 12 additional hours at any level, including the 400 level. Up to 6 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 must be met in one of the following ways:

1. 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 UT 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 Ph.D. foreign language examination as currently administered at UT Knoxville.
2. 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 UT Knoxville and completion of two courses in the foreign language at the 400 level or above, at least one of these courses to be at the 500 or 600 level. A minimum grade of B must be received in each course.
3. 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) below:
   a. One course in the 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 three hours, the student may either complete the history of the language sequence or choose one 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 Ph.D., and anyone electing this language option may not take the comprehensive examination in linguistics.

Examinations: (1) A 4-hour qualifying examination taken before the end of the first year of Ph.D. coursework; this examination is given three times a year, with the M.A. written examination. (2) 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 9 or more hours of coursework and/or dissertation hours each semester. For students on assistantships, full-time consists of at least 6 hours of courses and/or dissertation hours and 3 hours of teaching each semester.

GRADUATE COURSES

Note: 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 romantic tragedies, including Othello, problem plays, including Measure for Measure, and dramatic romances, including The Tempest.

406 Renaissance Drama (3) English theatre between 1590 and 1640 through 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 (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 Victorian Poetry and Prose I (3) Tennyson, Pre-Raphaelites, Carlyle, Newman, and Mill.

419 Victorian Poetry and Prose II (3) Browning, Arnold, Hopkins, Hardy, Ruskin, Darwin, 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.