vision for audiologists and speech language pathologists interested in private practice, supervisory or administrative positions.

561 Tutorial in Child Language Pathology (2) Interactions with various staff members of Pediatric Language Programs; selected topics. May be repeated. Maximum 6 hrs.

574 Pediatric Audiology (3) Theoretical and practical considerations in evaluation and treatment of hearing loss in infants and children. Audiological intervention in case management of hearing impaired child; amplification, educational alternatives, and state and federal guidelines.

579 Psycholinguistic Concepts in Speech Pathology (3) Psycholinguistic concepts and information theory in studying the normal acquisition of language and certain disorders of language. Prereq: Consent of instructor.

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

594 Advanced Aural Rehabilitation (3) Procedures; assessment and counseling for communicative function of hearing impaired. Prereq: 494.


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

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


603 Language Science (3) Seminar of theories and paradigms of research on acquisition and use of language: phonology, syntax, semantics and pragmatics. Prereq: Graduate standing and consent of instructor.


608 Advanced Clinical Concepts and Models in Hearing Science (3) Theoretical concepts of clinical manifestations in pathological condition of ear. Electrical, mechanical, and mathematic models of normal and abnormal auditory mechanism function. Prereq: Consent of instructor.

609 Seminar in Speech Science (2) Experimental areas: speech physiology, acoustic analysis, recognition, perception and intelligibility of speech, communication theory, and psycholinguistic measurement of speech and language. Topics vary. Prereq: 601 or consent of instructor. May be repeated. Maximum 6 hrs.

610 Seminar in Hearing Science (2) Advanced study of perception of nonspeech acoustic signal, detectability, pitch, loudness, differential threshold, adaptation, and fatigue. Prereq: 602 or consent of instructor. May be repeated. Maximum 6 hrs.

611 Experimental Design in Speech and Hearing (2) Analysis of experimental design in thry and related journals. Generation of experimental designs. Prereq: Consent of instructor.

619 Advanced Technology in Speech and Hearing (2) Applications of recent technological advances, computers, to speech and hearing research. Prereq: Consent of instructor.

650 Advanced Seminar in Audiology (2) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

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

655 Practicum in College Teaching (2) Supervised experience in college teaching. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. S/NC only.

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

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

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

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

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

Airavation Systems (UT Space Institute)

Major

Degree

M.S.

R. D. Kimberlin, Program Chair

Professors:

Collins, F. G., Ph.D............. California
Frost, W., Ph.D................ Washington
Mason, A. A., Ph.D............. Tennessee
Roberts, R. M., Ph.D........ Air Force Tech
Wu, J. M., Ph.D................ Calif Tech
Young, R. L., Ph.D............ Northwestern

Associate Professors:

Kimberlin, R. D., M.S........ Tennessee
Watts, C. F., M.S............. Arizona

Assistant Professor:

Solies, U. P., Ph.D............ Tennessee

The University of Tennessee Space Institute offers a program leading to the Master of Science degree with a major in Aviation Systems. The Aviation Systems program is designed for those who possess a Bachelor's degree in engineering or science and wish to study under a 'system philosophy' toward careers in research and development or administration in areas pertinent to aviation.

To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science from an accredited institution, show evidence of ability to pursue and benefit from the program, and fulfill the University of Tennessee Graduate School admission procedures and grade-point standards. It is expected that the student will have a basic knowledge of computer utilization and statistics; an understanding of aerodynamic fundamentals, aircraft propulsion, and performance; and some understanding of economics.

Both thesis and non-thesis programs are available. The thesis program involves a minimum of 30 semester hours credit while the non-thesis program involves a minimum of 33 semester hours credit.

Thesis Option

The thesis program 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. Six hours of electives from the major field, mathematics or engineering.
4. Six hours of Aviation Systems 500 demonstrating the ability to conduct and report on an independent investigation.

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. Six hours of electives selected from the major field, mathematics or engineering.
5. Six hours of Aviation Systems 500 demonstrating 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 course work 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 510.
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 UTK on an in-state tuition basis. The M.S. program in Aviation Systems is
available to residents of the states of Arkansas, Kentucky, Mississippi, South Carolina, or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

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

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

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

503 Air Vehicles (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 collecting and distributing 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 enforcement procedures. Prereq: 501.

506 Aircraft Design (3) Design process, compromise of conflicting requirements, economic, industrial, and legal aspects. Definition of mission requirements, synthesis and optimization techniques, safety and reliability, systems integration, standards and regulations, teamwork and decision-making process.

510 Special Topics in Aviation Systems (3) Current problems. Prereq: Consent of instructor. May be repeated with consent.


Biochemistry

(College of Liberal Arts)

MAJOR DEGREES

Biochemistry M.S., Ph.D.

Wesley D. Wicks, Head

Professors:

Churchich, Jorge E., Ph.D. Sheldon

Huang, Leaf, Ph.D. Michigan State University
Josh, J. G., Ph.D. Poona
Monty, Kenneth J., Ph.D. Rochester
Salto, T. P. (emeritus), Ph.D. Michigan State University
Wicks, Wesley D., Ph.D. Harvard

Associate Professor:

Koontz, John W., Ph.D. Kentucky

Assistant Professors:

Fairfield, Frederic R., Ph.D. SUNY Stony Brook
Feinberg, R. H. (emeritus), Ph.D. California University
Howell, Elizabeth E., Ph.D. Lehigh
Serperu, Engin H., Ph.D. Hacettepe University
Roberts, Daniel M., Ph.D. California (Davis)

Adjunct Faculty:

Constantinides, P., Ph.D. Brown
Farkas, W., Ph.D. Duke
Georgiou, S., Ph.D. Manchester
Kennel, S., Ph.D. California (San Diego)

THE MASTER'S PROGRAM

1. At least one year each of Introductory Organic Chemistry with laboratory* and approved physical chemistry.

2. A minimum of 8 semester hours of approved biology courses beyond the introductory level and including the subject areas of genetics and physiology.

3. Biochemistry 511-12 and 515-16.

4. At least 6 hours of advanced seminar courses from the following: 601, 603, 604, 605, 606.

5. At least 6 hours of Master's research and a thesis.

6. A final examination that covers both thesis and laboratory and the subject matter of the course requirements.

THE DOCTORAL PROGRAM

1. Introductory Organic Chemistry*, Introductory Physics*, Differential and Integral Calculus*, approved physical chemistry, and at least 12 hours of biology beyond the introductory level and including the subjects of genetics and physiology.

2. Biochemistry 511-12 and 515-16.

3. At least 3 hours of approved graduate courses in chemistry, physics, or other physical science; for example, Chemistry 550, 551, 552, Physics 521, 522, 551. No survey courses will be accepted.

4. At least 6 hours of topics offered in 521 and 621.

5. Participation in 601 and 603 during the entire period of residence.

6. Comprehensive examination, taken after the end of the third year of study.

7. A dissertation reporting the results of original and significant research carried out during the term of candidacy.

8. 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 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 biochemical journal as senior author.

*Though completion of these courses or their equivalent is required, they may not be taken for graduate credit.

GRADUATE COURSES

410 Cellular and Comparative Biochemistry (4) Electrolyte behavior, chemistry and structure of proteins; enzyme behavior and biological function; catabolism and energy capture; synthetic metabolism; nucleic acid function, protein synthesis, and biochemical genetics; regulation of biochemical processes. Prereq: Chemistry 350-60-69 and Biology 316-20. 3 hrs and 1 discussion. F,Sp


430-440 Introduction to Physical Biochemistry (3,3) Development of concepts from physical chemistry for application to biological problems. 430—Thermodynamics; intermolecular bonding; transport phenomena; hybridization, sequencing, and immunochemical methods of studying macromolecules. 440—Quantum mechanics; molecular orbitals; interactions of light with biological molecules; macromolecular studies through nuclear magnetic resonance and electron spin resonance; case studies of studies of selected macromolecules. Prereq: Mathematics 141-42, Chemistry 350-60-69, and Biology 110-20. F,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 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 Concepts in Protein Structure, Protein Function and Intermediary Metabolism (4) Protein structure and dynamics; regulation of enzyme activity; intermediary metabolism; membrane structure and function. Original literature and review articles; contemporary experimental approaches. Prereq: 410, 420 or consent of instructor. 3 hrs and 1 discussion. F,Sp

512 Advanced Molecular Biology (4) Replication, repair, transcription, translation and control mechanisms. Prior knowledge of fundamentals of gene expression. Prereq: 511 or Life Sciences 511. 3 lectures and discussion. (Same as Life Sciences 512.) Sp

515 Experimental Techniques I (3) Modern experimental methodology and instrumentation. Laboratory work for departmental graduate students. Prereq: Consent of instructor.

516 Experimental Techniques II (3) Laboratory rotations. Student works in laboratory of faculty member on clearly defined project. Written proposal and oral report. Primarily for departmental graduate students. Prereq: 515. Sp

521 Special Topics (1-3) Registration only by prior arrangement with department. May be repeated. Maximum 9 hrs.

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

Office of the Provost

Major DEGREES

Biomedical Sciences  M.S., Ph.D.

Raymond A. Popp, Acting Director

Professor:

Olins, Donald E., Ph.D.  Rockefeller Research Professor:

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

Research Associate Professor:

Uherbacher, Edward C., Ph.D.  Pennsylvania

Shared Faculty:

Not all faculty listed are necessarily available in teaching and/or research roles in every academic year.

Bunick, Gerald J., Ph.D.  Pennsylvania

Cook, John S., Ph.D.  Princeton

Fry, R. J. M., M.D.  Dublin

Fujimura, Robert K., Ph.D.  Wisconsin

Gehrs, C. W., Ph.D.  Oklahoma

Hartman, Fred C., Ph.D.  Tennessee

Jacobson, K. Bruce, Ph.D.  Johns Hopkins

Kennel, Steve, Ph.D.  California (San Diego)

Kenney, Francis T., Ph.D.  Johns Hopkins

Larimer, Frank W., Ph.D.  Florida State

Lee, Kain-Lin, Ph.D.  Tulane

Littlefield, Gary, Ph.D.  Georgia

Marchok, Ann C., Ph.D.  Connecticut

Mazur, Peter, Ph.D.  Harvard

Mitra, Sankar, Ph.D.  Wisconsin

Mural, Richard, Ph.D.  Georgia

Niyogi, Sallí K., Ph.D.  Northwestern

Popp, Raymond A., Ph.D.  Michigan

Preston, R. Julian, Ph.D.  Reading

Regan, James D., Ph.D.  Hawaii

Richmond, G. R., Ph.D.  New Mexico

Rinchik, Eugene M., Ph.D.  Duke

Russell, Liane B., Ph.D.  Chicago

Sega, G. A., Ph.D.  Louisiana State

Shugart, Lee H., Ph.D.  Tennessee

Snyder, Fred L., Ph.D.  North Dakota

Stevens, Audrey L., Ph.D.  Western Reserve

Terzaghi-Howe, Peggy, D.Sc.  Harvard

Vo-Dinh, Tuan, Ph.D.  Swiss Fed IT Waters, Larry C., Ph.D.  Georgia

Wai, C. H., Ph.D.  Wisconsin

Woychik, Richard P., Ph.D.  Case Western

Yang, Wen K., M.D., Ph.D.  Tulane

Bunick, Gerald J., Ph.D.  Pennsylvania

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 physical chemistry. A course in physical chemistry is offered by the school in order to meet the last requirement. 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, Biology Division, ORNL, Box 2005, Oak Ridge, Tennessee 37831-8077.

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); Molecular Genetics (517); Cell Biology (518-19); Computing for the Life Sciences (525); and Statistics for Biologists (574).

2. Three semesters of Biomedical Sciences Laboratory (531-32-33).

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 interests. 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.

SPECIAL MASTER OF SCIENCE DEGREE PROGRAM

The graduate faculty has designed a Master of Science program in Biomedical Sciences primarily to fill the need for such a degree within the Oak Ridge National Laboratories; however, a limited number of students from other institutions may be accepted if qualified and as space is available. The requirements for the degree are:

1. Graduate credit or a proficiency in the following core courses: Biochemistry (511); Biophysical Biochemistry (514); Cell Biology (516-19); plus any two of the following courses: Genetics (515); Molecular Genetics (517); Statistics for Biologists (574); or Computing for the Life Sciences (525). Additional credits may be obtained (6 to 15 hours) with elective courses.

2. Thirty hours of approved graduate courses including a minimum of 6 semester hours for thesis.

3. For admission to candidacy: Completion of any required prerequisite courses and one semester of graduate coursework with a B average. Admission to candidacy forms must be filed at least one full semester prior to receipt of degree.
4. A Master’s committee of three approved faculty members upon admission to candidacy.
5. A thesis reporting results of original and significant scientific research.
6. Passing a final examination.

GRADUATE COURSES

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

507 Physical Chemistry (3) Thermo-dynamics; phase equilibria; chemical equilibria, electro motive force, surface chemistry; electrolyte solutions; kinetics, conductance; viscosity; diffusion.

511 Biochemistry (3) Chemistry of carbohydrates, lipids, proteins, and coenzymes; enzyme kinetics intermediation metabolism and photosynthesis; biosynthesis of amino acids lipids, and macromolecules. Coreq. 507.

514 Biophysical Biochemistry (3) Chemistry metabolism and biosynthesis of purines, pyrimidines and nucleic acids; DNA, RNA and proteins. Energy levels and excited states of large molecules; optical instrumention; adaptations to system perturbation methods of macromolecules in solutions; molecular solution; molecular conformations; inter- and intramolecular forces; principles of microscopy. Prereq. 511.

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

517 Molecular Genetics (2) Molecular biology of genetic processes. Three distinguished outside lecturers present current research on mechanisms of gene regulation; protein synthesis; misense and nonsense mutation; mutagenesis; gene defects and hereditary diseases. Prereq. 511, 514, and 515.

518 Cell Biology I (3) Structure and composition of major nuclear and cytoplasmic organelles of eukaryotic cells. Pertinent instruments and techniques; Meiosis and mitosis; cell cycle; chromosome structure; nucle- ar RNA metabolism; nucleoli and ribosome biogenesis; signal transduction and expression of genes. Prereq. 511. Coreq. 511.

519 Cell Biology II (3) Comparative biochemical approach to cell structure and function. Membrane systems and metabolism; development and function of milk; milk; dairy, chloroplasts, peroxisomes and other organelles as related to metabolism and regulation; transport phenomena; cell cycle; cell products; interaction of cells; function of tissues and organs. Prereq. 511. Coreq. 511.

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.

531-32-33 Biomedical Sciences Laboratory (3.33) 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.

543-44-49 Graduate Research Participation (3.6) 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) Fall, Spring, and Summer. Special topics. Potential topics: X-ray diffraction and crystallography; excited-state biophysics; physical chemistry or macromolecules; pathology; mammalian genetics coverage.


574 Statistics for Biologists (2) Application and interpretation of statistical methods in data analysis. Random variation; normal, binomial, and Poisson distribution; statistical presentation of data; estimating means and variance; confidence intervals; tests of significance for comparing samples; analysis of variance; contingency tables; Chi-square tests; correlation and association; linear regression. Prereq. Statistics 201 or consent of instructor.

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

622 Enzyme Regulation and Kinetics (3) Kinetics of catalysis; inhibition by-product, substrate and dead end inhibitors; simulation and inhibition of allosteric enzymes, types of feedback regulation; role of sub-units in enzyme regulation; multifunctional enzymes. Prereq. 511, 514.

624 Chemistry and Metabolism of Lipids (2) Nomenclature, chromatographic isolation, chemistry, physical properties, and enzymology and lipids. Hormonal action of prostaglandins and role of lipids in membranes. Metabolism of cholesterol and other hormones, and interconnection of pathway. Prereq. 511, 514.


628 Molecular Genetics of Carcinogenesis (2) DNA and RNA tumor viruses, oncogenes, growth factors, and their potential role in induction of cancers.


641 Techniques in Cell Biology (3) Basic concepts of cell biology techniques, their application to specific research problems, kind of data yield, and caution in data interpretation. Laboratory demonstrations may be arranged where appropriate. Prereq. 511, 514, 518, 519.

551-52-53 Advanced Topics in Biomedical Sciences (3,3,3) Current and future research developments: protein synthesis, protein chemistry and enzyme mechanism, cellular differentiation. Either as six-month seminar 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 rodents. Prereq. 515.

665 Microbial Genetics (3) Basic phenomena in microbial genetics: transduction, transformation, conjugation, and mutation. Genetics of bacteriophage. Prereq. 515, 517.

666 Cytogenetics (3) Chromosome structure, chromosomal alterations (mitosis and meiosis), mechanisms of inheritance chromosomal alterations by radiation and chemicals, aneuploidy, chromosome banding and in situ hybridization. Chromosome changes and human cytogenetics, sister chromatid exchanges, human genetic risk assessment, molecular techniques for analyzing chromosome changes. Prereq. 515.

54 Botany

(College of Liberal Arts)

MAJOR

DEGREES

Botany

M.S., Ph.D.

Karen W. Hughes, Head

Professors:

Caponetti, J. D., Ph.D. Harvard

Clebsch, E. E., Ph.D. Duke

DeSelm, H. R., Ph.D. Ohio State

Evans, A., Ph.D. Michigan

Harnden, W. R. Vanderbilt

Hickok, L. G., Ph.D. Massachusetts

Holton, R. W., Ph.D. Michigan

Hughes, K. W., Ph.D. Utah

Jones, L. W., Ph.D. Texas

McNamick, J. F., Ph.D. Emory

Norris, F. H. (Emeritus), Ph.D. Ohio State

Petersen, R. H. (Distinguished Prof.), Ph.D. Columbia

Sharp, A. J. (Emeritus), (Distinguished Prof.), Ph.D. Ohio State

Smith, W. O., Ph.D. Duke

Waine, P. L. (Distinguished Prof.), Ph.D. Tennessee

Associate Professors:

Amundsen, C. C., Ph.D. Colorado

Heilman, A. S., Ph.D. Ohio State

Henke, R. R., Ph.D. Miami (Ohio)

Mullin, B., Ph.D. NC State

Schilling, E. E., Ph.D. Indiana

Schwartz, O. J., Ph.D. NC State

Smith, D. K., Ph.D. Tennessee

Wofford, B. E. (Curator), Ph.D. Tennessee

Lecturer:

McFarland, K., Ph.D. Tennessee

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, bryology, cytology, cytogenetics, ecology, genetics, lichenology, morphology, mycology, photobiology, physiology, psychology, pteridology, and taxonomy.

Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of undergraduate students. For further information, contact the Department Head or the Graduate Coordinator.

ADMISSION REQUIREMENTS

The Botany Department requires scores from the general and subject biology portions 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 with 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: 8 semester hours; organic chemistry: Physcis highly recommended.
5. College mathematics: 6 semester hours including 1 term of calculus.

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

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 normal route taken by botany students for the M.S. in accordance with the emphasis of the University and the department on research, it involves writing and defending a thesis to describe the results of a completed research project of original work. It is important that the entering student promptly identify a major professor and a suitable research project, if it may be either a terminal degree or a preliminary step to studying for a Ph.D. degree.

1. Satisfactory preparation of a written formulation and an oral defense to the student's committee for 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 in botany.

3. Demonstrated reading proficiency in one modern foreign language or in the use of computers for data analysis. Proficiency in a foreign language may be demonstrated by satisfactory completion of an examination in one modern foreign language (see Graduate Coordinator) or an A or B in French 302 or German 332 (can also be applied to the doctoral program). Proficiency in computer use may be demonstrated by satisfactory completion with a grade of A or B of the following computer science courses or their equivalents: C.S. 101 or 102, 112, and 403 or Stat. 205.

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


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

Non-Thesis Option

Satisfactory completion of 34 semester hours of approved graduate courses of which 30 semester hours must be in botany including Botany 503. At least two-thirds of the hours must be at the 500 level or higher.

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.

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 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 departmental seminar near the end of the doctoral program.

Note: The listed requirements for the M.S. and Ph.D. are as follows. If they are 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.

GRADUATE COURSES

401-02 Field Studies in Botany (3,3) Field experience and taxonomy of special plant groups. Topics vary: Bryology, lichenology, pteridology, mycology, phycology, aquatic vascular plants, synantherology, bryology, lichenology, pteridology, agrostology, mycology, and taxonomy of special plant groups. Topics vary: Bryology, lichenology, pteridology, mycology, phycology, aquatic vascular plants, synantherology, bryology, lichenology, pteridology, agrostology, mycology, and taxonomy of special plant groups.


412 Plant Anatomy (3) Cells, tissues and organs; development in vegetative and reproductive structures of vascular plants—seed plants. Prereg: 110-20 or Biology 110-20.

426 Palaeobotany and Palynology (3) (Same as Geology 425).

431 Plant Ecology (3) Interactions between individuals, species, communities and their environments. Circulation of energy and matter in ecosystems. Weekly field trips or laboratory periods, and at least two weekend field trips. Prereg: 330 or equivalent. Su.

451 Plant Tissue Culture (3) Methods for culture of cells, tissues, and organs; media preparation and maintenance of cultures. Prereg: 110-20 or Biology 110-20 or equivalent and Chemistry 120-30 or equivalent. Recommended prereq: 310-20, 321, 412; Microbiology 310 or 319; Ornamental Horticulture and Landscape Design 330; and Plant and Soil Science 331.

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

501 Mycology (4) Intensive survey of fungi, all major classes, lecture laboratory and field information. Occasional field trips. Prereg: 310. 3 hrs and 1 lab. Su.A

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 tuition fees are due. May not be used toward degree requirements. May be repeated. S/NC only. E


506 Phycology (4) Comparative study of major algal phyla, both freshwater and marine: morphological, biochemical, anatomical, and taxonomic aspects. Field and laboratory studies, identification, classification, experimentation. Prereg: 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) photomicrography, drawing, graphics and video for recording and presentation for research and publication of data in pictorial and graphic form.

593 Morphology and Evolution of Basidiohydites (4) Structure and function of somatic and sexual life cycles as applied to evolution in group. Cycles and specimens in laboratory. Prereg: 330 or equivalent.

512 Taxonomy of Grasses and Grass-like Plants (3) Collection, identification, classification of grasses, sedges and rushes, phycology of the grass subfamilies and tribes. Prereg: 330 or consent of instructor. F.A

519 Biosystematics (3) Major experimental methods in systematics and application to specific types of systematic problems. Hypotaxonomy, numerical taxonomy, chemotaxonomy and cladistics.


530 Advanced Taxonomy of Flowering Plants (3) Evolution and classification of families of angiosperms, local flora. Prereg: 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.

535 Plant Communities and Plant Geography (4) Plants in communities and their classification and ordination; geographic distribution of communities—their climatic and soils relationships. Prereg: 431.

537 Natural Resource Management and Environmental Assessment in Developing Nations (3) (Same as Ecology 537 and Planning 553.)

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.

555 Seminar in Quaternary Studies (3) (Same as Geology 555 and Zoology 555.)

565 Phytoplankton Ecology (3) Interaction between environment and phytoplankton. Nutrient uptake, primary production, ecological theory applied to phytoplankton communities, and physiological adaptations to populations by environment. Prereq: 310 or consent of instructor.

573 Population Biology (3) (Same as Zoology and Ecology 573.)

578 Plant Cell Biology (4) Plant cellular organization, structure and function. Interaction of cellular components and correlation of their structures and functions. Principles and application of analytical and experimental laboratory procedures in cell biology research. Prereq: Biology 220 or equivalent. Recommended prereq: Biochemistry 410-19, 3 hrs and 1 lab. F.A

580 Bryophytes and Pteridophytes (4) Taxonomy, phylogeny, ecology and developmental morphology; field work and current research. Prereq: 310-20 or consent of instructor. 2 hrs and 2 labs. F.A

581 Cytogenetics (3) Chromosome structure and behavior during mitotic and meiotic divisions in relation to structural changes, genetic controls, hybridization, speciation, and polyploidy. Laboratory emphasis on normal and aberrant meiotic systems and somatic chromosome preparations of plants and animals. Prereq: 310 and at least 6 additional hrs in biological sciences. (Same as Forestry 581.) Sp.A

582 Methods and Instrumentation in Laboratory Investigation (1) Project experience and theoretical background in various research methods, on exchange resins, adsorption spectrometry, disc electrophoresis, polargraphy, zonal and ultracentrifugation, gas chromatography, automatic analyzers, microbiology, culture methods, use and detection of radioisotopes. Prereq: Chemistry 350, 360, Physics 121, 122. May be repeated. Maximum 5 hrs. S/NC only.

583 The Field Research Problem (3) Conceptualization, planning, and implementing field research. Criteria for choosing instruments, sampling methods, and locations for study of populations, communities, and ecosystem. Field practice. Development and critique of formal research proposal like those required by granting and contracting agencies. Prereq: 431, or 535 or 539.

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

590 Developmental Plant Morphology (3) Developmental morphology of plants from vegetative and reproductive organs, and of organ determination and differentiation. Prereq: 310, 320 or 412 and 321 or 521 or consent of instructor. 2 hrs and 1 lab. F.A

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

606-07 Advanced Topics in Botanical Sciences (1-3, 1-3) Experimental botanical science: nomenclature, morphology and systematic of vascular plants, cryptogamic botany, cytology and cell biology, genetics, plant physiology, palynology and ecology. May be repeated. Maximum 12 hrs.

632 Ecosystems of the World (2) Characterization of world and regional ecosystems; special characteristics of ecosystem function. F.A

637 Applied Ecology (3) (Same as Ecology 637.)

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

Broadcasting

(College of Communications)

MAJOR

Communications.........................................................M.S.

Norman R. Swan, Head

Professors:

Holt, Darrel W. (Emeritus), Ph.D. ....................... Northwestern
Howard, Herbert H., Ph.D. ...............................Ohio State, Norman R., Ph.D. ....................... Missouri

Associate Professor:

Moore, B. A., Ph.D. ...................................... Ohio State

Assistant Professors:

Buchman, Joseph, Ph.D. .............................. Indiana University
Manning-Miller, Carmen, Ph.D. ................. Indiana University
Ziegler, Dhyana, Ph.D. ................................. Southern Illinois

Adjunct Professor:

Nelson, Lindsey, B. A. ...................... University of Tennessee

The Department of Broadcasting offers a concentration area for the Master's with a major in Communications. See Communications for additional information.

GRADUATE COURSES

410 Television News (3) Writing, reporting, performing, and producing news for television. Experience as reporter/ producers for television news program. Electronic news gathering equipment and techniques, video editing. Prereq: 310, 1 hr and 4 labs. E

420 Radio-TV Sales and Promotion (3) Problems and practices of television, radio, and cable sales and promotion. Case studies in sales, sales management, pricing, rate cards, use of rating, and sales promotion. Effective station promotion techniques. Prereq: 320. F

430 Producing for Television (3) Principles of television studio and field production, both technical and creative. Writing, producing, shooting, and editing video stories and programs. 3/4' cameras, recorders, and editing system. Prereq: 330. E


490 Radio & Television Management (3) Business policies and management of broadcast operations, departmental function, cost and income analysis, leadership styles and techniques, mid-level management. Coursestone to be taken in student's last semester. Prereq: 275, 310, 320, 330. E

560 Radio & Television Law and Regulations (3) Legal problems faced by broadcast managers. Philosophy of regulatory policy formation. Efforts at self-regulation. Sociopolitical restraints, effects 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 audience research. Deciding which method to use, interpreting results, and applying research to management decision making. Prereq: Communications 512 or 612, or consent of instructor. Sp

580 Seminar in Radio & Television (3) Salient issues in broadcasting. Topics vary. International broadcasting, cable television, and new technologies, corporate television, educational and public broadcasting, and public broadcasting. Prereq: Consent of instructor or admission to program. F

590 Advanced Radio & Television Management (3) Financial management of broadcast operations: budgeting, financial planning, accounting, and related techniques. Theoretical perspectives in broadcast management, organization and management of commercial and non-commercial operations from perspective of general manager. Prereq: 490. Sp

597 Independent Study (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

598 Internship (3) 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: Senior or graduate standing, completion of at least 15 hrs of broadcasting courses, GPA 3.0 or better, and consent of department head.

Business Administration

(College of Business Administration)

MAJOR DEGREES

Business Administration...... MBA, J.D.-MBA, Ph.D.

The College of Business Administration offers two college-wide programs, the MBA and the Ph.D. with a major in Business Administration. A dual degree program is available with the College of Law leading to the J.D.-M.B.A.

To obtain application materials, write or call:

Associate Dean for Graduate Business Programs
Suite 527, Stokely Management Center
College of Business Administration
The University of Tennessee
Knoxville, TN 37996-0550
Telephone: (615) 974-5033

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state basis. The Ph.D. in Business Administration is available to residents of Virginia; the MBA is available to residents of Arkansas, Louisiana, or Virginia; and the Ph.D. and MBA concentration in logistics and transportation is available to residents of West Virginia.

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 for full-time students and the next two semester's coursework as established by the degree program for part-time students.

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. For full-time students, the MBA program is a
two-year, lock-step program with students beginning in the fall of each year and graduating in the spring, 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 complete MBA program with a concentration in management or new venture analysis and entrepreneurship is offered for part-time evening students. The part-time program has the same admissions requirements, curriculum (except for the summer internship, which is not required of part-time students), and faculty as the full-time program. Part-time students enter in the fall semester and take approximately 4 years to complete the program. Part-time students are required to successfully complete six hours of graduate credit per semester.

The program consists of 15 MBA core courses and 5 concentration/elective courses. Each course is 3 semester hours of graduate credit with the exceptions of Business Administration 501 and 503, which are one semester hour of graduate credit each.

Admission Requirements
Applications are accepted for fall semester only. The application deadlines for fall semester are March 1 for international students and April 1 for others. Applications by U.S. citizens and permanent residents received after April 1 will be considered as space allows.

To be considered for admission, the applicant's file must be complete. A complete 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 ten days before the MBA application deadline to allow for processing. Additional information is required by The Graduate School for international students (see page 14).

For admission to the MBA program, consideration is given to (1) 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 average or GMAT scores.

Prerequisites
College-level mathematics through at least one course in college-level calculus, taken within the past 2 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-K or at 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 same courses, but in a different sequence, comprise the core for part-time students.

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 no later than completion of 18 hours of MBA program coursework. In some cases selection of an area early in the program is encouraged to facilitate proper course sequencing. Requests for changes in concentration area must be submitted for approval to the Office of Graduate Business Programs.

Among the 5 courses in the concentration/electives block, at least 3 but not more than 4 must be in one of the following concentration areas. For specific courses required in concentration areas, see the appropriate field of instruction.

- Controllership
- Economics
- Finance
- Forest Industries Management
- Management Science
- Marketing
- New Venture Analysis and Entrepreneurship
- Statistics
- Logistics and Transportation

The remaining elective courses (1 to 2) must be in fields 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:

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

The maximum number of hours that may be transferred is 6 semester hours. Transfer credit will be considered upon formal petition to the Associate Dean for Graduate Business Programs.

Other Requirements
The Application for Admission to Candidacy must be approved by two faculty members and the department head in the student's area of concentration and the Associate Dean for Graduate Programs 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 to be conferred. (Permission 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. The student must demonstrate competency in these areas in a comprehensive examination administered in the capstone course, Business Administration 509.

BUSINESS ADMINISTRATION CONCENTRATION
For complete listing of MBA program requirements, see above.

MBA Concentration: New Venture Analysis and Entrepreneurship
This MBA concentration has been designated a Center of Excellence by the Tennessee Higher Education Commission. The concentration 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 courses may be combined with two elective courses in another area (finance, management, etc.) 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 Liberal Arts. Students in this program take their first three years of coursework in Liberal Arts, 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 Liberal Arts 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 for the MBA program.

Admission requirements are higher than those normally expected of MBA applicants. Desired qualifications include a minimum 3.4 GPA and a GMAT score of 550 or higher. Students interested in the program are counseled initially in the Liberal Arts Advising Center regarding admission standards and Liberal Arts requirements. At the end of their second year, they have a conference with the Associate Dean for 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 the year they wish to enter 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 Bachelor's degree at the end of that year. Students take 3 hours of graduate coursework during their senior year under the senior privilege rule, which requires them to notify The Graduate School in advance of the course for graduate credit. Upon successful completion of the fifth year, 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 conferral of both the Doctor of Jurisprudence and the Master of Business Administration. The dual program saves the student one semester over the time that would be required to earn both degrees independently.

The establishment of the dual program recognizes the increasingly complex body of knowledge into which the graduate business-oriented manager must integrate his or her business and legal skills. Under the concurrent study of both business and law, the graduate business-oriented manager may develop a comprehensive understanding of the legal issues inherent in the concurrent study of both business and business-related law. The program is designed to accommodate the interests of students who (a) contemplate a career in public service and want to acquire the skills and perspective of the lawyer and the business-oriented manager, (b) contemplate a career in business management and want to acquire the skills and perspective of a lawyer, or (c) contemplate a career as a lawyer specializing in business-related law and want to acquire the skills and perspective of the business-oriented manager.

**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 for the J.D., the Graduate School for the MBA, and by the Dual Program Committee. Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program studies be started prior to entry into the last 28 semester hours of J.D. coursework and prior to entry into the second year of the MBA program. 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 each college. 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 with regard to the dual program.

The College of Law will award up to 8 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 may not enroll in MBA coursework while completing the first year of the law curriculum and may not enroll in J.D. coursework while completing the first year of the business curriculum. During the first year in the J.D. program, students register through the College of Law. For any law course 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 Associate Dean for 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 so converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a 2.3 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 Accounting 503 or a more advanced graduate accounting course and 6 semester hours approved by the College of Law. Law courses to be counted toward the MBA must be selected from those approved by the Associate Dean for Graduate Business Programs.

**THE DOCTORAL PROGRAM**

The primary objective of the Ph.D. in Business Administration is to prepare a select number of students for careers in university-level teaching and research and 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. Actual admission is based on the applicant's overall academic record, combined with that of 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 an 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 intensive study and research beyond the Master's degree. Typically, the first two years of a student's program consist of coursework, writing, and research. The third year usually focuses on completion of the dissertation research and writing. It is emphasized that the Ph.D. program of study is structured for full-time students only. Upon acceptance of a student by a particular departmental faculty, the student is expected to remain in residence until the dissertation has been completed and all requirements are met for completion of the Ph.D.

Since the program focuses on the development of competent scholars, heavy emphasis is placed on both teaching and research skills. As part of the doctoral program, each student is required to serve as a teaching assistant to an undergraduate business class or as a research assistant to a senior faculty member. Typically, the College of Business Administration offers financial support for doctoral students during their tenure in the program.

The Ph.D. program is highly flexible, offering a wide array of concentrations and cognates. Moreover, heavy emphasis is placed on individualized instruction and close student-faculty interaction. Instruction takes the form of regular classes, doctoral seminars, and independent study and research. Students are also encouraged to attend lectures and discussions by visiting scholars throughout the year.

There are five concentrations offered in the Ph.D. program:

- Accounting
- Finance
- Management (Operations Management and Strategic Management)
- Marketing
- Logistics and Transportation

More detailed information concerning these specializations is available by writing directly to each department chairperson.
Degree Requirements

Students must complete a program of study that has been approved by their temporary doctoral advisory committee and the Associate Dean for Graduate Business Programs by the end of the first semester of coursework after entry into the program. This committee is nominated by the department chairperson in a student's intended area of concentration, subject to the Graduate Council's policies and procedures. Following are specific degree requirements:

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 must complete appropriate coursework at the graduate level, or other approved concentrations of coursework, in the following areas:

   Accounting
   Behavioral Science
   Business Policy
   Calculus
   Computer Science
   Economics
   Finance
   Legal Environment
   Management
   Marketing
   Statistics

All work in the above areas is subject to approval by the temporary doctoral advisory committee and the Associate Dean for Graduate Business Programs. Specific majors may have prerequisites not listed above.

3. Basic Core: Economics 510 (or approved substitute) is required, except that Management 567 (or equivalent) may be substituted with prior approval.
4. 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.
5. 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 are 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, management (operations management and strategic management), marketing, and transportation/logistics. See the appropriate fields of instruction for specific course requirements.
6. 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 five concentration business areas listed above, economics, statistics, or a related area in another school or college of the University.

Comprehensive Examinations

Comprehensive written examinations over the concentration and cognate areas are required of all candidates for the Ph.D. The concentration area examination is administered in two sessions of approximately four hours each and the cognate area examination in one session of approximately four hours. Written examinations may be supplemented with oral examinations. For a doctoral student having a cognate area in the College of Law, the results of only an oral examination may be deemed acceptable. Scheduling of comprehensive examinations is coordinated through the Office of Graduate Business Programs. 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 during the fall and spring term of 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 date of acceptance of the research proposal by the doctoral committee should be indicated. The application must be approved by the student's doctoral committee and the Associate Dean for Graduate Business Programs 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

Greenard 501-03 Integrative Management I, II (1, 1) Introductory integrative management policy and strategy for MBAs only. Use of tools of analysis, data, information, design, and management to identify, solve, and correct problems in and of organizations.

Management Information Systems (3) Analysis of organizational information needs, decision support systems, data base designs, data base software, computer utilization in data display, modeling, and strategies.

Managerial Policy and Strategy (3) Strategy and policy that affect character and success of total enterprise. Case study course integrating all functional areas in formulation and implementation of strategy that enables organization to reach objectives. Prereq: MBA core.

Executive-In-Residence (3) Interaction with corporate executives providing wide spectrum of business disciplines and discussion of domestic and international strategic planning as applied in major corporations. Prereq: MBA core and consent of instructor.

Chemical Engineering

(Graduate Program in)

MAJOR

DEGREES

Chemical Engineering...................M.S., Ph.D.

Joseph J. Perona, Head

Professors:

Bogue, Donald C., Ph.D. .................Delaware
Byers, Charles H., (Adjunct), Ph.D........California
Clark, Edward S., Ph.D. .................California
Culburn, Oran L. (Emeritus), Ph.D ....Texas
Donaldson, Terry L., Ph.D. ............Pennsylvania
D'Engros, Paul R., Ph.D. ...............Akron
Frazier, George C., Jr. .................Johns Hopkins
Holmes, John M. (Emeritus) ...........Tennessee
Johnson, Homer F. (Emeritus), Ph.D ...Wisconsin
Johnson, Homer F. (Emeritus), Ph.D ....Yale
Moore, Charles F., Ph.D. ..............Louisiana State
Perona, Joseph J., Ph.D. ...............Northwestern
Prados, John W., Ph.D. ..................Tennessee
Scott, Charles D. (Adjunct), Ph.D. ....Tennessee
Thomas, Cari O., Ph.D. .................Tennessee
Watson, Jack S., Ph.D. .................Tennessee

Associate Professors:

Bienkowski, Paul R., Ph.D. ..........Purdue
Blackburn, James W. (Research), Ph.D. ...Tennessee
Bruns, Duane D., Ph.D. ...............Houston
Cochran, Henry D. (Adjunct), Ph.D ....MIT
Counce, Robert M., Ph.D. ..............Tennessee
Donaldson, Terry L., Ph.D. ............Pennsylvania
Fellers, John F., Ph.D. ...............Akron

Assistant Professors:

Scott, Timothy C. (Adjunct), Ph.D. ...Wisconsin
Wang, Tse-Wei, Ph.D. .................MIT

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

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 18 hours in chemical engineering, 6 hours in other engineering, scientific, or business areas (as approved by the departmental faculty); and 3 optional hours from either one of these two categories.

2. A Master's thesis, ChE 500, totaling at least 9 hours.

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.

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 optional hours from either one 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.

Departmental 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 series courses.

2. 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 chemistry, mathematics, physics, and engineering.

3. The comprehensive examination, usually given in two parts, and covering such topics as chemical engineering operations and processes, thermodynamics, technology, and other related fields.

4. Active participation in graduate seminars conducted by the department. Resident students must register for ChE 501 every semester it is offered.

GRADUATE COURSES

401 Chemical Engineering Data Analysis (3) Experimental data; identification of system extrema; statistical properties of samples; empirical modeling of processes; statistical process control; optimization techniques.

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


440 Transport Phenomena (3) Momentum, heat and mass transfer processes, analyses, dimensional and macroscopic balances, applications involving molecular diffusion, simultaneous mass transfer and chemical reaction. Prereq: 340.


485 Hydrocarbon Processing (3) Chemical and physical properties of selected petroleum and those processes utilized in conversion of raw material into various fuels and selected chemical feedstocks. Prereq: 340.

486 Coal Processing to Liquid Fuels (3) Characterization of various coals with respect to current gasification and liquefaction technologies; modeling of conversion processes and estimation of product yields and associated water, oxygen, and energy requirements; catalytic hydrogenation; complex system design; both computer and laboratory work. Lab. Prereq: 350.

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

501 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. S/NC only.

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

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 solution techniques; transform methods; conformal mapping; variational methods; introduction to numerical methods. (Same as Materials Science Engineering 505.)

506 Approximate Methods in Chemical Engineering (3) Chemical engineering problems requiring approximate solution; introduction to some approximate methods. Prereq: 505.


631 Advanced Chemical Engineering Thermodynamics (3) Phase equilibrium in ideal and nonideal solution; composition relationship between phases, solution behavior and application to macroprocesses; introduction to microscopic approach to thermodynamics.

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

542 Diffusive and Stagewise Mass Transfer Operations (3) Analysis of mass transfer phenomena, coupled mass-transfer and reaction systems, processes involving adsorption, diffusion, molecular and turbulent flows, and multicomponent systems.

551 Chemical Reactor Analysis (3) Rate models for homogeneous reactions, properties of porous catalytic systems, reactor catalyst deactivation, fluid-fluid, fluid-solid reactions.

561 Process Modeling and Simulation (3) Theories and structures of models and art 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) Crossdisciplinary course combining basic concepts in microbiology, biochemistry, reaction kinetics, and biochemical and environmental engineering. Commercial processes, biodegradation/wastewater treatment, analysis of basic bioreactor systems, biosensors, and immobilization methods. Fundamental laboratory techniques during 6-week laboratory period. (Same as Environmental Engineering 575 and Microbiology 575.)

576 Principles of Chemical Separations (3) Fundamental aspects of chemical and physical process methods with emphasis on separations as unified field; several chemical separation techniques with application. Biotechnology process separation techniques for fermentation, biological and chemical separation fields; development of predictive mathematical models.


580 Technical Review and Assessment (3) Preparation of critical review of literature in area related to chemical engineering leading to candidates in non-thesis option. Prereq: Consent of advisor.

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

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Civil Engineering 588, Electrical and Computer Engineering 588, Engineering Science and Mechanics 586, Mechanical Engineering 588, and Aerospace Engineering 588.)

598 Measurement Science II (3) (Same as Nuclear Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 588, Mechanical Engineering 589, and Aerospace Engineering 589.)

591 Special Topics in Chemical Engineering (1-15) May be repeated. Maximum 6 hrs.

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

625 Venture Analysis (3) One or more chemical engineering firms will serve as basis for proposed new business venture. Case study with attention to markets, manufacturing needs, cost estimation, and management of the proposed new venture. To suit decisions by management or by potential investors. Prereq: 525 or equivalent.

631 Advanced Topics in Statistical Thermodynamics and Molecular Dynamics (3) Statistical thermodynamics, molecular based computer simula-
Chemistry

(College of Liberal Arts)

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

Professors:

Bloor, J. E., Ph.D..................................Manchester
Bowman, N. S. (Emeritus), Ph.D.................Princeton
Bull, William E., Ph.D................................Illinois
Chambers, J. Q., Ph.D................................Kansas
Compton, R. N., Ph.D................................Tennessee
Dean, J. A. (Emeritus), Ph.D........................Michigan
Eastham, J. F., Ph.D................................California
Fletcher, W. H. (Emeritus), Ph.D..................Minnesota
Grimm, F. A., Ph.D..................................Cornell
Guiochon, G. (Distinguished Scientist), Ph.D......Ecole Polytechnique and Paris VI
Kabalka, G. W., Ph.D..............................Purdue
Kleinfeilner, D. C., Ph.D............................Princeton
Lietzke, M. H., Ph.D...............................Wisconsin
Magid, L. J., Ph.D....................................Tennessee
Magid, R. M., Ph.D..................................Yale
Mamantov, Gleb

(Distinguished Prof.), Ph.D. Louisiana State
Pagni, R. M., Ph.D................................Wisconsin
Peterson, J. R., Ph.D...............................California
Ross, H. H., Ph.D................................Wayne State
Schwitzer, George K.

(Distinguished Prof.), Ph.D. Illinois
Smith, W. T. (Emeritus), Ph.D.......................Ohio State
VanHook, W. A., Ph.D..............................Johns Hopkins
Wehry, E. L., Ph.D................................Purdue
Williams, T. F.

(Distinguished Prof.), Ph.D. London
Wood, J. H. (Emeritus), Ph.D....................North Carolina
Wunderlich, B.

(Distinguished Scientist), Ph.D. .................Northwestern

Assistant Professors:

Barnes, C. E., Ph.D.................................Stanford
Feigler, C. S., Ph.D...............................Colorado
Shibata, J. H., Ph.D..............................Washington

Students majoring in Chemistry for the Master's or doctoral degree are required to present as 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 a minimum of 6 hours of graduate credit in Chemistry 500.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar. (No more than 2 hours may be applied to the course requirements.)
3. Prescribed 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: 510-11-12, 530-31-32, 550-51-52, 570-72-73, 590-94-95. At least 14 hours of this graduate 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, physical 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. Demonstration of a reading knowledge of French, German, Russian, or an alternative approved by the Chemistry faculty.
6. Eighteen additional hours in courses at the 500 level or above including at least one course above 601 and one of the following sequences: 510-11-12, 530-31-32, 550-51-52-53-54, 570-71-72-73, and 590-94-95.
7. A final oral examination.

The Ph.D. program with concentration in chemical physics is conducted jointly with the Department of Physics. The 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 6.

GRADUATE COURSES

430 Advanced Inorganic Chemistry (3) Atomic and molecular structure, bonding theories, descriptive chemistry of elements, kinetics and mechanism of inorganic reactions, applications of modern techniques for characterization, coordination and organometallic chemistry. Prereq: 230. Prereq or coreq: 360 or 361. Sp

431 Radioactivity and Its Application (2) Radioactive materials in tracer and therapeutic applications. Radioactive decay, detection apparatus and techniques, tracer procedures, safety precautions in agriculture, biology, medicine, nutrition. Not for credit by chemistry majors. Prereq: 230 or equivalent. F,sp


470 Advanced Physical Chemistry (3) Chemical dynamics, statistical thermodynamics, quantum mechanics of atomic and molecular systems, crystal structure and solid state. Prereq: 380 or 381. Sp

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

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

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 repeat- ed. S/NC only. E

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/NC only.

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

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

512 Electroanalytical Chemistry (3) Fundamentals of electrode processes; principles and practice of electroanalytical techniques in qualitative chemical analysis and applied to study of chemical systems. Prereq: 1 yr of physical chemistry.

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

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.

531 Characteristics of Inorganic Compounds (3) Descriptive chemistry of elements, structure, reactions, kinetics, mechanisms, equilibria, and spectra of coordination, organometallic, bioinorganic compounds. Prereq: 530. Sp
prerequisites. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

650 Selected Topics in Organic Chemistry (3) Topics of current significance. Prereq: Two of 550-51-52 or consent of instructor. May be repeated. Maximum 12 hrs.


670 Selected Topics in Physical Chemistry (3) Topics of current significance. Prereq: 570-72-73 or consent of instructor. May be repeated. Maximum 12 hrs.

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

533 Spectroscopic Characterization of Organic Compounds (2) Organic structure elucidation using spectroscopic methods: nuclear magnetic resonance, infrared, ultraviolet, and mass spectrometry. Prereq: 360 or equivalent. Sp

554 Advanced Organic Chemistry Laboratory (1) Synthesis of organic compounds illustrating modern techniques. Prereq: 360 or equivalent. Sp

570 Quantum Chemistry and Spectroscopy (3) Basic principles of quantum mechanics and their applications to molecular orbital theory, molecular structure, and spectroscopy; introduction to group theory. Prereq: 1 yr of physical chemistry. F

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

572 Thermodynamics and Statistical Mechanics (3) Macroscopic and microscopic description of equilibrium systems. Basic principles of thermodynamics and statistical mechanics, and application to selected chemical systems. Prereq: 1 yr of physical chemistry. F

573 Chemical Kinetics and Transport (3) Time-dependent phenomena in chemistry: chemical kinetics, chemical dynamics, transport theory. Prereq: 1 yr of physical chemistry. Sp

580 Fundamental Topics in Physical Chemistry (3) Quantum chemistry, spectroscopy, chemical kinetics, transport properties, thermodynamics, and statistical thermodynamics. Prereq: 1 yr of physical chemistry. F

580 Polymer Chemistry (3) Fundamentals of polymer synthesis and characterization through application of organic and physical chemical principles. Prereq: 1 yr each of organic and physical chemistry.


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

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

601 Chemistry Research Proposal (2) Preparation and oral defense of original written research proposal based on thorough survey of chemical literature. Prereq: Consent of department head. S/NC only. E

610 Selected Topics in Analytical Chemistry (3) Topics of current significance. Prereq: 510-11-12 or consent of instructor. May be repeated. Maximum 12 hrs.

630 Selected Topics in Inorganic Chemistry (3) Topics of current significance. Prereq: 530-31-32 or consent of instructor. May be repeated. Maximum 12 hrs.

650 Selected Topics in Organic Chemistry (3) Topics of current significance. Prereq: Two of 550-51-52 or consent of instructor. May be repeated. Maximum 12 hrs.
530 Families of Handicapped Children (3) Developmental nature of families’ experiences in caring for handicapped children, especially during infancy and early childhood. Prereq: 510 or consent of instructor.

533 Peer Relations (3) Significance of peer context in social development. Development of social skills and consequences of peer rejection for subsequent adjustment. Prereq: 510 or equivalent or consent of instructor.

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

550 Survey of Theory & Research in Family Studies (3) Research issues and literature in family studies: use of family conceptual frameworks, development of theoretical models and application to research and family life programs. F

560 Marital Dyad (3) Communication, power, sexuality, marital stability, and marital satisfaction. Prereq: 550 or equivalent or consent of instructor. F

561 Family Resource Management and Decision-making (3) Management of money and time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

562 Families in Crisis (3) Family processes during times of stress. Vulnerabilities and coping mechanisms of families. Prereq: 550 or equivalent or consent of instructor. F

563 Family Life Education Programs (3) Planning, implementing and evaluating programs in marital, parent-child, and family relationships, and parenting education. Prereq: Consent of instructor. (Same as Home Economics Education 563). F

564 Practicum in Human Development or Family Studies I (3) School and community programs. Education for human development and family living. Prereq: Consent of instructor. S/NC only. E

565 Practicum in Human Development or Family Studies II (3) School and community programs concerned with education for human development and of theoretical and practical application to family situations. Prereq: 550 or equivalent or consent of instructor. F.A

566 Approaches to Family Intervention and Counseling (3) Various theoretical approaches for family intervention and counseling. Structural, strategic, experiential and social learning schools of practice. Effects of intervention from perspective of their impact on family. Prereq: 564 and consent of instructor. E

567 Research Methods in Child and Family Studies (3) Empirical methods of collecting human behavior, evaluating and conducting empirical research. Prereq: 9 graduate hrs in major; or consent of instructor. Sp

568 Special Topics in Human Development or Family Studies (1-3) Research, theory and current issues in child development or family studies: divorce, handicapped children, symbolic interaction, work and family, Piaget, mainstreaming children, theory and research in human sexuality, cognition. Prereq: 6 graduate hrs in major, or consent of instructor. May be repeated with different topics. Maximum 9 hrs. E

581 Directed Study in Human Development or Family Studies (1-3) Individual learning experiences in specific topics in child development and early childhood education or family studies. Prereq: 8 graduate hrs or consent of instructor. May be repeated with different topics. Max: 8 hrs. E

580 Assessment of Development and Learning in Young Children (3) Theory, empirical research and practices related to measurement of development and learning in young children. F

591 Assessment of Family Behavior (3) Analysis of methods and measures used in family science research. Prereq: 561 or equivalent or consent of instructor. F

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

610 Advanced Special Topics in Human Development or Family Studies (1-3) Study of research and theory related to current issues. Prereq: 12 graduate hrs in major or consent of instructor. May be repeated with different topics. Maximum 6 hrs. E

620 Advanced Directed Study in Human Development or Family Studies (1-3) Advanced, in-depth individualized learning experiences in specific topics in child development, early childhood education, or family studies. May be repeated with different topics. Maximum 6 hrs. E

630 Advanced Study in Infant and Early Childhood Development (3) Normative and nonnormative development during infant and preschool years of life: cognitive, emotional, social, and physical aspects. Prereq: 510 or equivalent or consent of instructor. F.A

631 Adolescent Development in Families (3) Normative and nonnormative adolescent development: physical, cognitive, moral, social, familial, sexual, and personal development. Prereq: 510 or equivalent or consent of instructor. F.A

632 Advanced Study in Family Interaction (3) Human communication and conflict management within family context. Theoretical perspectives for family processes, adjustment, decision making, and coping. Prereq: 550 or equivalent or consent of instructor. Sp.A

Civil Engineering
(Majors in Engineering)

MAJORS

DEGREES

Civil Engineering.................................M.S., Ph.D.
Environmental Engineering......................M.S.
Gregory D. Reed, Head

Professors:
Burdette, Edwin G. (Fred N. Peebles Prof.), PE, Ph.D.................................Illinois
Chatterjee, Arun, PE, Ph.D..........................NC State
Davis, Wayne T., Ph.D..............................Tennessee
Goodpasture, David W. (Tenneco Prof.), PE, Ph.D.................................Illinois
Grecco, William L., PE, Ph.D...........Michigan State
Heathington, Kenneth W., PE, Ph.D...............Northwestern
Humphreys, J. B., PE, Ph.D.....................Texas A&M
Johnson, H. L., PE, M.S..........................Tennessee
Miller, William A., PE, Ph.D.....................Georgia Tech
Reed, Gregory D., PE, Ph.D.....................Arkansas Tech
Bruce A. (Crawford Prof.), PE, Sc.D..............New Mexico State
Walker, C. R. (Emeritus), PE, M.S............MIT
Weeter, D. W., PE, Ph.D.........................Purdue
Wegmann, F. J. (IBM Prof.), Ph.D.................Northwestern

Associate Professors:
Alaviana, V., Ph.D.................................Wisconsin
Frederick, B. J., PE, B.C.E......................Clayton State
Hansen, J. H., Ph.D..............................Missouri
Kressin, G. D., J.D..............................Tennessee
Moore, A. B., M.S...............................Tennessee
Robinson, R. Bruce (Fisher Prof.), PE, Ph.D............Iowa State
Tiry, R. F. (Emeritus), PE, B.S..............Marquette

Assistant Professors:
Bennett, R. M., PE, Ph.D........................Illinois
Drumm, E. C., PE, Ph.D.........................Arizona
Kane, W. F., Ph.D...............................VPi
The Department of Civil Engineering offers degrees leading to the Master of Science and Doctor of Philosophy with a major in Civil Engineering concentrating in construction engineering, environmental engineering, geotechnical/materials engineering, public works engineering, structural engineering, and transportation engineering; to the Master of Science in Environmental Engineering with concentrations in water quality, water resources, air quality, and waste management.

**MASTER OF SCIENCE PROGRAM**

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

**Civil Engineering**

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

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

**Non-Thesis Option:** A minimum of 33 semester hours, including a 3-hour special problems course, is required. Special problems 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. For a student who does not have an engineering degree, the following minimum prerequisite courses will be required:

- Basic Engineering 121, 131, 231, 321
- Civil Engineering 390, 395, 398, 380
- Mathematics 141, 142, 231, 241
- Chemistry 120, 130

In general, these must be completed before courses for graduate credit can be taken.

The Department of Civil 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 a minimum of 6 semester hours of thesis and 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 engineering design courses selected from a list provided by the student's committee.

Non-Thesis programs 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 thesis or dissertation credit, at least 6 hours 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 9 semester hours of mathematics will be required beyond 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.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The M.S. program in Environmental Engineering is available to residents of the state of Alabama. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

**Civil Engineering**

**GRADUATE COURSES**

494 Computer Applications in Civil Engineering


496 Legal and Ethical Aspects of Engineering

410 Land Surveying

421 Portland Cement and Asphallic Concrete

451 Highway Engineering

502 Traffic Engineering

510 Urban Systems: Engineering and Management

**494 COMPUTER APPLICATIONS IN CIVIL ENGINEERING**


**496 LEGAL AND ETHICAL ASPECTS OF ENGINEERING**

Legal principles underlying engineering work: laws of contracts, torts, real property; problems of professional registration and ethics. Prereq: Senior standing.

410 **LAND SURVEYING**

421 **PORTLAND CEMENT AND ASPHALTIC CONCRETE**

451 **HIGHWAY ENGINEERING**

502 **TRAFFIC ENGINEERING**

510 **URBAN SYSTEMS: ENGINEERING AND MANAGEMENT**
521 Pavement Design (3) Empirical and theoretical basis for design and analysis; strengthening existing pavements, pavement distress and economical design alternatives. Prereq: 321 and 332.

530 Shear Strength and Earth Slope Stability (3) Shear strength of fine-grained soils from a perspective of idealized, simple clay. Drained and undrained shear strength and stress-strain behavior of real soils. Laboratory testing and capacity of natural and cut slopes and embankments. Prereq: 335.


535 Advanced Foundations and Retaining Structures (3) Planning subsurface investigations; bearing capacity and settlement of shallow foundations on layered soils; surcharges/preloads; pile foundations; drilled piers; foundation design with pressure-meter; lateral earth pressures and design of retaining structures and sheetpiles. Prereq: 335.


541 Construction Management II (3) Management organization of heavy and building construction projects. Prereq: 340.

543 Construction Estimating (3) Project costs, estimating and take-off techniques, market cost conditions, and feasibility of design to cost. Prereq: 340 or consent of instructor.


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

552 Traffic Engineering-Operations (3) Signs, signals and marking; short-term operations; controllers; signal timing/phasing; one-way reversible flow; system operations; identification and correction of high-accident situations and system deficiencies. Prereq: 551 or 452.

553 Geometric Design and Layout of Roadways and Community Facilities (3) Functional and geometric design and rural and urban roads of all classes; subdivision layout; configuration of urban roads of all classes; techniques for access control; freeway intercepts and changes and street intersections; and parking. Prereq: 457 or consent of instructor.

554 Urban Transportation Planning (3) Transportation problems in urban area; systematic planning for identifying existing and future problems; travel surveys and demand models; evaluation of alternatives; implementation tools; special topics: urban goods movement, transportation system management. Prereq: 352 or graduate standing.

555 Pavement Design and Analysis (3) Empirical and theoretical basis for design and analysis; strengthening existing pavements, pavement distress and economical design alternatives. Prereq: 321 and 332.

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

558 Planning and Transportation (3) Preparation of transportation as elements of comprehensive development plan, identifying travel pattern, modeling of existing travel pattern, predicting transportation modes and between transportation and other community features. Use of planning process to establish existing travel patterns, modeling of existing travel patterns, proposing alternatives and evaluation. Prereq: Gradate standing. (Same as Planning 537.)

561 Matrix Formulation of Structural Problems (3) Review of matrix algebra, vectors, solution techniques; direct stiffness method, general elements, members, and structures composed of general members. Prereq: 361.

562 Analysis and Design of Plate Structures (3) Plate bending and buckling theory; analysis and design of bridge and building floors and structural plate components. Prereq: 361.

563 Statically Indeterminate Structures (3) Deflections of beams and trusses; force methods; moment distribution and other displacement methods; secondary stresses. Prereq: 361.

564 Finite Element Structural Analysis (3) Application of finite element method to structural analysis; plate stress, plate strain, axisymmetric, and three-dimensional elements; use of typical computer programs. Prereq: 561.

565 Structural Dynamics (3) Analysis of free and forced vibrations, and transient response of structures having many degrees of freedom; elastic behavior considered for structural systems: earthquake design and response of structures. Prereq: 561.

566 Structural Reliability (3) Application of probability theory and statistics to evaluating reliability of structures; development of safety factors and probability based design codes.

571 Behavior of Steel Structures (3) Behavior of steel structural members due to static and fatigue loading; relation between research results and current special codes for design. Prereq: 471.

572 Connections for Structural Steel Frame (3) Design, analysis and behavior of connections for structural steel frames. Simple, rigid and semi-rigid connections; column bases and column splices. Prereq: 472.

573 Prestressed Concrete (3) Properties of prestressing materials: methods of pretensioning and posttensioning; analysis and design of simple and continuous beams and slabs. Prereq: 471.

574 Behavior of Reinforced Concrete Members (3) Moment-curvature and load-deflection relationships for reinforced concrete elements: deflections and axial load; shear and torsion; relation between research results and specifications for design. Prereq: 471.

575 Repair and Retrofitting of Structures (3) Techniques, methods, and materials for repair and retrofitting of deteriorated or overstressed structures: foundation underpinning, retrofitting of steel fatigue failures. Prereq: 472.

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 588, Engineer- ing Science and Mechanics 588, Electrical and Computer Engineering 588, Mechanical Engineering 588, and Aerospace Engineering 588.)

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Engineering Science and Mechanics 589, Electrical and Computer Engineering 589, Mechanical Engineering 589, and Aerospace Engineering 589.)

590 Special Problems in Civil Engineering (1-4) Enrollment limited to civil engineering students. May be repeated. Maximum 6 hrs. S/NC only.

596 Special Readings (1-4) Readings related to current developments in field. May be repeated.

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


596 Special Readings (1-4) Readings related to current developments in field. May be repeated.

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

567 Numerical Models for Geologic Materials (3) Numerical models to represent the stress, strain, volume relationships for soils, rock, and concrete; nonlinear elastic models; classical plasticity models; critical state and capping plasticity models; multiple surface constitutive equations; estimation of parameters from laboratory tests; numerical implementation. Prereq: 530 and Engineering Science and Mechanics 539.

569 Soil Dynamics (3) Behavior of soils and soil-structure systems under time dependent loading; wave propagation in elastic media; principles of seismic reflection techniques; effects of earthquakes and vibrating machines on soil and foundation systems; analysis of pile foundations and cyclic soil testing and determination of soil parameters. Prereq: 335 and 565 or Engineering Science and Mechanics 538.

565 Analysis Techniques for Transportation Systems I (3) Analysis of trip generation, trip distribution, modal split and traffic assignment, employing mathematical, statistical, and computer science techniques. State of the art and new modeling techniques. Prereq: 554 or 558.

562 Analysis Techniques for Transportation Systems II (3) Advanced topics of application of mathematical, statistical and computer science techniques in modeling and analysis of transportation systems. Prereq: 561.


571 Behavior of Steel Bridges and Buildings (3) Behavior, analysis and design of plate girders, columns, and composite members subjected to static and dynamic loading. Prereq: 571.

574 Behavior of Reinforced Concrete Beams and Slabs (3) Strength and behavior of statically indeterminate reinforced concrete beams and frames; limit analysis; behavior, analysis, and design of reinforced concrete slabs: yield-theory line, finite element solutions, and ACI Code Method. Prereq: 574.

691 Special Topics in Civil Engineering (3) Selected advanced problems of current interest. Prereq: Consent of instructor. May be repeated.

Environmental Engineering

GRADUATE COURSES

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 session when studying at UTK. Prereq: Graduate or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

508 Seminar (1) Reports on current research in environmental engineering at UTK. Prereq: Graduate standing.

510 Environmental Protection (3) Managing of water resources, wastewaters, air quality, solid wastes, and hazardous materials to promote efficiency and comfort and to safeguard balances in natural ecosystems. Prereq: Consent of instructor.

520 Open Channel Hydraulics (3) Open channel flow principles, properties, and classifications, uniform and non-uniform flows, critical depth, uniform flow, and applications; open channel design; unsteady flow theory and analysis; dynamic routing; spatially varied flow; non-linear alignment; microcomputer applications, featuring HEC-2 model. Prereq: Civil Engineering 390.

522 Floodplain and Urban Flood Management (3) Review of national, regional, and local flood problems; state of the art flood damage reduction alternatives; open structural and non-structural; institutional responses: policies, programs, organizations, regulations, and laws; flood insurance; floodplain management; HEC-1, HEC-2; floodway encroachment, flood hazard zone and damage potential determinations; cast studies. Prereq: Civil Engineering 390 or consent of instructor for non-majors.
524 Sediment Transport (3) Sediment properties and measurements; principles of dynamics of suspended and bed sediment transport in erodible channels; erosion, transportation, and deposition of sediment by flowing water; erodible channel design; channel regime theory; common computer models. Prereq: Civil Engineering 390.


535 Ground Water Hydrology (3) Dynamics of flow in porous media, physical processes important in subsurface hydrology. Hydrodynamics, dispersion, anisotropy, layered soils and unsaturated flow phenomena. Analytical and numerical solution of flow equations; Elements of groundwater contamination and groundwater law. Prereq: Civil Engineering 390 or Engineering Science and Mathematics 341.

540 Remote Sensing for Transportation and Facilities Siting (3) Principles of remote sensing; sources of data and data acquisition systems; photo interpretation, analog and digital techniques for analysis of aerial and terrestrial photos, radar and thermal imagery with application to transportation and facilities planning, construction and operations. Prereq: Consent of instructor.

541 Remote Sensing Data Acquisition and Analysis (3) Active and passive sensors; automated analog and digital analysis and interpretation systems; image enhancement and classification techniques for color aerial photo and thermal imagery applications to environmental pollution, stress assessment. Prereq: Consent of instructor.

551 Physiochemical Unit Processes (3) Theory and design application in water and wastewater treatment. Prereq: Civil Engineering 380, and Civil Engineering 390.

552 Biological Treatment Theory (3) Theory and design applications of biological processes to treatment of wastewater and solid wastes. Prereq: Civil Engineering 380. 2 hrs and 1 lab.

553 Environmental Engineering Chemistry (3) Theoretical, applied and analytical chemistry concepts important to generation, measurement and treatment of environmental contaminants. Prereq: Chemistry 130. 2 hrs and 1 lab.

555 Solid Waste Management (3) Magnitude and characteristics of solid waste problems; collection systems; design of disposal systems: landfill, incineration, and composting, design of resource recovery systems; current and future regulations. Prereq: Senior standing.

556 Hazardous Waste Management (3) Analysis and design of operations and processes for hazardous waste disposal and processing: regulations analysis; industrial applications. Prereq: Graduate standing or consent of instructor.

570 Air Quality Management/Pollution Control (3) Introductory course on concepts of air pollution, analysis of relationships 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 volatile 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: Consent of instructor.

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

575 Applied Microbiology and Bioengineering (3) (Same as Chemical Engineering 575 and Microbiology 576.)

590 Special Problems in Environmental Engineering (1-6) Enrollment limited to environmental engineering students in non-thesis program. 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.

596 Special Readings (1-4) Readings related to current developments in field. May be repeated.

620 Advanced Surface Water Hydraulics (3) Advanced topics in surface water hydraulics; solutions in St. Venant equations of unsteady flow for complex channel situations; dam breach modeling. Prereq: 520.

630 Advanced Stormwater Modeling (3) Advanced topics in stormwater modeling; stormwater quality modeling; advanced applications of available stormwater computer models. Prereq: 530.

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


653 Pollutant Fate Modeling and Risk Assessment (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of air, water, and earthen solids in environment. Methods 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.

**Classics**

(College of Liberal Arts)

Harry C. Rutledge, Head

Professors:

Geesell, G. C., Ph.D., North Carolina
Rutledge, Harry C., Ph.D., Ohio State

Associate Professors:

Craig, C. P., Ph.D., North Carolina
Shelton, J. E., Ph.D.

Assistant Professor:

Martin, S. D., Ph.D., Michigan

The graduate courses in the Classics include the wider reading of Greek and Latin authors in a selected field, a more detailed study of one of the great departments of classical literature, and the development of background for the appreciation of Greek or Roman life and literature.

**GRADUATE COURSES**

401 Greek Poetry (3) Epic, lyric, drama. Authors vary. Prereq: 261.


405-06 Selected Readings from Greek Literature (3,3) For advanced students in Greek, plays, historical writing and poetry of ancient Greece in original Greek. Prereq: 401-402 or consent of instructor. May be repeated. Maximum 9 hrs. Sp

414 Cicero and Techniques of Latin Prose Composition (3) For advanced students in Latin, practice in prose composition, writings of Cicero the model. Prereq: 351-352 or consent of instructor. Sp

422 Seminar in Classical Studies (3) Field of classical studies today; recent achievements in areas of both philology and archaeology; impact of development of Linear B; new understandings of culture and politics of 'golden age' of Pericles and Augustus; classical studies and academic profession on both high school and college levels. May be repeated. Maximum 6 hrs.

431-32 Selected Readings from Latin Literature (3,3) For advanced students in Latin oratory, historical writings, poetry of ancient Rome in original Latin. Prereq: 351-352 or consent of instructor. May be repeated. Maximum 9 hrs.

435 Medieval Latin (3) Selected readings from Latin prose and poetry of medieval Europe. Prereq: Consent of instructor.

441 Special Topics in Classical Civilization (1-3) Art, literature, religion, and society of Greece and Rome. May be repeated with consent of department. Maximum 9 hrs.

461 Studies in Classical Archaeology (3) Variable content course offering subject matter not taught in an existing course, or concentrating on one aspect of existing survey. Prereq: According to topic. May be repeated. Maximum 9 hrs.

462 Roman Law (3) Development of Roman law through examination of cases from writing of Roman jurists, world's first legal professionals, understanding legal institutions in relationship to Roman society. Roman property and contract law.

501 Special Topics in Greek Literature (3) Advanced study of classical Greek literature, authors selected by students and instructor. May be repeated. Maximum 9 hrs.

531 Special Topics in Latin Literature (3) Advanced study of classical or medieval Latin literature, authors selected by students and instructor. May be repeated. Maximum 9 hrs.

451-42 The Latin Epic: Lucretius, Vergil (3,3) Advanced study of epic masterpieces of Lucretius and Vergil; both Georgics and Aeneid of Vergil.

561 Special Topics in Classical Civilization (3) Advanced study of advanced topics in Classical civilization; impact of decipherment of Linear B; problems in cultures of Greece and Rome. May be repeated. Maximum 9 hrs.

562 Problems in Old World Archaeology (3) Selected topics and research problems in European, Asian, and African prehistory. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. (Same as Anthropology 562.)

**Communications**

(College of Communications)

MAJOR

DEGREES

Communications..................M.S., Ph.D.

Professors:

Adamson, June N., M.S., Tennessee Ashdown, Paul G., Ph.D., Bowling Green Crook, James A., Ph.D., Iowa State Elliott, George A., Ph.D., Iowa Holt, Darrel W. (Emeritus), Northwestern
Communications

Howard, Herbert H., Ph.D. ............... Ohio
Leiter, B. Kelly, Ph.D. ............... Southern Illinois
Singletary, Michael W. ............... Illinois
Ph.D. ............... Southern Illinois
Swan, Norman R., Ph.D. ............... Missouri

Associate Professors:
Bowles, Dorothy, Ph.D. ............... Wisconsin
Miller, Mark M., Ph.D. ............... Michigan State
Moore, Barbara A., Ph.D. ............... Ohio
Motowidlo, Jerry L., Ph.D. ............... Illinois
Stankey, Michael J., Ph.D. ............... Illinois
Taylor, Ronald E., Ph.D. ............... Illinois

Assistant Professors:
Buchman, Joseph, Ph.D. ............... Indiana
Caudill, C. Edward, Ph.D. ............... North Carolina
Heller, Robert B., M.A. ............... Syracuse
Howard, Herbert H., Ph.D. ............... Illinois
Hoy, Marica, Ph.D. ............... Oklahoma State
Manning-Miller, Carmen, Ph.D. ............... Indiana
Ziegler, Dhyana, Ph.D. ............... Southern Illinois

The College of Communications offers the Master of Science and the Doctor of Philosophy degrees with a major in Communications. For application forms and other information about the M.S. and Ph.D. programs in Communications, write to:

Assistant Dean for Graduate Studies
College of Communications
98 Communications Building
The University of Tennessee
Knoxville, TN 37996-0313

ADMISSION REQUIREMENTS

Applicants must meet admission requirements of The Graduate School. In addition, they must complete the Graduate Record Examination 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 above the fiftieth percentile in verbal and quantitative 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 status. Applications for fall admission must be received by May 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 for 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.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The Ph.D. program in Communications is available to residents of the states of Alabama, Arkansas, Georgia, Louisiana, South Carolina, Virginia, or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

ACADEMIC STANDARDS

A student in the College of Communications whose cumulative 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 his or 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 12 semester hours of graduate coursework in Communications that is specified in the student’s degree program. Exceptions to this policy may be made only with the approval of the Assistant Dean for Graduate Studies of the College of Communications on the recommendation of the student’s faculty committee.

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 while allowing the student to concentrate in one of four fields: advertising, broadcasting, journalism or public relations.

The prospective student who is interested in acquiring basic skills in one of the areas listed above is advised to enroll for a second baccalaureate rather than an advanced degree.

Degree Requirements

The M.S. program emphasizes communications management in the areas of advertising, broadcasting, journalism (publications), and public relations. A minimum of 31 hours of approved graduate work is required:

1. Ten hours of core courses—Communications 510, 512, 540, and 550, the first three of which must be taken during the first two semesters of the student’s program, except with written approval of the Assistant Dean for Graduate Studies or the College. Three hours are included to provide the department in area of concentration.

2. Twelve hours within one department of the college, at least 6 hours at the 500 level or above. An internship, if needed, is included.

3. Three hour elective from a list provided by the department in area of concentration.

4. Six hours of thesis work (Communications 500), including a thesis seminar.

Additional hours may be required for those who do not have academic prerequisites, and an internship may be required for

those who do not have professional experience in the field they wish to study. A course in communications law is a prerequisite.

A student’s internship experience requires approval by his/her advisor. Credit will be given through Advertising 598, Broadcasting 598, or Journalism 598 on the basis of 3 hours of credit for the equivalent of 15 weeks of full-time professional experience. This credit is to be included in the student’s 31-hour M.S. program. Previous professional experience will be evaluated by the student’s committee.

Students interested in subsequent entry into a doctoral program are advised to take additional courses in communications theory and research, subject to advisor’s approval. After completion of the formal program of coursework and thesis research, the student must pass an oral examination conducted by his/her graduate committee. The student must also pass a written examination after completion of the core courses and communications law.

Communications majors in the M.S. program must demonstrate ability to use a typewriter proficiently within their first semester in residence.

THE DOCTORAL PROGRAM

The Ph.D. with a major in Communications is intended to prepare scholars for teaching, research, administration, and service in the field of mass communications. The program is interdisciplinary, consisting of a required core curriculum and recommended courses outside the College in the related social and behavioral sciences. The program is flexible and will accommodate a wide variety of career goals in communications. New students may be admitted to the program at any time; however, core courses begin only in the fall semester.

The Master’s degree is not required for entry into or completion of the doctoral program. Program planning, however, will permit the Master’s degree to be earned if desired. Students lacking academic or professional experience on time study beyond the Bachelor’s degree. Those holding Master’s degrees should anticipate two or more years of full-time study for completion of the Ph.D.

The following are normally minimal requirements for admission to full potential candidate status:

1. A 3.0 (4.0 system) grade-point average in undergraduate studies, or 3.5 for graduate work if applicant holds a Master’s degree.

2. Above the fiftieth percentile in verbal and quantitative aptitude on the Graduate Record Examination.

3. Endorsement by at least three former teachers or professional colleagues; and

4. A statement of the applicant’s goals and reasons for pursuing the degree. Personal interviews with members of the Ph.D. Admissions Committee are recommended and may be required. Communications experience in some field of communications is a highly desirable criterion for admission.

A minimum of 88 hours of approved graduate work is required for the Ph.D.
1. Twenty-eight hours of core courses—Communications 610, 612, 620, 640, 641; 6 hours of statistics; and three of the following courses: Communications 622, 632, 642, 652, and 692.

2. Fifteen hours in a primary concentration (advertising, broadcasting, journalism, public relations, or speech communications).

3. Twelve hours in secondary concentration (outside the College of Communications).


5. Twenty-four hours of dissertation.

*Specific courses to be taken require the approval/consent of 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.

A diagnostic exam must be taken during the second semester after entering the doctoral program. This exam covers Communications 610, 612, 640, 641, and one statistics course.

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 published in the College newsletter the preceding November. This information is available from the Dean's Office, 302 Communications Building, 974-3031. See also courses listed under Advertising, Broadcasting, and Journalism.  

GRADUATE COURSES

**400 Mass Communications Law and Ethics (3)** Legal issues directly affecting the mass media: libel, privacy, free press-fair trial, judicial controls, governmental regulations. Ethical standards and practices of mass media in America. Prereq: Writing for Mass Communication or consent of instructor.  

**500 Thesis (1-19) P/NC only.** E

**502 Registration for Use of Facilities (3-15)** Required for the student not otherwise registered during any semester in which 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 Orientation to Master's Studies (1)** Degree and thesis requirements. Committee formation and program planning. Overview of research methods and informational sources. Prereq: Consent of instructor or admission to program. S/NC only. F

**512 Fundamentals of Media Research (3)** Applications of communications research techniques for management. Gathering and analysis of data for assessing media audiences and impacts. Prereq: Consent of instructor or admission to program. Sp

**521 Tutorial in Communications Teaching (1)** Experience as teacher under guidance of faculty member. Prereq: Consent of instructor. S/NC only. E

**540 Theory for Media Management (3)** Selected research hypotheses and theories in literature of mass communications, managerial decision-making. Prereq: Consent of instructor or admission to program.

**550 Seminar in Media Economics and New Technology (3)** Electronic and print media ownership, finance and corporate structure. Roles of new technologies and marketing techniques in changing media content and corporate structure. Roles of new technologies and marketing techniques in changing media content and corporate structure. Prereq: Consent of instructor or admission to program. S/NC only. F

**593 Seminar in Mass Communications Issues (3)** Contemporary topics in communications. Consent of instructor. Maximum 6 hrs. E

**597 Independent Study (3)** Reading, research or projects on special topics in communication. On individual basis, under faculty direction, with consent. May be repeated: Maximum 6 hrs. E

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

**610 Orientation to Doctoral Research (1)** Degree and dissertation requirements. Committee formation and program planning. Overview of research methods and informational sources. Prereq: Consent of instructor or admission to program. S/NC only. F

**612 Fundamentals of Communications Research (3)** Universal research process from defining ideas and problems to reporting results. Causal inference and relative strengths of various research designs. Fundamentals and specific applications of most common data-gathering and measurement techniques in communications research: experimental, survey, content analysis, historical and qualitative. Prereq: Consent of instructor or admission to program. F

**620 Seminar in Mass Communications Education (3)** Role and scope of mass communications teaching unit; historical perspectives of curricular trends. Teaching methods and instructional objectives; classroom testing and measurement; design of professional curricula, research and extension; program evaluation; grants and contracts in research. Prereq: Consent of instructor or admission to program. Su

**622 Quantitative Research (3)** Techniques for evaluation of research design and measurement. Survey, content analysis, and experimental techniques. Assessment of reliability and validity. Data analysis, hypothesis testing, and inference strategies. Prereq: 612. Sp

**623 Mass Communications History and Historiography (3)** Origins and development of mass media in America. Philosophies of history. Historical sources and their verifications. Synthesis and interpretation of data. Prereq: 612 or consent of instructor. Su

**640 Mass Communications Theory I (3)** Selected research hypotheses, and theories in literature of mass communication theory. Prereq: Consent of instructor or admission to program. F

**641 Mass Communications Theory II (3)** Selected topics in theory. Critical evaluation of extant theory, derivation of hypotheses, and advanced theory construction. Prereq: 640. Sp

**642 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. Prereq: 612 or consent of instructor. Su

**652 Mass Communications Law and Legal Research (3)** Legal restrictions under which mass media operate. Finding, interpreting and analyzing sources of legal information. Prereq: 612 or consent of instructor.  

**662 Advanced Topics in Communications Theory and Methodology (3)** Advanced study of communication issues, theories and methods. May use quantitative, qualitative, historical or legal approaches. May be repeated: Prereqs: 622, 632, 642 or 652 or consent of instructor.

**Comparative and Experimental Medicine**

*(Office of the Provost)*

**MAJOR DEGREES**

**Comparative and Experimental Medicine...**

M.S., Ph.D.
Requirements for Admission to the Doctor of Philosophy Program

Applicants will generally be expected to have a Master's degree in one of the biological sciences or a professional degree in one of the medical sciences. Selected individuals having baccalaureate degrees with strong backgrounds in the physical and biological sciences may be admitted upon presenting evidence of satisfactory performance on the Graduate Record Examination.

Exceptions to the above requirements may be made at the discretion of the Admissions Committee if the minimal requirements of the Graduate School have been met. Applicants who are admitted to graduate programs but who are lacking in course requirements will be required to correct these deficiencies early in their graduate programs.

For additional information, write to the Office of Research and Graduate Programs, P.O. Box 1071, Knoxville, TN 37901.

Computer Science

(College of Liberal Arts)

MAJOR

DEGREES

Computer Science ..................... M.S., Ph.D.

Jesse H. Poore, Head

Professors:

Ali, Moonis (UTSI), Ph.D. .......... Aligarh
Gonzalez, R. C., Ph.D. ............... Florida
Poore, J. H., Ph.D. ................. Georgia Tech
Sherman, Gordon R., Ph.D. ....... Purdue
Thomason, Michael G., Ph.D. ... Duke

Associate Professors:

Case, Jeffrey D., Ph.D. .......... Illinois
Char, Bruce W., Ph.D. .......... California
MacLennan, Bruce J., Ph.D. ... Purdue
Pfeiffer, Charles P., Ph.D. ....... Penn State
Whitehead, Bruce, Ph.D. ........... Michigan

Assistant Professors:

Blair, J. R. S., Ph.D. .......... Pittsburgh
Lee, Seung-Chul (UTSI), Ph.D. .... Florida
Mutchler, David, Ph.D. ........... Duke
Straight, David W., Ph.D. ......... Texas
Vose, M. D., Ph.D. ............... Texas
Zemanova, M., Ph.D. ............. Florida State

Instructor:

Mayo, J. W., M.S. ................. Tennessee

THE MASTER'S PROGRAM

Thirty semester hours of graduate credit are required, 24 of which must be 500 level or above. 511 and 513 are required unless explicitly waived by the department. One course in programming in a modern recursive, high-level programming language is required as entrance to 511 and one year of college mathematics beyond algebra and trigonometry is required for 513. Graduate courses outside the department are 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 at least 6 hours of 500 Thesis. No more than 6 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 courses has been taken before the student may schedule the examination. Information concerning the examination is available in the departmental office.

Master's Minor in Computer Science

The graduate minor consists of 511 or its equivalent plus an additional 6 hours of computer science graduate level courses at or above the 400 level.

THE DOCTORAL PROGRAM

Admission Requirements

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.

Precandidacy Coursework

The departmental precandidacy course requirements include a set of 400-level core courses and a distribution among 500-level and 600-level courses as determined by the departmental graduate committee. Information about specific requirements is available from the department.

Admission to Candidacy

Admission to the Ph.D. program does not guarantee admission to candidacy for the degree. Official admission to candidacy is based on the following procedures:

1. The student completes the coursework requirements as defined above.

2. The student passes written comprehensive examinations. Information concerning these examinations is available in the departmental office. The Computer Science Graduate Committee administers these exams, which must be passed prior to admission to candidacy and at least two semesters in advance of conferral of the degree. Comprehensive examinations must be taken within five years, and all requirements must be completed within eight years from the time of a student's first enrollment in the doctoral degree program.

3. The student requests a member of the Computer Science Department's faculty to become the major professor, dissertation director, and chair of the student's committee. The committee must have at least four members, with at least three from the Computer Science Department and at least one holding an appointment in another department. At least three members, including the chair, must be approved by the Graduate Council to direct doctoral research.

4. The student's dissertation committee evaluates the student's background and performance and outlines a coherent program of study, which may include additional courses and outside readings in the technical literature. This program is subject to periodic revision within reasonable limits and will be reviewed by the committee no less frequently than once a year. Completion of the entire program is not required before admission to candidacy.

5. In a public meeting, the student presents to the committee a survey of current literature in the area of proposed Ph.D. research.

6. The student completes Graduate School requirements for formal admission to candidacy.

Postcandidacy Work

After consultation with the committee and initial investigation of a topic, the student submits a written proposal to the committee and makes an oral presentation of this proposal in a meeting which other faculty may attend. The written version must be typed, conform to high standards of scholarly writing, and contain an overview of previous research in the area of interest. Based on the written and oral presentations, the committee must accept, reject, or modify the topic to make it suitable for doctoral research.

Dissertation Proposal

After consultation with the committee and initial investigation of a topic, the student submits a written proposal to the committee and makes an oral presentation of this proposal in a meeting which other faculty may attend. The written version must be typed, conform to high standards of scholarly writing, and contain an overview of previous research in the area of interest. Based on the written and oral presentations, the committee must accept, reject, or modify the topic to make it suitable for doctoral research.

Dissertation and Residency Requirements

The student continuously registers in CS 600 (minimum of three hours each semester) from the time the topic proposal is approved, admission to candidacy occurs, or registration for course 600 is begun, whichever comes first. The semester in which the dissertation is accepted by The Graduate School and the summer semesters are included in this continuing registration. The minimum residency for a doctoral degree is one academic year or two consecutive semesters of full-time study (minimum of nine hours each semester) in the graduate program subsequent to admission to candidacy. Part-time enrollment does not count toward this requirement.

Dissertation Defense

The student presents and defends the dissertation in a public meeting. The committee determines pass or fail.

GRADUATE COURSES

401 Applications of Computer Graphics (3) Commercial software, techniques, hardware. Prereq. 100 or 101 or 102. Not for credit for computer science majors. 3 hr tab required.
402 Applications of Artificial Intelligence (3) Algorithms for solving problems that are not well suited for traditional computer systems. Prereq: 111 or 112. Not for credit for computer science majors. 3 hr lab required.

403 Applications of Microprocessors (3) Microprocessors, design and use of microcomputer systems. Prereq: 111 or 112. Not for credit for computer science majors. 3 hr lab required.

404 Applications of Database Systems (3) Commercial software, systems, techniques. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

421 Introduction to Artificial Intelligence (3) Basic techniques of heuristic search, gaming, and theorem proving. Prereq: 320. 3 hr lab required.

422 Expert Systems (3) Production rule model and its extension into many-valued and fuzzy logics. Deriving conclusions, examples of expert system tools and building expert systems. Other methodologies—frames, scripts, decision expressions. Prereq: 421. 3 hr lab required.

423 Natural Language Processing (3) Phase-structured and slot grammars, error-correcting interfaces and semantics. Applications in database and expert systems. Prereq: 381 and 421.

424 Robotics Software (3) Software for robotic control. Prereq: 331 and 424. 124. 3 hr lab required.

425 Functional Languages (3) Functional, applicative control. Prereq: 331 and Mathematics 142. 3 hr lab required.

432 Computer Graphics (3) Interactive computer graphical software, techniques, shading, vector generation. Graphics hardware, tablets and chips, with goal of understanding techniques for designing computer systems for graphics capability. Prereq: 331. 3 hr lab required.


434 Networks and Communications (3) ISO open systems interconnection (OSI) architecture. Study of several existing wide area networks, local area networks. Prereq: 331 and 360.

435 Microcomputer Systems (3) Disk operating systems, peripheral's, local area networks and communication protocols. Introduction to multiprocessor microcomputer systems. Prereq: 331 and 360. 3 hr lab required.

436 Computer Systems Hardware Design (3) Computer hardware architectures, techniques, I/O devices, interrupt support hardware, direct memory access logic, timing budgets, and system considerations. Lab construction, testing and debugging of either or both of: prototyped subsystem; system based on commercially available microcomputer component devices. Prereq: 435.

439 Microprogramming (3) Microprogramming concepts and techniques for control systems of large and small machines. Bit-slice architecture, sequencers. Prereq: 331. 3 hr lab required.

441 Science Information Systems (3) Design of scientific data banks, document repositories, information retrieval and electronic dissemination services. Control and dissemination of scientific information at national and international levels. Prereq: 549.

442 Introduction to Database Management Systems (3) File and entity organization, hierarchical, network, and relational models; relational calculus and algebra, data definition and manipulation languages; implementation and security considerations; performance, integrity, and reliability metrics; intelligent database systems. Prereq: 340 and 311.

443 Introduction to Information Storage and Retrieval (3) Internallorganizing storage and retrieval, statistical, syntactic, and logical analysis of information content, evaluation of retrieval effectiveness. Prereq: 340.


451 Pattern Recognition and Analysis (3) Elements of syntactic pattern recognition, learning algorithms, decision theory, classification rules. Prereq: 111, 112 and 311. 3 hr lab required.

452 Image Processing and Analysis (3) Methods for digitizing, storing, processing, and displaying images. Image enhancement, restoration. Prereq: 451. 3 hr lab required.

460 Human Factors in Software (3) Interface between people and machines and ease of use of software in intended environment. Prereq: 111 and 112.


462 Software Engineering (3) Exploration of software design and application process from initial requirement and specification statements to coding, testing, implementation, and maintenance. Prereq: 111 and 112.

463 Programming Languages (3) Study and comparison of programming languages and their environments. Human interfaces, formalisms, domain of applicability, object manipulation, syntax. Prereq: 111 and 112.


465 Parallel Computation I (3) Examination of non-numerical algorithms for parallel computation, operating systems, design and classification of parallel processors, compiler, concurrent computation. Prereq: 433.


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

472 Numerical Algebra (3) (Same as Mathematics 472.)


482 Graph Theory and Applications (3) Planarity, network flow, critical paths. Prereq: 111, 112 and 311.


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 (3-16) 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 repeat ed. S/NC only. E

511 Immigration to Computer Science (5) Advanced programming techniques in high-level language; control of input/output devices; file systems; machine organization and assembly language programming; data structures and analysis of algorithms. Computing laboratory. Prereq: Course in programming.
Asian Studies

GRADUATE COURSES

421 Readings in Islamic Literature (3) Prereq: Mastery of intermediate-level Arabic or consent of instructor. May be repeated. Maximum 9 hrs.

431 Readings in Chinese Literature (3) Prereq: Mastery of intermediate-level Chinese or consent of instructor. May be repeated. Maximum 9 hrs.

451 Readings in Japanese Literature (3) Prereq: Mastery of intermediate-level Japanese or consent of instructor. May be repeated. Maximum 9 hrs.

471 Selected Topics in Asian Studies (3) Content varies. May be repeated. Maximum 9 hrs.

Comparative Literature

GRADUATE COURSES

401-02 Special Topics in Comparative Literature (3,3) Content varies. May be repeated. Maximum 9 hrs.

Latin American Studies

GRADUATE COURSES

401 Cultural Plurality and Institutional Changes in Latin America (3) Value systems, behavioral patterns, political parties, role of military, church, educational institutions, dictatorship and nationalism.

402 Latin American Studies Seminar (3) Selected topics. May be repeated. Maximum 6 hrs.

Linguistics

GRADUATE COURSES

400 Topics in Linguistics (3) Content varies. May be repeated. Maximum 6 hrs.

411 Linguistic Anthropology (3) (Same as Anthropology 411.)

420 The Development of Historical Linguistics as a Science (3) Scientific understanding of language change. Emergence of Neogrammarian paradigm from 19th-century intellectual trends, impact of synchronic, descriptive, and transformational—generative linguistics on contemporary diachronic theory. Prereq: 6 hrs of courses required for linguistics concentration or consent of instructor.

425 Introduction to Descriptive Linguistics (3) (Same as French 425, German 425, Russian 425, and Spanish 425.)

426 Methods of Historical Linguistics (3) (Same as German 426, French 426, Russian 426, and Spanish 426.)

429 Romance Linguistics (3) (Same as French 429 and Spanish 429.)

430 The Development of Synchronic Linguistics as a Science (3) Development of first synchronic paradigm of linguistics. Impact of social sciences on American descriptivists. Prague School. Transformational—generative theory. Prereq: 8 hrs of courses required for linguistics concentration or consent of instructor.

435 Structure of the German Language (3) (Same as German 435.)

436 History of the German Language (3) (Same as German 436.)

471 Sociolinguistics (3) (Same as English 471 and Sociology 471.)

472 American English (3) (Same as English 472.)

474 Teaching English as a Second or Foreign Language (3) (Same as English 474.)

475 Teaching English as a Second or Foreign Language II (3) (Same as English 475.)

485 Special Topics in Language (3) (Same as English 485.)

559 Problems in Linguistics: Romance Languages (3) (Same as French 559 and Spanish 559.)

Urban Studies

GRADUATE COURSES

401 The City in the U.S. (3) (Same as Planning 401.)

441 Urban Geography (3) (Same as Geography 441.)

464 Urban Ecology (3) (Same as Sociology 464.)

Women's Studies

GRADUATE COURSES

400 Topics in Women's Studies (3) Content varies. May be repeated.

422 Women Writers in England (3) (Same as English 422.)

425 Women's Health (3) (Same as Health 425.)

434 Psychology of Gender (3) (Same as Psychology 434.)

466 Rhetoric of the Women's Rights Movement (3) (Same as Speech 466.)

483 Afro-American Women in American Society (3) (Same as Afro-American Studies 483.)

Curriculum and Instruction

(College of Education)

MAJOR DEGREES

Curriculum and Instruction M.S., Ed.S., Ed.D. Education Ph.D.

Theodore W. Hippie, Head

Professors:

Alexander, J. E., Ed.D. .................. Kentucky
Allison, C. B., Ph.D. .................... Oklahoma
Bellon, Jerry J., Ed.D. ................. California
Blank, Kermit J., Ph.D. ................. Ohio State
Christensen, Mark A., Ph.D. ......... Kansas
Davis, A. R., Ph.D. ...................... Ohio State
Dessart, Donald J., Ph.D. ............. Maryland
Doak, E., Dale, Ed.D. .................. Colorado
Frandsen, Henry, Ph.D. ............... Illinois
French, R. L., Ph.D. .................... Ohio State
Hippie, Theodore W., Ph.D. ........... Illinois
Howard, R., Ph.D. ...................... Ohio State
Huff, P., Ph.D. .......................... Ohio State
Jost, Karl J., Ed.D. ..................... Oklahoma
Knight, Lester N., Ph.D. ............... Texas
Kolker, B. M., Ed.D. ................. ..... Indiana
Malik, Anand, Ed.D. .................. ... California
Mays, N., Ph.D. ........................ Southern Illinois
McIntyre, Lonnie D., Ed.D. ........... Indiana
Myer, M. E., Ph.D. ..................... Florida
Ray, John R., Ed.D. .................... Tennessee
Roeske, C. E., Ph.D. .................. Ohio State
Rowell, C. Glennon, Ed.D. ........... George Peabody
Sawson, W. S., Ed.D. ................. Virginia
Terwilliger, Paul N., Ed.D. .......... Penn State
421 Elementary and Middle School Science and Social Studies Instruction (3) Methods and materials for teaching science and social studies. Development of functional relationships and entities of two fields. Not open to students with recent course or background in teaching science and/or social studies. Prereq: Admis-
sion to teacher education. F,Sp

429 Language Arts/Reading Instruction in Elementary and Middle Schools (3) Language and language develop-
ment as applied to reading (listening and speaking) and aspects of literacy (reading process/ readyness and writing). Not open to students with recent course in reading methods. Prereq: Admis-
sion to teacher education. F,Sp

430 Elementary and Middle School Developmental Reading Instruction (3) Word recognition (including phonics), comprehension, evaluation, and materials. Not open to students with recent course in reading methods. Prereq: Admission to teacher education. F,Sp

434 Topics in Reading Education (1-6) Prereq: Admis-
sion to teacher education and course in reading education. May be repeated. Maximum 6 hrs. E

443 Elementary and Middle School Mathematics Instruction (3) Procedures for helping children learn mathematics. Unit planning, daily planning, grouping, general factors related to classroom management. Not open to students with recent course in teaching of elementary school mathematics. Cannot apply toward M.S. degree. Prereq: Admission to teacher education. F,Sp


451 Education in Cultural Perspective (3) Contribution of anthropological concepts (primarily concepts of culture) to understanding of education processes, problems, and thought in our society and others.

460 Teaching Reading and Literature in the Secondary School (3) Approaches for teaching basic reading skills and ways of teaching literature. Sp

461 Developing Reading Skills in Content Fields (3) Techniques for teaching reading and study skills in content areas of school program. Extensive assess-
ment of textbooks. Middle school and high school. E

475 Utilization of Instructional Media (3) Basic concepts of communication and instructional development for improving instruction through use of media. (Same as Library and Information Science 475) E

486 Introduction to Instructional Computing (3) Class-
room use of computers, applications for teachers, overview of software and hardware for teach-
ers of all grades. F,Sp

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,Sp

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

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 faculty time before degree is completed. May not be used toward degree requirements. May be repeat-
ed. S/NC only. E


504 Studies and Theory in Language Development (3) Studies and theory of language development in children. Prereq: 1 elementary school language arts course or consent of instructor. F

507 Teaching Poetry Grades 7-12 (3) Research and theory in application to teaching of poetry. Design of strategies and materials for teaching and writing and reading of poetry. Review of texts and materials. F

506 Teaching Composition in the Secondary School (3) Teaching narration, description, exposition, and argumentation; writing process and marking of student papers. Sp

509 Teaching Fiction in the Secondary School (3) Teaching of novels and short stories. F

511 History of American Education (3) Changing goals and processes in education. Historical interpre-
tations of role of school and its relationship to American society—colonial to present. E

515 Seminar (1-3) Curriculum, instructional technolo-
y, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC only. E

516 Seminar (1-3) Curriculum, instructional technolo-
y, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC only. E

517 Seminar (1-3) Curriculum, instructional technolo-
y, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC or letter grade. E

518 Educational Specialist Research and Thesis (2) May be repeated. Maximum 4 hrs. P/NP only. E

519 Educational Specialist Research and Thesis (2) P/NP only. E

520 Techniques of Research in Education (3) Study and application.

521 Teaching Social Studies in Elementary and Middle Schools (3) Planning and techniques. Trends in cur-
riculum, development of concepts and generalizations, integration of social sciences. Prereq: Course in teach-
ing of social studies or consent of instructor. Sp

522 Teaching Mathematics in Elementary and Middle Schools (3) Instructional strategies for helping ele-
mentary school children learn mathematics. Examination, development and use of materials for creating active learning environment. Prereq: 443 or equivalent or consent of instructor. F,Su

523 Diagnosis and Correction of Children's Difficulties in Learning Mathematics (3) Children's difficulties in learning mathematics and procedures for helping classroom teacher correct difficulties. Prereq: 522 or equivalent or consent of instructor. Sp


525 Strategies, Programs and Materials for Teach-
ing Elementary Social Studies (3) Analysis of new and innovative social studies program materials and techniques, exploration of related social studies education. Prereq: Previous course in teach-
ing of social studies or consent of instructor. Sp

526 Philosophy of Education (3) Truth, knowledge, and valuation in relation to work of schools. F,Su

527 Elementary School Curriculum (3) Examination, evaluation and application of curriculum design in elementary school. Trends and issues which affect elementary education. Prereq: Consent of instructor. F,Su

528 Teaching Language Arts Elementary and Middle School (3) Recent trends and current materials and methods in teaching elementary language arts (except reading). Prereq: Course in language arts or consent of instructor. Sp,Su

529 Practicum in Diagnosis and Remediation of Difficulties in Learning Mathematics (2) Assessment and practicum experience with children having difficulties in elementary school mathematics. Prereq: 523 or consent of instructor. May be repeated. Maxi-
mum 4 hrs. Su

530 Teaching Reading in Elementary and Middle Schools (3) Trends in methods, materials, basic approaches, skill development and assisted study pro-
cedures for teaching reading at elementary school
level. Prereq: Course in teaching of reading or consent of instructor. F, Su

531 Teaching Science in Elementary and Middle Schools (3) Recent trends in methods, materials and content in teaching elementary school science. Prereq: Course in teaching elementary school science or consent of instructor. F, Su

532 Instructional Research: Analysis and Application (3) Analysis of research on instruction. Translation and application of research findings into instructional performance. Prereq: Consent of instructor. F, Su

533 Reading in Middle and Secondary Schools: Research and Theory (3) Analysis and critique of effective middle and secondary school reading programs. Attention to research and theoretical bases. Prereq: Course in reading education or consent of instructor. Su

534 Seminar in Reading Education (1-4) May be repeated. Maximum 8 hrs. E

535 Curriculum Evaluation and Program Improvement (3) Historical background and importance of educational evaluation in relation to curriculum development. Understanding systematic curriculum evaluation approach and applying it to improve program development and implementation. Prereq: Consent of instructor. E

536 Psychology of Reading (3) Reading act, relationship between learning theory and reading, role or reading in child's overall development. Affective and cultural factors. Prereq: 500-level course in reading education or consent of instructor. F

537 Diagnosis and Correction of Classroom Reading Problems (3) Procedures, methodologies and materials for diagnosing and correcting classroom reading problems. Prereq: Course in reading education, or equivalent teaching experience, or consent of instructor. Sp, Su

538 Practicum in Diagnosis of Reading Problems (2) Theoretical and practical applications of specific reading diagnostic instruments; testing of elementary and/or secondary school students, preparing case study reports, and conducting parent conferences. Prereq: Course in diagnosis and correction of classroom reading problems or consent of instructor. May be repeated. Maximum 4 hrs. Sp

539 Practicum in Remediation of Reading Problems (2) Application of learning and teaching methodology in working with elementary and/or secondary school students on one-to-one or small group basis. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 4 hrs. Sp

540 Topics in Improvement of Instruction (1-3) Specialized topics in teaching methods, reading, classroom management. May be repeated. Maximum 8 hrs. S/NC only. E

541 The High School Curriculum (3) Identification of problems associated with curriculum study, Tennessee and state assessment of programs, and programs of local, regional, and national significance. E

542 Development of Educational Thought (3) Historical and philosophic approach to lives and writing of influential educators: Plato, Quintillian, Comenius, Rousseau, Pestalozzi, Froebel, Dewey. Prereq: Graduate status and consent of instructor. Sp, Su

543 Foundations of Educational Policy (3) Relationship of philosophical, political, and practical educational policies that arise from philosophical and practical considerations relative to human nature, to education, and the composition of curriculum and to methods and techniques for conducting educational enterprise. F, Su

544 Survey in Contemporary Philosophies of Education (3) Existentialism, phenomenology, philosophical analysis of the modernist, structuralism, hermeneutics and other philosophies. E

545 Educational Sociology (3) Sociological analysis of American education system. Controversial social 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. E

547 Topics in Philosophy of Education (3) May be repeated. F, Su

548 Topics in International Education (3) Historical, philosophical, and sociological foundations; selected nations and their cultures. May be repeated. E

550 Assessment and Correction of Language Arts Difficulties (3) Procedures and materials for diagnosing and correcting language arts difficulties; analysis of children's work. Prereq: At least one language arts course or consent of instructor. Su

552 Developmental Reading Practicum (2) Diagnosis and teaching children having developmental and corrective reading needs. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 4 hrs. Su

557 The Junior High and Middle School Curriculum (3) Curriculum and instructional design for junior high and middle school. Characteristics of students, curriculum designs, instructional patterns, and organization and structure of junior high and middle schools. Sp, Su

558 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 application for improved learning. 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. F, Su

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

564 Curriculum for Early Childhood Education (K-3) (3) Theoretical foundations and current research in content and skill areas of curriculum for kindergarten-grade 3; application to local school setting. Prereq: Consent of Instructor. May be repeated. Maximum 9 hrs. Sp, Su

565 Programs, Materials and Strategies in Teaching Elementary Science (3) Analysis of new and innovative science program materials. Instructional strategies and current curriculum issues inherent in use of materials. Prereq: Graduate course in elementary science, at least one year teaching experience, or consent of instructor. Sp

566 Administering Instructional Media Programs (3) Leadership roles and responsibilities of professional media administrator in variety of organizational settings. F

567 Application of Theory in Early Childhood Education (K-3) (2) Principles and practices from selected theoretical orientations. Prereq: Course in early childhood education or consent of instructor. May be repeated. Maximum 6 hrs. 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

569 Advanced Production of Audiovisual Software (3) Hand and mechanical lettering, flat picture mounting laminating, projection, audio production, TV studio orientation, sync-taping, multi-screen presentations, and printing techniques. (Same as Library and Information Science 569) Sp, Su

573 Utilization of Educational Television and Radio (3) Television and radio as instructional tools and media. Selecting, making and evaluating instructional and audio visual tapes. F

577 Introduction to Data Processing in Curriculum and Instruction (3) Analysis of current activities in educational computing and data processing. Curricular, instructional, research, and classroom management applications from microcomputers to super computers. Prereq: Consent of instructor. F, Su

578 Teaching English as a Second Language (3) Theoretical and practical applications of learned procedures to diagnose English linguistic proficiency; materials for non-native speaker in K-12 classroom. Prereq: For Tennessee ESL (K-12) certification. Prereq: Consent of instructor. F

579 Career Development: Workshop (1-6) E

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 development of skills needed for proposal development. E

581 Seminar in Mathematics Education (3) Current issues influencing instruction in mathematics, elementary, through college. Related teaching methodology. Opportunities for work on special problems. Prereq: Undergraduate course in teaching of mathematics. Su

582 Teaching Enrichment Mathematics in Middle and Junior High Schools (3) Topics to enrich middle and/or junior high mathematics, Geometrical, laboratory, and problem solving activities. Special attention to metric system. Opportunities for individual projects. Prereq: 581. Su

583 Teaching Mathematics in Senior High Schools and Community Colleges (3) Topics appropriate for high school and college level junior mathematics curriculum special problems related to enrichment, problem solving, and use of microcomputers. Opportunities for special projects. Prereq: 581. F, Sp


585 Teaching Secondary School Social Studies (3) Strategies, projects, materials, and programs in social studies. Prereq: Undergraduate course in teaching of social studies. F, Su

586 Teaching Probability & Statistics (3) Teaching of probability and statistics in schools, elementary through college. Probabilities and statistical experiments, demonstrations, and applications. Prereq: 581. F


588 Instructional Theory and Design (3) Relationship of curriculum to instruction. Utilization of selected theoretical and related learning theories; instructional models and teaching styles. E

589 Field Experience (1-3) Application of curricular and instructional principles, methods, and materials in schools. Prereq: One year teaching experience or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

590 Seminar in Teaching English in Secondary Schools (3) Content varies. Theoretical and practical approaches to teaching English in secondary school. May be repeated. Su

592 Linguistics and the Teaching of English (3) Grammar, usage, semantics, dialectology, history of language, and applied linguistics. F

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

594 Supervised Readings (1-3) May be repeated. S/NC or letter grade. E

598 Special Topics (1-3) May be repeated. S/NC or letter grade. E

599 Teaching of Natural Science and Environmental Education (3) Strategies, laboratory techniques, assessment of current programs and professional guidelines for middle, junior and senior high schools, and community colleges. Prereq: Consent of instructor. F
597 Teaching Drama Grades 7-13 (3) Strategies and materials for teaching creative drama, acting and writing of plays, reading of scripts. S
598 Developing Speaking and Listening Skills, Grades 7-12 (3) Teaching approaches to nonverbal communication, interpersonal and group communication, public address and listening. Review of tests and materials. S
599 Seminar in Social Studies Education (3) Research, trends, and issues in secondary social studies. Su
600 Doctoral Research and Dissertation (3-15) P/NP only. E
601 Studies in English Education (3) Issues and research in teaching of English. Su
602 Seminar in Reading Education (1-6) May be repeated. Maximum 6 hrs. E
603 Advanced Studies and Theoretical Models of Reading (3) Research on reading processes. Current theoretical models related to how learners process print. Prereq: 500-level courses in reading education or consent of instructor. S
604 Seminar in Curriculum and Instruction (1) Required 2 consecutive semesters. S/NC only. E
605 Organizing and Administering Reading Programs (3) Analyzing and synthesizing instructional, learning, and materials components into classroom, school and system programs. Prereq: 2 500-level courses in reading education or consent of instructor. S
606 Research in Elementary Education (3) Analysis of research in elementary education with application to classroom teaching. Prereq: research course. Su
608 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. E
621 Seminar in Social Studies Research and Theory (2) Status of research and theory. Needed research, related research from other fields, and application of research. Prereq: Recent course in teaching of social studies or consent of instructor. May be repeated. Maximum 6 hrs. E
623 Programs for Curriculum Improvement (3) Research methodology; application to descriptive/ethnographic curricular materials. Critical reading of research, methodological development in descriptive and ethnographic areas. S
625 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. S
628 Advanced Studies in Elementary School Science (3) Current research in elementary school science as applied to classroom practice. Prereq: Graduate course in science education or equivalent or consent of instructor. May be repeated. Maximum 4 hrs. E
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
640 The Dynamics of Educational Change (3) Interdisciplinary approach to change process in education. Prereq: Consent of instructor. S
648 Topics in Sociology of Education (3) May be repeated. Sp
650 Advanced Studies in Early Childhood Education (3) Prereq: 2 graduate courses in early childhood education and consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E
651 Advanced Studies in Elementary School Language Arts (3) Selected issues in elementary school language arts. Prereq: Graduate course in elementary school language arts or consent of instructor. S
652 Advanced Studies in Educational Anthropology and/or Sociology (3) Ethnographic methods applied to formal and non-formal educational settings. Analysis of selected research field. Prereq: 451, 2 courses in cultural anthropology, or consent of instructor. Sp
669 Instructional Media Research (3) Identification, location, and collection of developmental and experimental research on instructional media. Application of research. Sp
671 Advanced Educational Statistics I (3) Parametric and non-parametric statistical inference to educational problems. Use of computer programs in educational research. Prereq: 661. Sp, Su
672 Interpretation and Application Curriculum and Instruction Research (3) Analysis of research in curriculum and instruction, new 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. S
675 Curriculum Evaluation: Theory and Application (3) Evaluation trends and issues. Theoretical frameworks to design evaluation studies for various educational programs. Sp
676 Curriculum Theory I (3) Influential curriculum theories and approaches, implications for structure and design of educational programs. Nature and function of theory, theory building activities. Prereq: Consent of instructor. E
683 Advanced Studies in Elementary School Mathematics (2) Research in elementary school mathematics. Prereq: Graduate course in mathematics education or consent of instructor. Sp
685 Educational Leadership: Theory and Practice (3) Theories of leadership applied to various educational settings. Prereq: Consent of instructor. F, Su
686 Internship (1-3) Experiences in application of principles and practices of curriculum development and instructional improvement. Prereq: Program prerequisites and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E
693 Independent Study (1-3) May be repeated. S/NC or letter grade. E
694 Supervised Readings (1-3) May be repeated. S/NC or letter grade. E
695 Special Topics (1-3) May be repeated. S/NC or letter grade. E
696 Advanced Studies in Secondary Science and Environmental Education (3) Trends in science and environmental programs, materials methods and research for middle, junior and senior high schools, and community colleges. Prereq: 589 or equivalent and consent of instructor. Sp

Ecology (College of Liberal Arts)

MAJOR DEGREES

Ecology ........................................ M.S., Ph.D.

Dewey L. Bunting, Director
B. L. Dearden, Associate Director
Paul A. Delcourt, Associate Director

Shared Faculty:

Amundsen, C. C., Ph.D., Botany
Auerbach, S. I., Ph.D., ORNL
Bartell, Steve, Ph.D., ORNL
Blaylock, B. G., Ph.D., ORNL
Buckner, E. R., Ph.D., Forestry
Bunting, Dewey L., Ph.D., Zoology
Burghardt, G. M., Ph.D., Psychology
Carter, Janusia R., Ph.D., Geography
Clebsch, E. E., Ph.D., Botany
Coutant, C. C., Ph.D., ORNL
DeAngelis, D. L., Ph.D., ORNL
Deardens, B. L., Ph.D., Forestry
Delcourt, Paul A., Ph.D., Geology
DeSelm, H. R., Ph.D., Botany
Dinnick, Ralph W., Ph.D., Fisheries and Wildlife
Drake, James A., Ph.D., Zoology
Echternacht, Arthur C., Ph.D., Zoology
Elwood, J. W., Ph.D., ORNL
Etner, D. A., Ph.D., Zoology
Evans, A. M., Ph.D., Botany
Farkas, Walter, Ph.D., Environmental Practice
Fribourg, Henry A., Ph.D., Plant & Soil Science
Gardner, R. H., Ph.D., ORNL
Gehr, C. W., Ph.D., ORNL
Gist, C. S., Ph.D., ORAU
Gittlerman, John L., Ph.D., Zoology
Greenburg, Neil, Ph.D., Zoology
Gross, L. J., Ph.D., Mathematics
Hallam, Thomas G., Ph.D., Mathematics
Hammitt, W. E., Ph.D., Forestry and Wildlife
Hansen, J. H., Ph.D., UTDSI
Hartin, Carol P., Ph.D., Geography
Hay, R. L., Ph.D., Forestry
Herbes, S. E., Ph.D., ORNL
Hildebrand, S. G., Ph.D., ORNL
Hilty, J. W., Ph.D., Entomology & Plant Pathology
Horn, Sally P., Ph.D., Geography
Houston, M., Ph.D., ORNL
Kelly, J. M., Ph.D., TVA
Kimmel, B. L., Ph.D., ORNL
Kissho, Y., Ph.D., ORNL
Laun, S. L., Ph.D., Zoology
Lewis, B. W., Ph.D., Zoology
McCracken, G. F., Ph.D., Zoology
McKinney, M. L., Ph.D., Geology
McLaughlin, S. B., Ph.D., ORNL
Olson, J. S., Ph.D., ORNL
O'Neil, R. V., Ph.D., ORNL
Pagliardini, M. R., Ph.D., Chemistry
Parramley, Paul W., Ph.D., Anthropology
Pelton, Michael R., Ph.D., Fisheries & Wildlife
Pimm, S. L., Ph.D., Zoology
Pless, C. D., Ph.D., Entomology & Plant Pathology
Post, W., Ph.D., ORNL
Reed, R. M., Ph.D., ORNL
Rehder, J. B., Ph.D., Geography
Reichle, D. E., Ph.D., ORNL
Rennie, J. C., Ph.D., Forestry
Reynolds, John H., Ph.D., Plant & Soil Science
Riechert, Susan E., Ph.D., Zoology
Sayer, Gary S., Ph.D., Microbiology
Schlender, Gary, Ph.D., Forestry
Schneider, Gary, Ph.D., Forestry
Shepard, H. H., Ph.D., UV
Smith, W. O., Ph.D., Botany
Stacey, G. E., Ph.D., Microbiology
Stewart, A., Ph.D., ORNL
Strange, R. J., Ph.D., Botany
Van Hooke, R. R., Ph.D., ORNL
VanWinkle, W., Ph.D., ORNL
Vaught, G., Ph.D., Zoology
Walton, B. G., Ph.D., ORNL
Wehry, E. L., Ph.D., Chemistry
West, D. C., Ph.D., ORNL
White, David C., Ph.D., Microbiology
White, P. S., Ph.D., UNC
Wiener, J. L., Forestry & Wildlife
Witherspoon, J. P., Ph.D., ORNL
Woods, F. W., Ph.D., Forestry
The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. The interdepartmental program provides advanced courses in contemporary ecology for students from undergraduate programs in basic and applied biology, social sciences, mathematics, and engineering. Research opportunities in both fundamental and applied ecology are intended to prepare students for academic careers as well as professional positions in industry or government. The Environmental Sciences Division of the Oak Ridge National Laboratory, the national Park Service, and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

**ADMISSION REQUIREMENTS**

Requirements for admission to this program are:
1. Admission to The Graduate School; (2) chemistry including organic, mathematics including calculus, and 3 semester hours of ecology at the upper division level (physics highly recommended); (3) departmental application and 3 rating forms; (4) the Graduate Record Examination.

Application forms for admission should be obtained from The Graduate School. Inquiries concerning the admission requirements should be addressed to the Director of the Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37996-1101.

**THE MASTER’S PROGRAM**

Within the minimum requirements of The Graduate School, the program of study must include Ecology 573 and 574 or an approved equivalent and one course from an approved list of quantitative methods offerings. The list is available from the ecology office and is updated annually by the Ecology Curriculum Committee. The remainder of a student’s coursework is planned in consultation with the graduate committee. A listing of approved campus-wide ecology offerings is provided to each student during orientation. A graduate minor in ecology is available on an individual basis.

**THE DOCTORAL PROGRAM**

The requirements for this degree are in general the same as those of The Graduate School. The doctoral program must include Ecology 573 and 574 or an approved equivalent and one course from an approved list of quantitative methods offerings. A student cannot enroll for dissertation hours until the research proposal has been discussed and approved by the doctoral committee. A foreign language is required.

**ADVISORS**

Advisors are selected from ecologists on the shared faculty of the University who have competence in the area in which the student expects to work. Entering students should consult early with the director of the program on the choice of a faculty committee. The Master’s committee need not have more than three members. Doctoral committees consist of the major professor as chairperson, one additional member who should have an appointment in the same department, and at least two additional faculty from other departments.

**ACADEMIC COMMON MARKET**

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

**GRADUATE COURSES**

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 Special Problems in Ecology (1-3) Individual investigations in ecology. May be repeated with consent of instructor. Maximum 6 hrs.

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.

530 Implementation of Environmental Policy (3) Goals and problems of environmental legislation, National Environmental Policy Act; purpose, preparation, and evaluation of environmental impact statements and similar multidisciplinary studies. Prereq: 520 or 573 or coursework or experience in environmental law.

537 Natural Resource Management and Environmental Assessment in Developing Nations (3) Assessment of environmental and resource development issues. Scientific basis for integrated resource management and environmental assessment in developing nations. Prereq: General ecology equivalent. (Same as Planning 553 and Botany 557.)

552 Development Planning in the Third World (3) (Same as Planning 552.)

555 Environmental Planning (3) (Same as Planning 555.)

561 Environmental Toxicology (3) (Same as Biochemistry 561.)

562 Techniques in Environmental Toxicology (3) (Same as Biochemistry 562.)

573 Population Biology (3) (Same as Zoology 573 and Botany 573.)

574 Communities and Ecosystems (3) Patterns underlying principles between short and long term community and ecosystem organization, dynamics, energetics and nutrient cycling.

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

604 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 604.)

610 Special Topics in Ecology (3) Seminars on advanced topics and recent developments. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

620 Seminar in Ecology (2) May be repeated. Maximum 12 hrs.

637 Applied Ecology (3) Review of contemporary and historical issues. Analysis of scientific basis of environmental assessment and natural resource management. Analysis of careers and career planning in applied ecology. Prereq: 573-74 or equivalent or consent of instructor. (Same as Botany 637.)

**Economics**

(Office of Business Administration)

**MAJORS**

**DEGREES**

Economics M.A., Ph.D.

Business Administration MBA

Anne Mayhew, Head

Professors:

Bohn, Robert A., Ph.D. Washington (St. Louis)

Bowby, Roger L., Ph.D. Texas

Carroll, Sidney L., Ph.D. Harvard

Chang, Hui S., Ph.D. Vanderbilt, Cole, William E., Ph.D. Texas

Davidson, Paul (Chair of Excellence)

Feiwell, George R. (Distinguished Prof.), Ph.D.

Fox, William F., Ph.D. Ohio State

Garrison, Charles B., Ph.D. Kentucky

Herzog, Henry W., Ph.D. Maryland

Jensen, Hans E., Ph.D. Texas

Jee, Fung-Yao, Ph.D. Michigan State

Mayhew, Anne, Ph.D. Texas

Moore, John R., Ph.D. Cornell

Neale, Walter C., Ph.D. London

Quindry, K. E. (Emeritus), Ph.D. Kentucky

Schottmann, Alan M., Ph.D. Washington (St. Louis)

Spiva, George A., Ph.D. Texas

Associate Professors:

Clark, Don P., Ph.D. Michigan State

Gustoff, Errol, Ph.D. Stanford

Mayo, John W., Ph.D. Washington (St. Louis)

Phillips, Keith E., Ph.D. Washington

Assistant Professors:

Gauger, Jean A., Ph.D. Iowa State

Kunkin, Matthew, M.A. Wisconsin

Mandy, David M., Ph.D. Illinois

Murray, M. N., Ph.D. Syracuse

The Department of Economics offers graduate programs leading to the M.A. and Ph.D. The M.A. may be completed by either a thesis or non-thesis option, while the Ph.D. requires successful completion of a dissertation. Applicants to these programs should contact the Director of Graduate Studies, Department of Economics, for further information. The Department also offers an area of concentration for the MBA degree. Students interested in the MBA program should contact the Associate Dean for Graduate Programs, College of Business Administration.

**ACADEMIC STANDARDS**

A graduate student in the College of Business Administration whose grade-point average falls below 3.0 may be placed on probation. A student on probation will be dropped from the program unless his/her cumulative 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 established by the degree program for full-time students and the next two semester's coursework as established by the degree program for part-time students.

**THE MASTER'S PROGRAM**

Admission to the M.A. program is based on undergraduate academic performance and on scores from the GRE or on scores from the GMAT. The student may choose either the thesis or non-thesis option. The non-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 (no more than 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 the GRE or on scores from the GMAT. Requirements for successful completion of the program consist of the four components listed below.

1. Students are required to complete the following core requirements:
   a. Economic Theory: Microeconomic theory by comprehensive examination or by completion of 511, 512 with a B+ average or higher, and macroeconomic theory by comprehensive examination or by completion of 513, 514 with a B+ average or higher.
   c. Mathematical and Quantitative Economics: 581, 582. The 582 requirement may be waived for students completing 681, 682.

2. Students must achieve a grade average of B or higher over the courses offered to fulfill requirements in subparagraphs b and c, or, as an alternative, may petition to satisfy these requirements in two core areas with some other means such as a comprehensive written examination.

3. Students are required to complete with a grade of C or better two elective economics courses at the 500 level or above, outside the core subject areas and outside the two fields of specialization.

4. Students are required to complete a dissertation, including an oral defense, to give at least 24 hours of graduate credit (600).

**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.

**GRADUATE COURSES**

400 Special Topics (3) Topics vary. Prereq: Determined by department.

415 History of Economics (3) Methods of study of economic historians. Origins and evolution of major economic doctrines, economic theories of Keynes and his followers, principal developments of second half of 20th century. Major writing requirement. Prereq: 201 or equivalent and consent of instructor.

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.


442 Analytical Labor Economics (3) Problems connected with labor market, intensive treatment of small number of topics. Health economics, economics of education, economics of discrimination, natural rate of unemployment, wage-price guidelines, or job search models. Major writing requirement. Prereq: 341.

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. 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. Prereq: 201.

482 Introduction to Mathematical Economics (3) Application of algebra, matrix algebra, differential and integral calculus to micro and macroeconomics. Prereq: 201 and Mathematics 121-22 or 141-42.

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

501 Managerial Economics (3) Application of economic concepts to business decision making. Analysis and forecasting of demand, cost analysis, pricing behavior, and application of optimizing techniques.

502 Registration for Use of Facilities (3-15) Required, or faculty time before degree is completed. May not be used toward degree requirements. May be repeated.

503 Business Conditions Analysis (3) Macroeconomic environment of firm. Determination of level of output, employment and prices for economy as whole. Implications of aggregate fluctuations for individual firms. Role of forecasting techniques and stabilization policies.

510 Fundamentals of Microeconomics (3) Theory of consumer behavior and demand analysis, theory of supply and cost, behavior of the firm in perfectly competitive and monopolistic environments. For non-economics majors. Not available to students with credit for 511. Prereq: 311 or equivalent.

511-12 Microeconomic Theory (3,3) Theory of consumer choice and demand, theory of production and cost, market structures, derived demand and factor pricing, introduction to microeconomic models, market failure and theory of second best, pure exchange.

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.

562 Labor Relations and Collective Bargaining (3) (Same as Management 522.)


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

612 Advanced Microeconomic Theory (3) Prereq: 512 or equivalent.

613 Advanced Macroeconomic Theory (3) Prereq: 514 or equivalent.


621-22 International Economics (3,3) Comparative advantage, trade migration, commodity composition of trade, protectionist devices, protectionist arguments, trade liberalization, exchange rate determination, balance of payments adjustment, multinational corporations, and international capital flows. Prereq: 512 and 513.

623 Economic Development: Theories and Policies (3) Principal theories explaining economic behavior in developing countries and policies and strategies used to promote development. Prereq: Undergraduate degree in economics or consent of instructor.

624 Economic Development: Western Impact on Asia and Africa (3) Studies of consequences of contact between developed world and developing countries of Asia and Africa. Prereq: Undergraduate degree in economics; or graduate degree in social science or consent of instructor.
631-32 Industrial Organization and Public Policy (3,3)

634 Comparative Economic Systems (3) Study and appraisal of alternative economic systems in comparative perspective.

641 Labor Economics (3) Theory of labor markets and wage determination under competitive conditions. Labor markets under conditions which interfere with competition, unions and discrimination. Human capital and estimation of returns to schooling. Topics vary. Prereq: 311 and 313, or equivalent.

642 Labor History and Legislation (3) Development of organized labor as important economic and political force in U.S., from Colonial times to present. Evolution of legal status of labor unions and of individual workers vis-a-vis their employers.

651 Monetary Theory (3) Study of money, credit, and liquidity as related to real output determination. Interest rates, employment, and prices. Prereq: 513.

652 Topics in Monetary Theory (3) Advanced monetary models, issues in monetary policy, open economy monetary theory and policy. Student participation. Prereq: 615.

661 Regional and Urban Location and Development Theory (3) Theory of industrial and agricultural location and human migration. Economic basis for land-use patterns, central places, and urban form. Spatial inequalities and urban problems. National policies for regional and urban assistance.

662 Methods of Regional and Urban Analysis (3) Theoretical regional and urban economic structure and growth. Regional income and product accounts, shift and share analysis, economic base studies, and regional/urban input-output models. Theory and problem solution.

663 Environmental and Resource Economics (3) Topics in environmental quality, natural resource allocation by private markets, and issues in formulating public policy toward environmental problems.


672 Public Finance: Taxation and Intergovernmental Relations (3) Theory of taxation; tax incidence and tax efficiency; policy analysis of U.S. tax structure at federal, state, and local levels. Theory of fiscal federalism and intergovernmental relations.

681-82 Econometric Methods (3,3) Theory and techniques of statistical testing of econometric hypotheses and construction and estimation of econometric models. Review of classical least squares regression model, and approaches to simultaneous equation models with application to current econometric research. Prereq: 582 or equivalent.

690 Workshop (3) Advanced topics in economics. Student participation. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Education

(College of Education)

MAJOR DEGREE
Education ........................................ Ph.D.

THE DOCTORAL PROGRAM

The Ph.D. program with a major in Education provides six concentrations. The departments participating in the Ph.D. program are Curriculum and Instruction; Educational Leadership; Educational and Counseling Psychology; Health, Leisure, and Safety; Physical Education and Dance; Special Services Education; and Technological and Adult Education.

The program requirements, concentrations and specializations are:

Requirements

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<tr>
<th>Research Area</th>
<th>Minimum Hours</th>
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<tr>
<td>Area</td>
<td>Minimum Hours</td>
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<tr>
<td>Foreign or Computer Language (demonstrate proficiency)</td>
<td>6</td>
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<tr>
<td>General Core Requirements</td>
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<tr>
<td>Courses in history of education, philosophy of education (two areas must be represented)</td>
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<tr>
<td>Alternative Core Requirements</td>
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<tr>
<td>Courses in philosophy of science</td>
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<td>Trans-college Seminar—three consecutive semesters (including summer)</td>
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<td>Seminar in area of specialization</td>
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<tr>
<td>Courses in learning theory/group or independent study</td>
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<td>Concentrations</td>
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<tr>
<td>Primary Concentration—A minimum of 16 hours normally selected from one or two specializations within the primary concentration</td>
<td>16</td>
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<tr>
<td>Supporting Specialization—A minimum of 9 hours selected from a specialization in a concentration other than the primary concentration</td>
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<tr>
<td>Cognate—A minimum of 6 hours selected from outside the college in addition to the designated research courses</td>
<td>9</td>
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<tr>
<td>Dissertation</td>
<td>24</td>
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CONCENTRATIONS

Administrative Theory and Practice

Specializations:
1. School administration
2. Higher education administration
3. Organizational leadership and policy studies

Theories of Curriculum Development and Foundations of Education

Specializations:
1. Anthropological, historical, philosophical, and sociological bases for educational planning and curriculum
2. Principles and models for planning, developing, and evaluating educational programs
3. Research design for educational programs

Instructional Theory and Practice

Specializations:
1. Principles and models for instructional improvement
2. Elementary and early childhood instruction and practices
3. Secondary/community colleges: (English, foreign language, mathematics, science, social studies education)
4. Elementary: mathematics, science, social studies education
5. Reading education
6. Instructional media and technology
7. Technological and adult education
8. Special education and rehabilitation

Theories and Practice of Educational and Personal Adjustment

Specializations:
1. Counselor education
2. Counseling psychology
3. Educational psychology
4. School psychology

Foundations of Human Movement

Specializations:
1. Adapted physical education
2. Philosophical foundations of sport
3. Sociological foundations of sport
4. Physical activity and positive health
5. Metabolic and cardiovascular adaptations to acute and chronic exercise
6. Motor behavior: motor control motor learning psychology of sport

Health Education

Specializations:
1. Public health
2. Safety

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The Ph.D. program in Education is available to residents of the states of Georgia, South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

See College of Education for additional departmental listings.

GRADUATE COURSES

601 Trans-College Seminar (1) Introduction to Ph.D. program in Education; research requirements, meaning of scholarship in academe and issues/problems in education. Minimum of two consecutive semesters preceded or followed by summer term required of all Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. Maximum 3 hrs. May not be used to meet 600 requirement. S/N only.

Educational and Counseling Psychology

(College of Education)

MAJORS

DEGREES

Guidance ........................................ M.S.
Educational Psychology ........................ M.S., Ed.D.
Educational Psychology and Guidance . Ed.S.
Education ........................................ Ph.D.

Siegfried C. Dietz, Acting Head

Professors:

Davis, K. L., Ed.D. ........................................ Georgia
DeRidder, Lawrence M. (Emeritus), Ph.D. ........................................ Michigan
Dickinson, Donald J., Ed.D. .. Oklahoma State
Dietz, Siegfried C., Ed.D. . Arizona State
Hector, M. A., Ph.D. ........................................ Michigan State
Huck, Schuyler W., Ph.D. ........................................ Northwestern
George, Thomas, Ed. D. Tennessee  
Associate Professors:
Williams, R. L., Ph.D. George Peabody
Thompson, C. L., Ph.D. Ohio State

The Department of Educational and Counseling Psychology offers graduate programs leading to the following: Master of Education with a major in Educational Psychology, concentrations in educational psychology and school counseling; and Doctor of Education with a major in Educational Psychology, concentrations in educational psychology and school psychology. The department also participates in the college-wide Ph.D. program with a major in Education. The concentration area is theories and practice of educational and personal adjustment with specializations in counselor education, counseling psychology, educational psychology, and school psychology.

Several programs in the department are accredited. The counselor education graduate program is accredited by the Council for Accreditation of Counseling and Related Educational Programs; counseling psychology by the American Psychological Association; and school psychology by the National Association for School Psychology. Also, the school counseling and school psychology programs have the approval of the National Council for Accreditation of Teacher Education.

SPECIALIST PROGRAMS

Admission requirements include up-to-date scores from the GRE, the departmental admissions application form and letters of recommendation. All programs include thesis and non-thesis options. The program in school psychology requires a minimum of 66 hours. When students are admitted to the Ed.S. programs in educational psychology, school counseling or community agency counseling, it is assumed that they have completed a Master's degree. In this case, the minimum hours beyond the Master's required to complete the Ed.S. are as follows: educational psychology, 24; school counseling, 22; and community agency counseling, 25. The specialist programs require supervised practicum and internship experiences with students or clients, either in the public schools or in community human services agencies. A final examination is required of all specialist students.

THE DOCTORAL PROGRAMS

The Ph.D. with a major in Education includes concentrations and specializations as listed under Education. For students applying to the Ph.D. program concentration located in this department, two applications are required: one for the Ph.D. in Education program and one for the department that specifies which specialization is desired (i.e., counseling psychology, counselor education, educational psychology, or school psychology). Applicants for the Ed.D. with a concentration in either counselor education or educational psychology fill out only the departmental application form.

Admission requirements include up-to-date scores from the GRE; the department admissions application form; letters of recommendation; a writing sample; and, in the case of the counselor education program only, an audiotape or video-taped sample of the applicant's counseling work with a client.

The following minimum number of hours is required in each program concentration/specialization: counseling psychology - 98; educational psychology, Ph.D. - 98, Ed.D. - 79; educational psychology, Ph.D. - 92, Ed.D. - 89; school psychology, Ph.D. - 97. Residency for the Ph.D. program consists of two consecutive semesters of full-time coursework and two consecutive semesters for the Ed.D. The Ph.D. program requires coursework in both a supporting specialization and a cognate area, as well as either foreign language or computer proficiency. Coursework in statistics and research design is a requirement in all doctoral programs. Pre-dissertation research participation is a requirement in the Ph.D. program. The concentrations/specializations in counseling psychology, counselor education, and school psychology each require a minimum of 36 hours for the programs in guidance and community agency counseling require 42 and 37 hours respectively. The programs in community agency counseling and in guidance each require supervised practicum and internship experiences working with clients. A final examination is required of all Master's degree students.

GRADUATE COURSES

404 Special Topics (1-3) Instructor-initiated course offered at convenience of department on topics of current interest. May be repeated. Maximum 15 hrs. S/NC or letter grade.

410 Sex Role Development: Implications for Education and Counseling (3) Theories and research concerning development of person's sexual role and its relevance in educational and counseling settings.

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

432 The Disadvantaged Student: Psychoeducational Perspectives (3) Theory and research regarding psychology/sociohumanistic behavior and appropriate interventions.

480 Self-Management in the Helping Professions (3) Applications of self-management strategies to career, social, emotional, and health domains for both helping professionals and their clients. Prereq: Introductory course in psychology or consent of instructor. S/N or letter grade.

493 Independent Study (1-15) Independent investigation of problems in educational and counseling psychology. May be repeated. Maximum 15 hrs. S/N or letter grade.

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

502 Registration for Use of Facilities (1-5) 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.


504 Special Topics (1-3) Instructor-initiated course offered at convenience of department on topics of current interest. May be repeated. Maximum 15 hrs. S/N or letter grade.

510 Psychological Theories of Human Development Applied to Education (3) Theory and research on emotional, social, and intellectual development over life span with applications to educational and therapeutic settings.

511 Cognitive Development: Implications for Education (3) Applications of theory and research related to higher mental problem-solving. Prereq: 510 or consent of instructor.

515 Educational Applications of Behavioral Theories of Learning (3) Behavioral theories and research concerning classical and operant conditioning as systems apply to student motivation, discipline and learning. Sp,Su

516 Educational Applications of Cognitive Learning Theories (3) Cognitive theory and research, social learning, attribution and information processing as systems apply to education. Prereq: 515 or consent of instructor.

518 Educational Specialist Research and Thesis (1-9) May be repeated. Maximum 9 hrs. P/NP only.

S20 Statistics and Research Design: Conceptual (3) Consumer-oriented, conceptual treatment of statistics, research design, and quantitative basis of testing.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The MA program in Educational Psychology is available to residents of the state of South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.
521 Statistics and Research Design: Application (3) Data collection and analysis. Descriptive techniques, estimation, hypothesis testing and selected parametric and nonparametric tests. For Master's students conducting thesis and beginning doctoral students. Use of computer statistical packages. F,S

526 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: 525 or equivalent. F,S


540 Seminar in School Psychology (3) Essentials of theory and practice of school psychology as professional specialty. Consideration of history and current issues in school psychology. S/NC only. Sp

541 Psychoeducational Assessment (3) Direct, psychometric and naturalistic assessment methods in learning environments. Prereq: Admission to school psychology program or consent of instructor. and 525 or equivalent. May be repeated. Maximum 6 hrs. F,S

542 Practicum in Psychoeducational Assessment (3) Application of assessment skills to clients in learning environments. Coreq: 541 or consent of instructor. May be repeated. Maximum 8 hrs. S/NC only. F,Sp

545 Psychoeducational Consultation (3) Use of two and three-way consultation in educational and therapeutic settings based on behavioral, ecological, social learning and cognitive-behavioral theories. F,Sp

546 Practicum in Consultation (3) Application of counseling skills to educational settings. Coreq: 545. Sp

549 Internship in School Psychology (1-6) Supervised employment in departmentally approved school psychology internship sites. Prereq: Enrollment in school psychology program and consent of instructor. May be repeated. Maximum 12 hrs. (Same as Psychology 549). S/NC only. E

550 Development and Operation of Pupil Personnel Services (3) History, philosophy, trends, standards of preparation, certification, and role identity of counselors and other personnel service specialists. Program administration and organization. F,S

551 Theory and Practice of Counseling (3) Philosophical bases of helping relationship; development of counselor and client self-awareness; counseling theory/techniques. E

552 Career Development: Vocational Theory, Research and Practice (3) Relationship of vocational theory, career development, research and societal factors to life career roles. F,S

553 Career Development: Vocational and Educational Resources (3) Application and use of career and educational resources in personnel planning and program development. Sp,Su

554 Group Dynamics and Methods (3) Theory and types of groups, 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 9 hrs. E

556 Seminar in Community Agency Counseling (1) Orientation to professional organizations, code of ethics, certification requirements, and role identity of community agency counselors. May be repeated. Maximum 2 hrs. E

558 Internship in School Counseling (1-6) Supervised postpracticum employment at departmentally approved site. Prereq: 550 and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

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

560 Models of Classroom Discipline (3) Applications of major models of discipline in development of constructive atmospheres for classroom learning. Sp,Su

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

570 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. Sp

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Nursing 585, Public Health 585, and Social Work 585.)

593 Independent Study (1-15) Independent investigation of problems in educational and counseling psychology. May be repeated. Maximum 15 hrs. S/NC or letter grade. E

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

602 Directed Research (1-3) Instructor- or student-initiated group investigation of empirical and theoretical problems in educational and counseling psychology. May be repeated. Maximum 12 hrs. S/NC only. E

604 Special Topics (1-3) Instructor-initiated courses offered at convenience of department 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. Sp

635 Ethical, Legal, and Professional Issues in Psychology (3) Use of two and three-way consultation in educational and therapeutic settings based on behavioral, ecological, social learning and cognitive-behavioral theories. F,Sp

649 Advanced Internship in School Psychology (1-9) Supervised experience as school psychologist in departmentally-approved internship site for doctoral level students. Prereq: Enrollment in doctoral level school psychology program and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

650 Seminar in Counselor Education (1) Professional issues related to role and function of counselor educator. Prereq: Admission to doctoral program in psychology, or consent of instructor. (Same as Psychology 638.) Sp

671 Personality and Vocational Assessment (3) Use and interpretation of personality and vocational measures in assessment of clients. Prereq: 525, 552 or consent of instructor. F

672 Psychological Dysfunction (3) Classification methods, dynamics and treatment of dysfunctional individuals in counseling. Prereq: 525 and course in abnormal psychology, or consent of instructor. Sp

673 Advanced Theory and Practice in Group Counseling (3) Theories and supervised practice. Prereq: 554, 555, and consent of instructor. Sp

674 Practicum in Counseling Psychology (3) Supervised practice of individual counseling. Minimum 135 clock hrs required each semester. Prereq: Admission to counseling psychology doctoral program, 555, and consent of instructor. May be repeated. Maximum 6 hrs. E

678 Theory and Practice of Counseling Supervision (3) Theory and practice of supervision in counseling. Prereq: 555, or 574, or consent of instructor. S/NC only. Sp

679 Internship in Counseling Psychology (1-6) Supervised employment in departmentally approved counseling psychology internship sites. Prereq: Admission to counseling psychology doctoral program and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E

693 Independent Study (1-15) Independent investigation of problems in educational and counseling psychology. May be repeated. Maximum 15 hrs. S/NC or letter grade. E

Educational Leadership

College of Education

MAJORS

DEGREES

College Student Personnel ............. M.S., Ed.S., Ed.D.

Educational Administration and Supervision .......... M.S., Ed.S., Ed.D.

Mary Jane Connelly, Head

Professors:

The Department of Educational Leadership offers graduate programs leading to the Master of Science with concentrations in specializations of Educational Administration and Supervision, Educational Administration and Supervision in Higher Education, Educational Administration and Supervision in Colleges and Universities, and Educational Administration and Supervision in Community Junior College Administration. Specializations may be developed in Administration and Supervision, and the Education with a major in Educational Administration and Supervision, and the Doctor of Education with a major in Educational Administration and Supervision, and the Doctor of Philosophy with a major in Educational Administration and Supervision.

Non-Thesis Option
A minimum of 60 hours beyond the baccalaureate degree including 6 hours of Educational Administration and Supervision 518 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the thesis.

Non-Thesis Option
A minimum of 60 hours beyond the baccalaureate degree including 6 hours of Educational Administration and Supervision 503 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the problem papers.

THE EDUCATIONAL SPECIALIST PROGRAM
Thesis Option
A minimum of 60 hours beyond the baccalaureate degree including 6 hours of Educational Administration and Supervision 518 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the dissertation.

Thesis Option
A minimum of 33 credit hours including 6 hours of Thesis 500 is required. A major consists of a minimum of 18 hours. An internship is highly recommended but not required. A final written comprehensive examination is required with an oral exam at the option of the committee.

THE MASTER'S PROGRAM IN COLLEGE STUDENT PERSONNEL
This program is designed for individuals interested in entering the field of student personnel administration in colleges and universities and in community or junior colleges. The program has both a thesis and non-thesis option. A minimum of 39 hours, which includes 6 hours of practicum experience, is required in either option. Students entering any of the M.S. options are advised to first complete the introductory core consisting of Educational Administration and Supervision 513, 515, 516, and 535 or a demonstrated computer proficiency. The courses are prerequisites to other courses in the department.

THE DOCTORAL PROGRAM
For the Ed.D. program, the minimum hours are determined by the student's doctoral committee. Six to 9 hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the dissertation.

The Ph.D. with a major in Education includes concentrations and specializations as listed under Education.

Educational Administration and Supervision

GRADUATE COURSES
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 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 (3-5) May be repeated. S/NC only. E
513 Administrative and Organizational Theory in Education (3) Introduces student to theoretical administrative and organizational foundations of management and leadership of educational programs and institutions. F,Su
515 Human Relations and Communication in Administration (3) Development and use of effective interpersonal communication skills and channels, intergroup relations, supportive work climates, personnel motivation, conflict management skills, and role of values, attitudes, and expectations in administration. F,Su
516 Research for School Administrators (3) Descriptive, experimental, and quasi-experimental designs to help students without quantitative backgrounds to read and understand technical professional literature. Introduction to inferential statistics, needs assessments, and evaluation procedures. Sp,Su
518 Educational Specialist Research and Thesis (3) May be repeated. Maximum 6 hrs. P/NP only. E
529 Politics of Education and Educational Environments (3) School environments in political context of modern, complex society. Administrator and supervisory competencies: political, social, ethnic, cultural, and racial environments in which schools operate. Prereq: M.S. introductory core or consent of instructor. F,Su
535 Administrative Applications of Micro Computers (3) DOS, word processing, data based management, spreadsheets, and computer communications. Review and development of specific administrative applications: scheduling, attendance, student record systems, and accounting. F,Su
544 School Finance and Business Management (3) For prospective building level administrators. Financial and fiscal management tasks and procedures in individual school setting. Prereq: M.S. introductory core or consent of instructor. F,Su
547 Educational Facility Planning (3) Concepts and skills for development, evaluation, construction, renovation, maintenance, and operations of quality educational environments and facilities. Prereq: M.S. introductory core or consent of instructor. Sp,Su
548 Introductory Supervision and Personnel (3) Basic supervisory and personnel concepts and related competencies; building (or micro-organizational) level; interviewing, personnel planning, collecting and maintaining employment information; educational and non-educational personnel, clinical supervision, staff evaluation, and staff development. Prereq: Introductory M.S. core or consent of instructor. Sp,Su
553 Strategies of Educational Planning (3) Processes for improving decision-making function through use of both quantitative and qualitative planning techniques. Policy analysis, CPM, PERT, Delphi. Prereq: Introductory M.S. core or consent of instructor. F,Su
554 School Law (3) Logical arrangement of case and statutory materials for public school administrators and teachers; problems concerning law and public education. Prereq: M.S. introductory core or consent of instructor. Sp,Su
580 Internship in Educational Administration (3) Field experience in appropriate educational setting work- ing directly with administrator. At end of planned program of study. Placement by department assignment. Some on-campus classes in conjunction with 583 or 582. Prereq: 21 hrs in educational administration and supervision or consent of instructor. E
582 Educational Leadership and District-Level (3) Role of central administrative team; relationships, behaviors, concepts and competencies for development and maintaining effective school organization. At end of planned program of study. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F,Su
591 Educational Leadership—Principalship (3) Knowledge, skills and relationships for principal to be effective instructional leader. Simulation materials and field-based activities. Culminating course with internship and problems paper. At end of planned program of study. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F, Su

590 Special Topics (3) May be repeated. E

592 Field Problems in Educational Administration and Supervision (3) Topic to be assigned. May be repeated. S/NC or letter grade. E

593 Independent Study in Educational Administration (3) Prereq: Consent of instructor. May be repeated. E

594 Methods of Educational Administration and Supervision (3) For in-service training of elementary school administrators. Developments, problems, programs, and trends of elementary schools and management skills of elementary school administrators. Prereq: Presently elementary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F, Sp

595 Elementary Principals Seminar (1-3) For in-service training of elementary school administrators. Developments, problems, programs, and trends of elementary schools and management skills of elementary school administrators. Prereq: Presently elementary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F, Sp

596 Middle School Principals Seminar (1-3) For in-service training of middle school administrators. Developments, problems, programs, and trends of middle schools and management skills of middle school administrators. Prereq: Presently middle school administrator or consent of instructor. May be repeated. S/NC or letter grade. F, Sp

597 Secondary Administrator Seminar (1-3) For in-service training of secondary school administrators. Developments, problems, programs, and trends of secondary schools and management skills of secondary school administrators. Prereq: Presently secondary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F, Sp

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

604 Seminar in Educational Administration and Supervision (1) Current educational issues, problems and research. Required two consecutive semesters during doctoral residency. May be repeated. S/NC only. E

610 Internship in Educational Administration (3) Opportunity for doctoral and advanced graduate students to gain experience in performance of critical tasks of educational administration under supervision of practitioner and University representative. May be repeated at discretion of student's committee. Maximum 12 hrs. S/NC only. E

611 Current Issues in Educational Administration (1-3) May be repeated. S/NC or letter grade. E

612 Current Issues in Higher Education (1-3) May be repeated. S/NC or letter grade. E

614 Statistical Methods for School Administrators (3) Descriptive and experimental research methods, parametric and non-parametric statistical techniques used in research in educational settings. F

615 Research Designs (3) Statistical methods through multi-variate techniques and applications to various research designs. Prereq: 614 or consent of instructor. Sp

616 Research Methods (3) Overview of descriptive and experimental research designs: data collection, analysis, and interpretation for survey studies and school surveys. Conduct of survey. Prereq: Basic statistics, and consent of instructor. E

622 Programs for the Professional Preparation of Educational Administrators and Supervisors (3) Exploring designs and methodology for training school administrators at both pre-service and in-service levels. F

629 Seminar in Politics of Education (3) Political theories and practices as they affect operation of public school systems and higher educational institutions. Interdisciplinary discussions of community power structure motivation, power and special interest group, based on literature and research from education, sociology, and political science. Prereq: 529, 561 or equivalent or consent of instructor. F

538 Advanced Supervision (3) Supervision at district level: roles, responsibilities, and operations: goal development, instructional supervision, staff development, curriculum development, program evaluation, and personnel evaluation. Prereq: 548 or consent of instructor. F, Su

644 Educational Finance and Business Management (3) Contemporary educational finance policies and their influence upon education, nation and citizens. Superintendent team concept, management of school logistical services. Prereq: 544 or consent of instructor. F, Su

646 School Personnel Administration (3) Personal administration functions for professional and supporting staff in educational organizations. Recruitment, selection, placement, personnel policies, employee wage and salary administration, fringe benefits, collective negotiations, human relations, staff development, and staff evaluation. Prereq: 548 or consent of instructor. F, Su

653 Seminar in Educational Planning Methods (3) Exploration of alternative futures and advanced planning methodology. Sophisticated planning/forecasting techniques. Prereq: 553 or consent of instructor. F, Su

655 State-Federal Relations in Education (3) Interrelationships of federal, state, and local responsibilities and organization for education by analysis of traditional, legal, fiscal and functional aspects of educational partnerships. Prereq: S, E, F, Su

656 Legal Foundations of Public Education (3) School law; constitutional foundations as they relate to public education at state and local levels. F, Su

658 Conflict Management (3) Social conflict and its management. Causes of interpersonal, intergroup, and organizational conflict, skills and strategies used to manage conflict, conflict management models associated with different sectors: human activity, and current organizational practices for managing destructive conflict. F

680 Administration of Complex Organizations (3) Concepts and theoretical formulations to understand, analyze, evaluate, and change complex educational programs and organizations. Prereq: S, E, F, Su

687 Seminar in Educational Facility Planning (3) Concepts and techniques for evaluating educational facilities, conducting comprehensive school surveys, and developing educational specifications. Prereq: S, E, F, Su

690 Specialized Seminar (3) Prereq: Consent of instructor. May be repeated. E

693 Independent Study in Educational Administration and Supervision (3) Prereq: Consent of instructor. May be repeated. E

542 The College Student and the Court (3) Legal precedent affecting organizations, administration, and finance of higher education. Academic freedom, faculty termination, religion, tort liability, administrative law, academic due process and affirmative action in employment. Sp

645 Curriculum and Instruction in Undergraduate Higher Education (3) Content and organization of institutional strategies and curricular structure in higher education. F, F

650 Fiscal Problems in Higher Education (3) Revenue sources, appropriation process, budget procedures, cost analysis, and fiscal management in public and independent colleges and universities. Sp

693 Independent Study (3) Prereq: Consent of supervising instructor. May be repeated. S/NC or letter grade. E

695 Practicum in Higher Education (1-6) Supervised practicum in selected areas of higher education administration. Prereq: Consent of instructor. May be repeated. S/NC only. E

698 Seminar in Higher Education (3) Analysis of administrative and organizational structure, theory and practice in management of American colleges and universities. Prereq: 543 or consent of instructor. Su

640 College and University Law (3) Legal precedent affecting organizations, administration, and finance of higher education. Academic freedom, faculty termination, religion, tort liability, administrative law, academic due process and affirmative action in employment. Sp

645 Cuniculon and Instruction in Undergraduate Higher Education (3) Content and organization of institutional strategies and curricular structure in higher education. F, F

543 American Higher Education in Transition (3) History, philosophy, purposes, functions, organizations and programs in American higher education. F

570 Introduction to Student Personnel Work in Higher Education (3) Historical, philosophical and organizational perspective. Functional areas comprising field and major issues. F

572 Theory and Practice in Student Personnel Services (3) Theoretical framework of college student personnel services and practical application of theory in student services environment. Applicable administrative theory, human development theory and evaluation assessment techniques. Sp

586 The Community-Junior College (3) History and role of two-year college, major functions, organization and administration, problems and issues. Sp

684 Internship in Elementary School Supervision (3) Prereq: Consent of supervisory instructor. May be repeated. S/NC or letter grade. E

699 Practicum in College Student Personnel (1-6) Prereq: Consent of instructor. May be repeated. S/NC only. E

619 Administration and Governance of Higher Education (3) Trends, structure and process of collegiate governance. Development of understanding of administrative theory and practice in higher education. Prereq: S, E, F, Su

630 Special Topics (1-3) May be repeated. E

640 College and University Law (3) Legal precedent affecting organizations, administration, and finance of higher education. Academic freedom, faculty termination, religion, tort liability, administrative law, academic due process and affirmative action in employment. Sp

645 Curriculum and Instruction in Undergraduate Higher Education (3) Content and organization of institutional strategies and curricular structure in higher education. F, F

560 Fiscal Problems in Higher Education (3) Revenue sources, appropriation process, budget procedures, cost analysis, and fiscal management in public and independent colleges and universities. Sp

693 Independent Study (3) Prereq: Consent of supervising instructor. May be repeated. S/NC or letter grade. E

695 Practicum in Higher Education (1-6) Supervised practicum in selected areas of higher education administration. Prereq: Consent of instructor. May be repeated. S/NC only. E

698 Seminar in Higher Education (3) Analysis of administrative and organizational structure, theory and practice in management of American colleges and universities. Prereq: S, E, F, Su

Higher Education

GRADUATE COURSES

455 Seminar in Student Leadership (1) Knowledge and skills in leadership roles for resident assistants, student government leaders, student activities, and other student organizations. Topics to be assigned. May be repeated. E

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

502 Registration for Use of Facilities (3-15) Required two consecutive semesters during doctoral residency. May be repeated. S/NC only. E

503 Problems in Lieu of Thesis (3-6) May be repeated. S/NC only. E

530 Special Topics (1-3) May be repeated. E

542 The College Student and the Court (3) Legal precedent affecting organizations, administration, and finance of higher education. Student discipline, housing, dress, organizations, activities fees, tuition and related federal regulations. F

Electrical and Computer Engineering

(College of Engineering)

MAJOR

DEGREES

Electrical Engineering.................M.S., Ph.D.

Joseph M. Googe, Head

Professors:


81
Admission Requirements

Students applying for admission to the Master of Science program and who hold a B.S. in Electrical Engineering are considered for admission on an individual basis. The minimum expectation is an undergraduate cumulative grade-point average of 3.0 of 4.0 and a GPA of 3.0 for the senior year.

Students who hold the B.S. or B.A. 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 in the field. These students should also have a background equivalent to that obtained by earning credit with a minimum 3.0 grade-point average in the Electrical Engineering courses normally taken at the 200 and 300 levels in the Bachelor's program in this department, and two 400-level courses in the student’s major area of concentration in the Master’s program. Students from fields other than electrical engineering who have met the admission standards except for this background will be admitted only as non-degree students until they have completed coursework to provide this background.

Master's Degree Requirements

Specific degree requirements which must be met include:

1. Electrical and Computer Engineering 503 and 504.
2. Six semester hours of graduate credit in mathematics consisting of mathematics courses of 400 level or higher which have been approved by the E.C.E. Graduate Committee.
3. An additional 12 semester hours of 500-level work in electrical and computer engineering courses and 6 semester hours of 500-level work in another area approved by the student's Master's Committee.
4. Master's thesis, totaling 6 semester hours or more.
5. A final oral examination covering the thesis and related coursework.

DOCTORAL PROGRAM

The Ph.D. with a major in Electrical Engineering may be pursued in the concentration areas of circuit theory, computers, electromagnetics, communication theory, electromagnetics, plasma engineering, power systems, solid-state electronics, and control systems.

Applicants must submit scores on the General Graduate Record Exam. Specific departmental requirements for the Ph.D. include the following:

1. A Master of Science or Master of Engineering degree.
   a. A minimum of 24 semester hours of work in electrical and computer engineering courses at the 500 and 600 levels.
   b. A minimum of 9 semester hours of 600-level coursework. At least 3 semester hours of this work must be in an area other than the student's major area.
   c. A minimum of 12 hours of mathematics courses approved by the Electrical and Computer Engineering Graduate Committee. All 12 hours must be 400-level or above, and at least 6 hours must be in 500-level courses.
3. 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.
4. Satisfactory performance on both a qualifying and comprehensive examination.

The qualifying examination is prepared by the Electrical and Computer Engineering faculty and consists of a 3-hour written examination in each of four areas. Areas (1) and (2) are usually computational, and areas (3) and (4) are usually theoretical. The comprehensive examination is normally taken after the completion of 24 hours of graduate coursework or immediately after completion of the Master's degree. A minimum of 16 hours of graduate coursework must be completed after the student has taken the qualifying examination the first time.

The comprehensive examination is prepared by the student's doctoral committee and consists of a 3-hour written examination in the student's major area, a 2-hour written examination in a related area, and an oral examination. The comprehensive examination is normally taken at least six months after passing the qualifying examination. Part of the comprehensive oral examination will be a defense of a formal written dissertation proposal. The comprehensive examination must be passed and the dissertation proposal accepted by the student's doctoral committee before the student is reported as ready for admission to candidacy for the Ph.D.

5. Participation in departmental seminars.

Many of the electrical and computer engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in the department's graduate program. Departmental graduate programs are also available at the Space Institute, Tullahoma.

Departmental actions regarding a graduate student may be appealed in writing, first to the Department Graduate Committee and then to the Department Faculty.

GRADUATE COURSES

Courses required in the Electrical and Computer Engineering undergraduate curriculum cannot be used in either the M.S. or Ph.D. programs. No 400-level course may be used toward a graduate degree in Electrical and Computer Engineering except when required by the program.


413 Pasive and Active Network Synthesis (3) Review of network analysis techniques, passive network driv- ing and synthesis, transfer function synthesis, approximation theory, topics in active network syn- thesis. Prereq: 312.

421 Power Systems (3) Bulk power system planning and control; reliability; system stability. Prereq: 322.

422 Machines (3) Dynamic behavior of rotating machines; transients and for common modern operation of d.c. machines; response to different waveforms in supply; describing equations for a.c. machines and their numerical solutions. Prereq: 322. Coreq: 426.


426 Machines Lab (1) Experiments and projects demonstrating machines. Coreq: 422.

429 Power Electronics Lab (1) Experiments and projects demonstrating power electronic devices. 

431 Digital and Analog Integrated Electronics (3) Basic concepts of active and passive components for monolithic integrated circuits; characteristics of bipolar, MOS and JFET transistors in integrated circuits; design and testing digital and analog integrated circuits; standard digital logic circuits including TTL, ECL, Schottky, NMOS, CMOS, and GaAs gates and arrays; design concepts for op-amps, comparators, references, regulators, and other linear functions. Prereq: 332. Coreq: 435.

432 Analog Signal Processing Electronics (3) Trans- duer signal and interfacing characteristics; analog signal processing electronics, feedback control, and isolation amplifiers, rms and logarithmic converters, multiplexers, and function generators; integrated circuit applictions; active filters, level and phase detection, multiplexers, modulation and demodulation, sample and hold, and comparators. Prereq: 332. Coreq: 436.

433 Electronic Amplifiers (3) Feedback amplifier prin- ciples; wideband linear amplifier design; radio frequency and audio power amplifier design; linear regulated power supply design; oscillator principles. Prereq: 332. Coreq: 439.


442 Antennas and Propagation (3) Linear antennas, arrays, other simple antennas. Antenna gain, imped- ance, efficiency, bandwidth. Waves and antennas in earth bound free space, earth's troposphere and ionosphere. Reflections from earth; effects on link reliability. Prereq: 342.


449 Microwave Circuits and Electronics Laboratory (1) Experiments and projects demonstrating micro- wave circuit and electronic circuits. Coreq: 443.

451 Microprocessors in Computer Engineering (3) Project-oriented course using microcomputer kit having monitor program and development system with cross- assembler, file management, and emulation capabilities. Interfacing and hardware/software trade-offs in interrupt driven applications. Term grade dependent on number of projects, homework, lab reports, and engineering notebook. Prereq: 352. Coreq: 455.


453 Data Acquisition Systems (3) Digital-to-analog conversion techniques; analog-to-digital conversion techniques; A/D and D/A ladder network-works; error analysis of D/A converters; sample hold circuits; analog-to-digital conversion techniques; open loop systems; closed loop systems; closed loop systems: dual slope and successive approxima- tion; error analysis of A/D converters; accuracy, linearity, drift, dynamic range, frequency response, gain, ground shielding; automated testing of A/D and D/A con- verters; device service routines; signature analysis. Prereq: 352. Coreq: 459.


455 Microprocessor Laboratory (1) Experiments and projects demonstrating microprocessors. Coreq: 451.


461 Plasma Magnetohydrodynamical Engineering (3) MHD approximations; MHD waves and disturbances in static and dynamic systems; MHD in pulsed and steady-state power generation. Applications to fusion energy, industry, and astrophysics. Prereq: 381.

462 Plasma Kinetic Theory Engineering (3) Kinetic theory; beam-plasma system; driven waves in plasma; transition from multiple beams to continuum; Vlasov and Landau theory; wave generation in plas- mas and traveling wave tubes; Microchannel plasmas in circular geometry; gyrotor and orbitron. Design of plasma devices. Prereq: 361, 481 or consent of instruc- tor.

463 Introduction to Fusion Energy I (3) High temperature plasma physics relevant to fusion plasmas, principles of fusion reactors, and engineering and physics con- straints on fusion reactors. Prereq: 361 or consent of instructor. (Same as Nuclear Engineering 463.)

464 Introduction to Fusion Energy II (3) Principles and phenomenology of tokamak reactor, alternate magnetic confinement concepts, advanced fusion fuel, fusion technology, plasma engineering, and fusion reactor design studies. Design project. Prereq: 463 or consent of instructor. (Same as Nuclear Engineering 464.)

469 Plasma Laboratory (1) Experiments and design projects for 461, 462, and 463, 464.


472 Introduction to Digital Image Processing (3) Basic methods for digitizing, storing, processing, and display- ing images. Computational procedures for image enhancement, restoration, coding, and segmenta- tion. Prereq: Consent of instructor.


482 Electro-Optics I Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 481.

484 Special Problems in Electrical Engineering (1-3) Problems involving library and experimental research. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

489 Senior Seminar (1) Topics of interest discussed in written papers and oral presentations. Consent of instructor. May be repeated. Maximum 2 hrs.

490 Electro-Optics II Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 482.

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 repeat- ed. S/N/C only. E

503 Modern Transform Methods (3) Fourier and Laplace transform and complex variables theory. Z- transform, difference equations and distributed param- eter systems.

504 Random Process Theory for Engineers (3) Probability and random variables as approached by set theory. Statistical averages and transformations of random variables. Random processes, statistics, stationarity, correlation functions and temporal analysis, power spectra and spectral density as applied to systems of random signals.

511 Linear Systems Theory (3) State space models of linear dynamical systems, linear algebra, state trans- sition map, matrix exponential, controllability, observability, realization theory, and stability theory.

512 Multivariable Linear Control System Design (3) Design of controllers and for multivariable systems, which satisfy constraints on robustness to plant uncertain- ties, disturbance rejection, command following. Prereq: 511.


515 Adaptive Control and System Identification (2) Adaptive control of linear deterministic and stochas- tic systems, adaptive controller design, parameter estimation for deterministic and stochastic systems. Prereq: 511-12 or 518-19.


519 Control Systems Design II (3) (Digital control, variable structure control, state-space design of SISO systems, use of estimators and observers, comparison of classical and state-space methods of control system design, considerations for control system instrumentation. Prereq: 518.
521 Power Systems Analysis I (3) Matrix-vector representation of power systems, voltage and scalar control of induction machines, parameter variations, control principles of synchronous machine.
522 Power Systems Analysis II (3) Operation and control of interconnected power systems, transient and dynamic stability. Formulation and solving problems in matrix-vector form with application to large scale power systems. Prereq: 421 or equivalent.
54 Volume Systems (3) Phenomena, generation, measurement, practice, and insulation in high voltages; power line; surge, arc, and control, shielding, reliability. Prereq: 421.
52 Advanced Electrical Machines I (3) Fundamental processes of electromechanical energy conversion; application in conventional devices. Differential equations for rotating machinery. Prereq: 422 or equivalent.
52 Advanced Electrical Machines II (3) Park's transformation and two-axis model, transient behavior of isolated and interconnected rotating machines. Prereq: 529.
particulate media; multiple scattering theory; coherence and modeshape. Fluctuation due to turbulence; rough surface scattering. Prereq: Consent of instructor.

643 Advanced Topics in Information Science I (3) Detection and estimation theory; system identification. Signals with unknown parameters; optimal filter synthesis; adaptive systems; sequential detection; suboptimal detection. Prereq: 504 or consent of instructor.

644 Advanced Topics in Information Science II (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.

645 Advanced Topics in Microwave Networks (3) Multipath scattering and transfer representations. Narrow band and wide band synthesis of networks containing lumped and distributed components; interstage matching and response equalization. Low noise, low distortion and high power designs of amplifiers and oscillators. Prereq: Consent of instructor.

646 Advanced Topics in Microwave Networks (3) Reciprocal and nonreciprocal devices, directional devices, high frequency switches and multiplexers, optimization in distortion control. Network analyzer measurement techniques and integration of measured data with design procedures. Prereq: Consent of instructor.

651 Computer-Aided Design of VLSI Systems I (3) Fabrication of microelectronic devices; computer architecture design; algorithmic state machines; partitioning; structural design methodologies. Prereq: 551-S2 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.

663 Advanced Plasma Physics I (3) Basic concepts of high temperature plasma physics. Magneto-hydrodynamics and kinetic descriptions of plasma, plasma transport, plasma waves, equilibrium, and stability. Prereq: Physics 541-42, 561-62 or 563-64, or consent of instructor. (Same as Physics 563.)

664 Advanced Plasma Physics II (3) Plasma heating and radiation phenomena. Advanced topics of current interest. Must be taken in sequence. Prereq: 663. (Same as Physics 654.)

671 Image Processing and Robotics I (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.

681-82 Quantum Electronics (3-3) Prereq: Consent of instructor.

691 Advanced Graduate Seminar I (3) Research in department. May be repeated.

692 Special Topics I-3 Advanced topics of current interest to Ph.D. students in Electrical Engineering. May be repeated. Maximum 9 hrs.

Jerry E. Stoneking, Head

Professors:

Associate Professors:

Assistant Professor:
Brooks, G. N., Ph.D. ....................... Stanford

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program concentrations include solid mechanics, fluid mechanics, computational mechanics, biomedical engineering, and optical engineering (UTSI only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. Each applicant is advised as to any prerequisite courses before entering a program; the student’s program of study must be approved by his/her advisory committee, and must comply with the requirements of The Graduate School. The student’s major professor may be selected from a department other than the Department of Engineering Science and Mechanics; however, at least one member of the student’s graduate advisory committee must be on the faculty of the Department of Engineering Science and Mechanics. A departmental application is required in addition to The Graduate School application. The names and addresses of four references must be included with the departmental application.

The flexibility and interdisciplinary aspect of the program concentrations are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering or can best be met by interdisciplinary study in engineering. The department’s course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics or in related interdisciplinary studies such as biomimetics.

THE MASTER’S PROGRAM

Two M.S. options are offered: option I requires a thesis, while option II does not. The second plan is restricted to those students who have had significant engineering professional work experience.

In option I, a minimum of 30 semester hours including the thesis is required. In option II, a minimum of 33 hours is required. The requirements include the following:

Hours Credit
Mathematics
Engineering courses (Major concentration may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.) 12 18
Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.) 6 9
Thesis
"Engineering courses under option II may include advanced laboratory work or special problem work; for example, Engineering Science and Mechanics 581 or analogous courses in other departments.

A final examination is required under both options covering graduate coursework and the thesis.

THE DOCTORAL PROGRAM

Specific departmental requirements for the Ph.D. include:

1. A minimum of 72 semester hours beyond the Bachelor’s degree, exclusive of credit for the Master’s thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

2. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 12 semester hours in mathematics or computer science in courses numbered 481 and above, exclusive of a first course in ordinary differential equations.

4. A minimum of 6 semester hours of courses numbered 500 and above, offered in departments other than mathematics, computer science, or the student’s major department and not included in the areas of concentration under item 2.

Engineering Science and Mechanics (College of Engineering)

MAJOR DEGREES
Engineering Science ......................... M.S., Ph.D.
5. Attendance and participation in graduate seminars and colloquia.

6. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering.

After being admitted as a potential candidate for the Ph.D., a qualifying examination must be taken at the first offering after the student has either completed a Master's degree or taken 24 semester hours of graduate credit. The purposes of qualifying examinations are:

A. To determine the qualifications of the student to continue the Ph.D. program.
B. To identify the areas of strengths and weaknesses to guide the student's graduate coursework and research.

The qualifying examination will be administered by the department's Graduate Studies Committee. The examination will be written and will cover at least four graduate level subject areas. One subject area will be mathematics, and the others will be designated by the student subject to the approval of the department's Graduate Studies Committee.

The comprehensive examination is to be taken by the student within 6 credit hours of completion of graduate coursework required for the Ph.D. degree. This examination is to be administered by the student's advisory committee and shall consist of both a written and oral portion.

7. After successfully passing the qualifying and comprehensive examinations, the student must present the Ph.D. dissertation research proposal to the student's advisory committee and receive committee approval of the proposal before being admitted to candidacy for the Ph.D.

8. A final examination on the student's dissertation and related fields will be taken by the student after completion of the Ph.D. dissertation and course requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs among legal residents allows some students to enroll in certain programs at UTC on an in-state tuition basis. The Ph.D. program in Engineering Science is available to residents of the state of Florida. Admission into the program may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE CREDIT FOR 400-LEVEL COURSES

Four hundred-level courses in engineering may be used for graduate credit at the discretion of the advising committee. However, at least two-thirds of the credit hours in a Master's degree program must be at or above the 500 level.

GRADUATE COURSES

421 Materials of Engineering (3) Mechanical properties of engineering materials; data collection and processing; time dependent and cyclic dependent properties. Prereq: 321, Materials Science and Engineering 201. 3 hrs or 2 hrs and 1 lab.

423 Fracture-Safe Design (3) Critical review of variables controlling fracture toughness: part and flaw factors, stress intensity factors, strain within 6 release rates, J integral, COO data, transition temperature tests; use of fracture toughness data in design. Prereq: 321 and Materials Science and Engineering 201. (Same as Materials Science and Engineering 475.) 3 hrs or 2 hrs and 1 lab.

425 Principles of Nondestructive Testing (3) Principles and theory of nondestructive testing methods; liquid penetrant, magnetic particle, eddy current, ultrasonic, acoustic testing, and ultrasonic methods. Materials Testing Laboratory. Prereq: 321, Materials Science and Engineering 201. (Same as Physics 475.)


433 Dynamic Systems (3) Three dimensional dynamics of particles and rigid bodies; gyroscopes; variable mass systems; central force motion; Lagrange's equations; stability; transfer functions. Prereq. Dynamics.

435 Engineering Acoustics (3) Concepts of acoustics, measures of sound and their units; noise generation and transmission, noise control principles and application, materials and procedures for noise abatement. Prereq: Introductory course in vibrations or acoustics.

442 Fluid Mechanics II (3) Differential forms of basic laws; compressibility, isentropic flow, shocks, duct flows with and without Mach numbers, flow with and without swirl, critical flow, energy methods; internal and external viscous flows, boundary layers, elementary turbulent closure. Prereq: 341, Mathematics 231.

454 Computational Mechanics III (3) Integration of fundamental physical laws, mathematical methods and computational techniques necessary to develop engineering analysis and design capabilities. Prereq: Computational Mechanics II.

461 Experimental Stress Analysis (3) Theory, techniques, and instrumentation of resistance strain gauges; theory and techniques of brittle coating method; introduction to other strain measuring devices. Prereq: 321, Electrical and Computer Engineering 301. 2 hrs and 1 lab.

463 Photomechanics (3) Introduction to photoelasticity, photoelastic coating method, Moiré method, interferometry, and holography. Prereq: 321, Physics 232. 2 hrs and 1 lab.

465 Dynamic Data Acquisition (3) Use and calibration of instrumentation for measuring and recording dynamic events; Fourier analysis, transfer function analysis, digital signal processing, transduction, experimental parameter estimation with applications to modal vibration analysis and computerized instrumentation. Prereq: 321, Electrical and Computer Engineering 301. 2 hrs and 1 lab.

471 Clinical Engineering and Bioinstrumentation (3) Function and characteristics of health care delivery systems: hospital organization and health care economics; development and management principles for hospital-based clinical engineering program. Biomedical instrumentation system operational characteristics; performance of transducers, signal conditioning, data readout and storage devices; evaluation of commercially available systems, selection and procurement methods, custom-designed system, equipment maintenance and control programs for hospitals. Ethical issues and professionalism in clinical engineering. Prereq: Biomedical engineering, Introduction to Pattern Recognition.

473 Biomechanics (3) Mechanical properties of living tissues; biomechanics of injury; mechanics of prosthesis, whip, composite prop, fractographic analysis; biomechanical problems related to impact. Prereq: 321.

475 Design of Artificial Internal Organs (3) Design, development and evaluation of artificial internal organs; analysis of human factors; design optimization; review of currently available devices, federal regulations and ethical considerations. Prereq: 341, Mathematics 231.


494-95 Special Engineering Science Topics (3,3) Problems related to recent developments and practice. Open to juniors or seniors by consent of instructor. May be repeated. 6 hrs.

500 Thesis (1-15) F/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 being admitted to candidacy. May not be used toward degree requirements. May be repeated. S/NC only. E

521-22 Advanced Mechanics of Materials (3,3) Three-dimensional transformations for stress and strain, unsymmetrical bending, energy methods, thick-walled pressure vessels, beams on elastic foundation, beam columns, introduction to elementary theory of elasticity. Prereq: 322 and Mathematics 431.

523-24 Theory of Elasticity (3,3) Equations of equilibrium; strain-displacement relations compatibility, and constitutive equations in three-dimensions. Beams, disks, thick-walled tubes, plates with holes; stress concentrations, A and complex potential stress function, free vibrations of continuous bodies; transformations to polar coordinates. Thermal stresses in beams, rings, plates, and shells; thermal buckling problems.

525 Theory of Plates (3) Classical bending theory of thin plates; thick plates; buckling and large deflection problems. Prereq: 523.


536 Advanced Engineering Acoustics (3) Introduction to theory and application of acoustic analysis; vibration of continuous systems, plane and spherical waves, transmission phenomenon, radiation and scattering. Resonators, filters, absorption mechanisms, microphones, ultrasonics, sonar transducers. Prereq: 431 or 435.

539 Introduction to Continuum Mechanics (3) Carries tensors, transformation laws, basic continuum mechanics concepts, constitutive equations, conservation laws. Conservation laws for mass, momentum, energy. Applications in solid and fluid mechanics.

541 Fluid Dynamics I (3) Kinematic, kinetic and thermodynamic properties of fluids. Development of rate deformation laws; mass, momentum and energy conservation, associated theorems, applications. Applications of Euler and Navier-Stokes equations; exact solutions, potential flow, transonic, boundary layer flows, coupled heat/mass transfer models. Coreq: 539.
Assistant Professors:
Bensa-Myers, Linda D., Ph.D............Oregon
Dunn, Allen, Ph.D..........................Washington
Forty, Jeanie K., Ph.D.....................Washington
Hammond, Patsy G., M.A...............Tennessee
Papke, Mary E., Ph.D.....................McGill
Riley, Kathryn, Ph.D..........................Maryland
Samson, Donald, Ph.D....................North Carolina
Smith, Arthur, Ph.D............................Houston
Wallace, Ray, D.A............................Illinois State
Zomchick, John, Ph.D..........................Columbia

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 the Director of Graduate Studies in English, McClung Tower.

THE MASTER'S PROGRAM

Requirements

Coursework: A minimum of 24 semester hours in English beyond the B.A., to include 6 hours at the 400 level; 12 additional hours at the 500-600 level (Only 3 hours of 593 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 addition- nal 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 B or better.
2. Completion of French 302 or German 332 at UTK with a grade of B or better. Six additional hours at the 500 level; 12 additional hours may be taken in some cognate field.

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 B or better.
2. Completion of French 302 or German 332 at UTK with a grade of B or better. Six additional hours at the 500 level; 12 additional hours may be taken in some cognate field.

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. Students who go on to complete the Ph.D. may also find the Master's with writing concentration helpful when they are seeking teaching positions.

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. Courses must take at least 9 hours in writing and in literature, the remaining 6 to be selected from any English courses at the proper level. All writing courses must be taken at the 300 level or above, at least one course to 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 writing or rhetorical theory.
2. A creative project, such as a collection of poems or 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.

Final Examination: The writing examination will consist of two parts. The first part will be a written examination which may be divided as written examination given by the English Language. For the other 3 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, on 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 the comprehensive examination, the student must have completed all coursework required. A student must also have met all requirements for the 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.

THE DOCTORAL PROGRAM

Requirements

A student must successfully complete a program of study, normally 6 full semester hours as outlined below, approved by the candidate's committee or the Director of Graduate Studies in English.

Coursework: At least 57 semester hours beyond the B.A., to at least 24 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.); a special course in teaching composition; and 15 additional hours at any level, including the 400 level. Up to 6 of these additional hours may be taken in some cognate field, 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 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 and approved by a doctoral committee of three or four other faculty members.

Language Requirement: A language requirement met in one of the following ways:
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 UTK of any two courses given in the foreign language at the 400 level or above, at least one course to be at the 500 or 600 level. A minimum grade of B must be received in each course.
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 UTK and completion of two courses given in the foreign language at the 400 level or above, at least one course to be at the 500 or 600 level. A minimum grade of B must be received in each course.
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) in option 1. for one foreign language, and completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509 History of the English Language. For the other 3 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, on 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 the comprehensive examination, the student must have completed all coursework required. A student must also have met all requirements for the 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 6 hours of courses and/or dissertation hours and 3 hours of teaching each semester.

GRADUATE COURSES

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.
Entomology and Plant Pathology

(Office of Agriculture)

MAJOR DEGREE

Entomology and Plant Pathology............M.S.

Carroll J. Southards, Head

PROFESSORS:

Bernard, Ernest C., Ph.D.....................Georgia

Gerhardt, Reid R., Ph.D.....................NC State

Hilty, James W., Ph.D......................Ohio State

Johnson, Leander F., Ph.D................Louisiana State

Lambdin, Paris L., Ph.D....................VPI

Piess, Charles D., Ph.D.....................Clemson

Southards, Carroll J., Ph.D................NC State

ASSISTANT PROFESSORS:

Grant, Jerome F., Ph.D....................Clemson

Gwinn, Kimberly D., Ph.D...................NC State

Reddick, Bradford B., Ph.D..................Clemson

Windham, Mark T., Ph.D....................NC State

The Department of Entomology and Plant Pathology offers a graduate program leading to the Master of Science with a concentration in entomology or plant pathology. Students in entomology may specialize in crop entomology, medical and veterinary entomology, insect biology, insect pest management, or biological control. Students in plant pathology may specialize in foliar and stem fungus diseases, soil-borne diseases, plant nematology, or virology. For specific information, contact the department head.

THE MASTER'S PROGRAM

Admission Requirements

For admission to the M.S. degree program, a student must meet all requirements of The University of Tennessee Graduate School and must have completed (1) general botany or biology, 8 hours; (2) advanced biological sciences, 8 hours; (3) inorganic chemistry, 6-8 hours; (4) organic chemistry, 3 hours. In addition, three completed rating forms and a written statement of career goals and interest in entomology or plant pathology are required.

Degree Requirements

The program requires a written thesis based on original research and the completion of a minimum of 24 hours of coursework for graduate credit, approved by the student's advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be completed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include 6-12 hours of graduate-level credit in the minor department. The student's committee shall include a member of the faculty from the minor department to assist in designating courses required for the minor.

GRADUATE COURSES

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

522 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. E/NC only. E

510 Plant Disease Fungi (4) Morphology, taxonomy, biology, and genetics of plant pathogenic fungi. Isolation and identification of plant pathogenic fungi. Prereq: 313 or consent of instructor. 2 hrs and 2 labs. F,A

Environmental Practice

(College of Veterinary Medicine)

MAJOR DEGREE

Veterinary Medicine..........................D.V.M.

T. P. McDonald, Acting Head

Professors:

Farkas, W. R., Ph.D............................Duke

Kitchen, Hyram, D.V.M., Ph.D..............Florida

McDonald, T. P., Ph.D......................Tennessee

Oliver, J. W., D.V.M., Ph.D.................Purdue

Associate Professors:

New, J. C., D.V.M.............................Texas A&M
Schroeder, E. C., D.V.M…………Michigan State

Assistant Professors:

Frazier, D., D.V.M., Ph.D………….. NC State
Lothrop, C. D., D.V.M., Ph.D…….. Tennessee Morris, P. J., D.V.M………….California (Davis)

Clinical Associate:

Funk, R. S., D.V.M………………….Ohio State

See Veterinary Medicine for program description.

GRADUATE COURSES

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

501 Special Topics in Environmental Medicine (1-3) Current and future research methodology, laboratory techniques of in vitro evaluation of toxicity, mutagenesis, carcinogenesis, and teratogenesis. Prereq: Biochemistry 561 and 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. S/NC only. E

503 In Vitro Evaluation of Toxicity (3) Principles and techniques of in vitro evaluation of toxicology, mutagenesis, carcinogenesis, and teratogenesis. Prereq: Biochemistry 561 and consent of instructor. May be repeated. S/NC only. E

504 Experimental Animal Surgery (3) Competence in performing humane surgical modifications of experimental animals. Techniques of anesthesia. Drug administration and postoperative care. Prereq: Embryology, paratology, physiology and/or consent of instructor. 1 hr and 2 labs. F

561 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamics properties of drugs: mode of action, pharmacologic 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

610 Advanced Topics in Environmental Medicine (1-3) Current and future research methodology, laboratory techniques in analytical techniques for environmental medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

Business Administration Concentrations

For complete listing of MBA and Ph.D. program requirements, see Business Administration.

MBA Concentration: Finance.

The curriculum offers courses for those interested in careers in corporate financial management, security analysis and investments, banking and financial institutions, and real estate.

Minimum course requirements are three courses; Finance 521, plus two courses from the following: 511, 512, 522, 531, 532, 581, or 582. A fourth finance course of the student's choice is strongly advised. Courses selected must be approved by the Finance Department MBA advisor.

Ph.D. Concentration: Finance.

Minimum course requirements are finance seminars 641, 642, 651, 652.

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 faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

511 Contemporary Issues in Corporate Finance (3) Selected topics in financial management, recent developments that have significant impact on strategic issues in financial management. Capital budgeting, financial and ownership structure, dividend policy and corporate growth and control. Prereq: 501.

512 Problems in Financial Management (3) Readings and cases that apply finance theory to real world investment, financing, and asset management problems. Prereq: 501.


599 Special Topics in Finance (3) Topics vary. Prereq: 501.

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


642 Seminar in Finance II: Theory of the Firm (3) Financial theory of firm and financial decision making under conditions of uncertainty, equilibrium models of firm. Option pricing, agency theory, capital structure, economics of information, and dividend policy.

651 Advanced Seminar in Finance I (3) Recent theoretical and empirical developments in finance literature. Intertemporal asset pricing, signalling, arbitrage-pricing theory, international finance.

652 Advanced Seminar in Finance II (3) Recent theoretical and empirical developments in finance literature. Market structure, theory of intermediation, structure of interest rates.

Food Technology and Science

(College of Agriculture)

MAJOR DEGREES

Food Technology and Science …………. M.S., Ph.D.

Hugh O. Jaynes, Head

Professors:

Collins, J. L., Ph.D…………………Maryland

Miles, J. T. (Emeritus), Ph.D………Wisconsin

Oversbach, W. W. (Emeritus), Ph.D, Iowa State

Penfield, M. P., Ph.D…………….Tennessee

Associate Professors:

Biswal, R. N., Ph.D………………..Massachusetts

Christen, G. E., Ph.D……………… Missouri

The Department of Food Technology and Science offers the Master of Science and Doctor of Philosophy degrees. Students in
the doctoral program may choose research in the concentration area of food products, food chemistry, food microbiology, or sensory evaluation of foods. Commodity interests (meats, dairy, fruits, vegetables, bakery products) can be emphasized in any of the areas by careful selection of courses and the research topical areas available in cognate fields. For detailed information, contact the department head.

Graduate School rating forms or letters of recommendation from at least three people are expected. A final oral examination is required to admission to candidacy. Major professors on the Ph.D. program.

mittee considers appropriate.

will advise candidates on competencies for admission. Scores on the GRE aptitude

THE DOCTORAL PROGRAM

1. Applicants must have a B.S. in food technology, food science, or a related agri-
cultural or scientific discipline.

2. A thesis is required for the Master's program. Prior to research for the thesis, the student must develop a detailed written research plan. Registration for a minimum of 6 hours of 500 Thesis is required.

3. In addition to the thesis requirement, a minimum of 24 hours of graduate coursework is required. This work must be approved by the student's committee and a minimum of 14 hours must be courses numbered above 600. The committee may require additional coursework if the student's progress or background indicates such need.

4. All students are required to include 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their Master's program. Completion of 510 or equivalent is also required.

5. An oral examination covering the thesis and coursework is required.

THE MASTER'S PROGRAM

1. Completion of a Master's degree in the field, or a closely related field, or passing a special qualifying examination is required for admission. Scores on the GRE aptitude test are also required.


3. A minimum of 72 hours beyond the Bachelor's degree, excluding credit for the Master's thesis, is required. Of this, 24 semester hours must be 600 Doctoral Research and Dissertation. At least 5 of the 24 hours must be courses numbered above 600.

4. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Technology and Science.

5. All candidates must complete 601 (2 hrs.) and are expected to attend 601 during their Ph.D. program.

6. Each candidate must pass both written and oral comprehensive examinations prior to admission to candidacy. Major professors will advise candidates on competencies expected. A final oral examination is required that includes a defense of the dissertation and subject matter that the student's committee considers appropriate.

GRADUATE COURSES

410 Food Chemistry I (3) Reactions of proteins, enzymes, and additives in foods. Physicochemical interactions of food materials. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. F

411 Food Chemistry II (3) Reactions of inorganic compounds, carbohydrates, lipids and vitamins in foods. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. Sp

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

429 Food Microbiology Lab (3) Methods for exami-

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

440 Preservation of Food (3) Prevention of deterio-
rations and spoilage of foods. Methods of preservation. Prereq: Agricultural Engineering Technology 422. 2 hrs and 1 lab. Sp

450 Dairy Products I (3) Procurement, processing and distribution of fluid milk. Manufacture of butter, frozen and condensed dairy products. Prereq: 140 or consent of instructor. 2 hrs and 1 lab. F

451 Dairy Products II (3) Manufacture of cheese and specialized dairy products. Market standards and grades, product defects, scoring of dairy products. Prereq: 140 or consent of instructor. 1 hr and 2 labs. Sp

460 Meat Products Technology (4) Processing meth-
ods for making cured, smoked, fresh, baked and formed products. Effect of processing methods on product characteristics. Prereq: 360 or consent of instructor. 3 hrs and 1 lab. F

470 Food Crop Products (3) Food products from plants: types, manufacturing systems, quality attributes and utility. Prereq: 3 hrs biological science. 2 hrs and 1 lab. Sp

480 Cereal Science and Bakery Products (3) Cere-
my expression of foods. Commodity interests in the concentration area of food products, market standards and grades, to 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

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

501 Seminar (1) Individual reports and discussion on topics from current literature. May be repeated. Maximum 3 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. S/NC only. E

510 Instrumental Analysis of Food (3) Modern instrumental methods for control of food manufactur-
ing processes. Prereq: 410-11. 2 hrs and 1 lab. F

511 Color and Flavor of Foods (3) Chemical basis, measurement and reactions involved in color and flavor changes that occur in conversion of muscle to meat; effect of postmortem treatments on meat quality, composition and shelf-life. Prereq: 400-29, 440. Biochemistry 410 or equivalent. 2 hrs and 1 lab. Sp

520 Food and Industrial Fermentations (3) Microbiology, biochemistry and technology of food-related fermentations involving dairy products, meat, cereals, fruits and vegetables. Production of food ingredients and by-products. Prereq: 400-29, 440. Biochemistry 410 or equivalent. 2 hrs and 1 lab. Sp

521 Advanced Food Microbiology (3) Microorganisms in foods, their identification, characterization and rela-
tionship to food processing. Isolation of microorganisms from foods and plant equipment. Prereq: 420-29, 1 hr and 2 labs. Sp

540 Food Product Development (3) Art, science and technology of developing and marketing new food products. Prereq: 440. 2 hrs and 1 lab. Sp

560 Advanced Meat Science (3) Physical and chemi-
ical changes that occur in conversion of muscle to meat; effect of postmortem treatments on meat quality, composition and shelf-life. Prereq: 460. 2 hrs and 1 lab. Sp

580 Oilsed Products (3) Chemistry and technology of foods and food ingredients produced from oils. Prereq: 410-11 or equivalent. 2 hrs and 1 lab. Sp

590 Special Topics in Food Technology and Sci-
cence (1) Critical reviews of current research and production concerns of the food industry. May be repeat-
ed. Maximum 3 hrs. F

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

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

601 Seminar 1 (Reports and directed discussion on research topics from current literature. May be repeat-
ed. Maximum 3 hrs. F

620 Food Toxicology (2) Basic and applied concepts in food toxicology; toxicological aspects of processed foods. Methods of action, prevention and control of food toxicants in food supply. Prereq: 410-11, 521, or consent of instructor. Sp

640 Advanced Food Processing (3) Role of processing treatments in modification of food properties; texture, flavor and color characteristics. Prereq: 440, 510, 511 or consent of instructor. Sp

THE DOCTORAL PROGRAM

Forestry, Wildlife and Fisheries Science (College of Agriculture)

MAJORS DEGREES

Forestry.................................M.S.

Wildlife and Fisheries Science.................................M.S.

George T. Weaver, Head

Professors:

Barrett, J. W. (Emeritus), Ph.D........................................Syracuse

Buckner, E. R., Ph.D........................................NC State

Core, H. A. (Emeritus), Ph.D........................................Syracuse

Dimmick, R. W., Ph.D........................................Wyoming

Hammitt, W. E., Ph.D........................................Michigan

Little, R. L., Ph.D........................................NC State

McGee, C. E. (Adjunct), D.F........................................Duke

Ostermeier, D. M., Ph.D........................................Syracuse

Pelton, M. R., Ph.D........................................Georgia

Ripley, T. H. (Adjunct), Ph.D........................................VPI

Schneider, G. D.........................................Michigan State

Sharp, J. B., D.P.A........................................Harvard

Smalley, G. (Adjunct), Ph.D........................................Tennessee

Strange, R. J., Ph.D........................................Oregone State

Stumbo, D. A., Ph.D........................................Minnesota

Thur, E. (Emeritus), Ph.D........................................NC State

Welcer, G. T., Ph.D........................................Tennessee

Wilson, J. L., Ph.D........................................Tennessee

Woods, F. W., Ph.D........................................Tennessee

Associate Professors:

Dearden, B. L., Ph.D........................................Colorado State

Hay, R. L., Ph.D........................................Duke

Hopper, G. M., Ph.D........................................VPI

Johnson, D. W. (Adjunct), Ph.D........................................Washington
Forestry and Wildlife Sciences

GRADUATE COURSES

Forestry

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

422 Forest and Wildland Resource Policy (3) Policy formulation; criteria for determining forest use; federal and wildland law and regulation; theory of conflict resolution; formal and informal resolution. Prereq: Senior standing.

423 Forest Recreation Planning and Management (3) Planning processes, master and site planning, site design projects; management strategies, methods of visitation; recreation management; case studies. Weekend field trips. Prereq: 321, 323. Ornamental Horticulture and Landscape Design 280, or consent of instructor. 1 hr and 2 labs.

431 Solid Wood Processing (3) Production processes or solid wood products: sawmilling, secondary machining, drying and preservation. Prereq: 331 and 332, or consent of instructor. 2 hrs and 1 lab.

433 Wood Composites and Gluing (3) Principles of adhesion; wood adhesives; fundamentals of plywood and composite panel manufacture. Evaluation resin properties; testing bond strength and durability. Prereq: 331 and 332, or consent of instructor. 2 hrs and 1 lab.

434 Measurement and Marketing of Wood Products (3) Measurement systems used for sale and transfer of wood products. Application of market principles and analysis to wood products markets and economic structure of wood products industry. Prereq 431, 433, and Forestry, Wildlife and Fisheries 315, or consent of instructor. Sp

500 Thesis (1-15) May be repeated. 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

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

512 Seminar (1) Current developments in forestry. Required of all graduate students in residence fall semester. May be repeated. Maximum 2 hrs. S/NC only. F

520 Advanced Forest Tree Biology (3) Growth, reproduction, and physiology of trees; forest ecology; variability and taxonomy of forest trees. Prereq: Graduate standing in forestry, or biological science, or consent of instructor. Sp

520 Advanced Forest Resource Management (3) Analysis of forest management problems as exemplified in public agencies and private firms. Forest organization and computerized regulation systems; financial and operational planning tools, as applied to forest resource management. Prereq: Senior-level forest management or consent of instructor.

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

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

555 Forest Recreation Research Methods (3) Evaluation of research methodologies through readings and case studies; techniques of recreation resource monitoring and research investigation; current research trends in wildland recreation. Prereq: 321 or equivalent and statistics.

560 Industrial Forestry I (3) Economic structure of forest products industries. Identification and analysis of industry structure and markets, domestic and foreign. Current trends in markets and industrial structure. Impacts on short-term and strategic planning. Prereq: Senior-level forest management or consent of instructor.

565 Industrial Forestry II (3) Evaluation of alternative strategies for firms in industry. Role of timber and timber management in integration of forest resource into the overall firm from standpoint of financial and strategic evaluations for different levels of self-sufficiency in securing raw material supplies. Tax and legal aspects of fee and leasehold interests. Other financial and institutional arrangements affecting forest management and marketing strategies for private, industrial firms. Prereq: Senior-level forest management or consent of instructor.

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

580 Advanced Silviculture (3) Silvicultural characteristics, silvicultural practices and systems applied to commercially important hardwoods and softwoods. In-depth analyses of silvicultural principles involved and tools used, prescription process. Forest land classification, management strategy, computer modeling of stand dynamics, structure, growth/yield.

585 Forest Biome III (3) Application of sampling techniques to forest inventory; fixed and variable plot sampling; lasso sampling; forest vegetation estimators; multistage and multiphase sampling. Growth and yield prediction for even-aged and uneven-aged forests. Prereq: 325 or consent of instructor.

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

Wildlife and Fisheries Science

GRADUATE COURSES

441 Wildlife and Fisheries Techniques (3) Capturing and handling fish and wildlife; population restoration;
**443 Fisheries Science (3)** Quantification and management of freshwater fisheries: population estimation, age and growth, biological assessment, and stocking. Prereq: Forestry, Wildlife and Fisheries 317 or Biology 230, and 6 hrs of mathematics. 2 hrs and 1 lab. S

**444 Ecology and Management of Wild Mammals (3)** Biological and ecological characteristics of game mammals and endangered mammals. Current principles and practices of wild mammal management. Prereq: Forestry, Wildlife and Fisheries 317 or Biology 230, 2 hrs and 1 lab. F

**445 Ecology and Management of Wild Birds (3)** Biological and ecological characteristics of game birds, endangered birds, and bird pests. Current principles and practices of wild bird management. Prereq: Forestry, Wildlife and Fisheries 317 or Biology 230. 2 hrs

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

**502 Registration for Use of Facilities (3-15)** Required during residency, 501 and 3 semester hours of related coursework. A minimum of 12 hours must be earned in related fields outside the department. Competence in cartography and quantitative techniques is required. Additional tools, including languages, will be required as appropriate to the student's areas of research specialization. Examinations required for admission to candidacy include a written examination, oral examinations on two special fields; and an oral examination on the student's program, the special fields, and the dissertation proposal. Also required is a final oral examination on the dissertation and on other aspects of the program as determined by the student's doctoral committee.

### ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some southern states to enroll in graduate programs at UTK on an in-state tuition basis. The Ph.D. program in Geography is available to residents of the states of Alabama, Arkansas, Mississippi, South Carolina, Virginia, or West Virginia. The Master's program is also available to residents of Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

### GRADUATE COURSES

**411 Computer Mapping and Geographic Information Systems (3)** Concepts, management, and presentation of digital data for spatial analysis: cartographic data structures. Prereq: 310 and knowledge of computer language or consent of instructor. 2 hrs and 1-2 hr lab.

**412 Cartography (3)** Cartographic techniques applied to design, compilation, and reproduction of maps and other graphic materials. Prereq: 310 or consent of instructor. 2 hrs and 1-2 hr lab.

**413 Remote Sensing: Types and Applications (3)** Principles and uses of remote sensing imagery, digital data, and specific geographic interpretation and mapping techniques. Prereq: 310 or consent of instructor.

**415 Quantitative Methods in Geography (3)** Geographic application of statistical techniques, point pattern analysis, and analysis of areal units. Prereq: Mathematics 115 or two semesters of calculus or consent of instructor.

**421 Geography of Folk Societies (3)** Geographical study of folk culture, traditional material culture and rural settlement, examples from eastern North America and selected foreign areas. Prereq: 102 or 130 or consent of instructor.

**425 Historical Geography of the United States (3)** Survey of changing human geography of the United States during four centuries of settlement and development. Changing population patterns, development of agricultural regions, and patterns of urban-industrial development. Prereq: 361 or consent of instructor.

**433 The Land-Surface System (3)** Nature and regional variations in relationships among surface form, water, vegetation, and surface materials. People as evaluators and agents of change. Prereq: 131-32 or 330 or consent of instructor.

**434 Climatology (3)** General circulation systems leading to world pattern of climates. Climatic change and modification, and interrelationships of climate and human activities. Prereq: 131-33 or consent of instructor.

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**French**

**See Romance Languages**

**Geography**

*(College of Liberal Arts)*

**MAJOR**

**DEGREES**

Geography ........................................... M.S., Ph.D.

Sidney R. Jumper, Head

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**Professor:**

Aiken, Charles, Ph.D., M.S., Ph.D. ................................................................. Georgia Bell, Thomas L., Ph.D. ................................................................. Iowa Hammond, E. H. (Emeritus), Ph.D., M.S., California Jumper, Sidney R., Ph.D. ................................................................. Tennessee Long, G. (Emeritus), Ph.D. ................................................................. Northwestern Minkel, C. W., Ph.D. ................................................................. Syracuse Palumbi, Stephen R., Ph.D. ................................................................. Delaware Ralston, B., Ph.D. ................................................................. Northwestern Smude, B. T., Ph.D. ................................................................. Wisconsin Wilbanks, T. J. (Adjunct), Ph.D. ................................................................. Syracuse

**Associate Professors:**

Brinkman, L. W. Jr., Ph.D. ................................................................. Wisconsin Carter, James R., Ph.D. ................................................................. Georgia Foresta, R., Ph.D. ................................................................. Rutgers Paluch, L., Ph.D. ................................................................. Southern Illinois Rehder, J. B., Ph.D. ................................................................. Louisiana State

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The department offers the Master of Science and Doctor of Philosophy degrees. The Master's degree emphasizes development of professional competence as a geographer and offers opportunities to gain substantial depth in a concentration or a major technique. An emphasis in geographic information systems is available for students who have appropriate backgrounds in mathematics and computer science. The doctoral program is for those who have demonstrated proficiency in conducting independent research. The department is particularly well-qualified to direct research in geography of the natural environment (biogeography, biological conservation, geomorphology), spatial analysis (especially transportation and location analysis), Latin America, and the American South. Graduate concentrations include nonmetropolitan areas, land use, urban geography, transportation geography, geography of resources, geography of development, and regional and historical geography of the United States.

**THE MASTER'S PROGRAM**

The department offers the thesis and non-thesis options for the Master of Science. Both options require a minimum of 30 semester hours beyond the completion of a sound undergraduate major program. At least two-thirds of the hours in the degree program must be at or above the 500 level and must include 501 (at each offering during residency), 504 and 3 semester hours at the 600 level. In the thesis option, no more than 6 hours may be thesis. A final examination is required in both programs.

**THE DOCTORAL PROGRAM**

The doctorate is a research degree and is granted only to those who demonstrate proficiency in conducting independent research. Students must have achieved the equivalent of a comprehensive Master's program before they will be admitted to the doctoral program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program of study must include sufficient coursework within the department, but outside the areas of concentration, to give broad foundation and understanding of the discipline. The program must include 504, 515, 599, and (at each offering during residency) 501. A minimum of 12 hours must be earned in related fields outside the department. Competence in cartography and quantitative techniques is required. Additional tools, including languages, will be required as appropriate to the student's areas of research specialization. Examinations required for admission to candidacy include a written examination, oral examinations on two special fields; and an oral examination on the student's program, the special fields, and the dissertation proposal. Also required is a final oral examination on the dissertation and on other aspects of the program as determined by the student's doctoral committee.
441 Urban Geography (3) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. Prereq: 101-02 or 141 or 340 or consent of instructor. (Same as Urban Studies 441)

443 Rural Geography (3) Geographical appraisal of rural areas of United States; small towns and urban fringes. Problems and potentials of rural America. Prereq: 101-02 or 141 or 340 or consent of instructor.

445 Geography of Resources (3) Study of factors related to variations in resource availability from time to time and place to place; energy and metallic resources. Prereq: 101-02 or 141 or 340 or consent of instructor.

449 Geography of Transportation (3) Examination of transportation systems, their effects on trade patterns, land use, location problems, and development. Prereq: 141 or 340 or consent of instructor.

450 Process Geomorphology (3) (Same as Geology 450)

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

501 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration required of resident graduate students whenever offered. May be repeated. Maximum 4 hrs. May be applied toward graduate degree. S/NC only.

502 Registration for Use of Facilities (3-15) Required of 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 Research Design (3) Geographical research from selection of topic and development of research design through field work and final report.

505 Directed Research (2-6) Research on problems as related to individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 6 hrs. S/NC only.

506 Directed Readings (2-6) Readings on topics of interest as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC only.

509 Topics in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

512 Topics in Cartography (3) Trends, concepts, problems and methods in cartography. Prereq: 411 and 412 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

513 Topics in Remote Sensing (3) Applied research using imagery for interpretation and mapping of geographic data. Prereq: 413 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

515 Topics in Quantitative Geography (3) Multivariate analysis applied to problems in geography; research problems utilizing appropriate computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 415 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

517 Geographic Information Management and Processing (3) Concepts and methods in management of geographic information. Database design, manipulation, sampling and analysis. Prereq: Consent of instructor.

519 Graduate Practicum in Cartography/Remote Sensing (2-6) Prereq: Written consent of department before registration. May be repeated with consent of instructor. Maximum 6 hrs.

521 Topics in Cultural Geography (3) Examination of trends, problems and methods in cultural geography. Prereq: 421 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

524 Topics in Political Geography (3) Geographical consequences of public decisions; understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

525 Topics in Historical Geography (3) Examination of trends, concepts, and methods in historical geography. Prereq: 425 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

533 Topics in Physical Geography (3) Examination of trends, problems, and methods in geography of land surface system or in modern climatology. Prereq: 433 or 434 and consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

535 Topics in Biogeography (3) Examination of trends, problems, and methods in biogeography. Prereq: 435 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

541 Topics in Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 441 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

549 Topics in the Geography of Transportation (3) Examination of trends, problems, and methods in transportation geography and transportation networks. Prereq: 449 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

550 Regional Geomorphology (3) (Same as Geology 550)

577 Biological Conservation (3) Analytical treatment of politics, policies, and norms of biological conservation as practiced in U.S. and abroad. Prereq: Consent of instructor.

591 Foreign Study (1-15) See page 31. Prereq: Written consent of department prior to registration. Maximum 6 hrs.

592 Off-Campus Study (1-15) See page 31. Prereq: Written consent of department prior to registration.

593 Independent Study (1-15) See page 31. Prereq: Written consent of department prior to registration.

599 Geographic Concept and Method (3) Traditional and modern geographic thought; readings on nature, scope, problems, and methods of geography. Prereq: Consent of instructor.

600 Doctoral Research and Dissertation (3) Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 yrs.

625 Seminar in Historical Geography (3) Prereq: 525 or consent of instructor. May be repeated. Maximum 6 hrs.

633 Seminar in Physical Geography (3) Prereq: 533 or consent of instructor. May be repeated. Maximum 6 hrs.

635 Seminar in Biogeography (3) Prereq: 535 or consent of instructor. May be repeated. Maximum 6 hrs.

641 Seminar in Urban Geography (3) Prereq: 541 or consent of instructor. May be repeated. Maximum 6 hrs.

643 Seminar in Rural Geography (3) Prereq: 443 or consent of instructor. May be repeated. Maximum 6 hrs.

649 Seminar in Geography of Transportation (3) Prereq: 549 or consent of instructor. May be repeated. Maximum 6 hrs.

663 Seminar in Geography of the American South (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

673 Seminar in Geography of Latin American (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

The Department of Geological Sciences offers both the M.S. and Ph.D. degrees in Geology. Persons interested in these programs should contact the Director of Graduate Admissions in the department.

For admission, an applicant must provide transcripts of previous university work, two rating forms or letters of recommendation, and GRE scores, including the subject exam in geology (or in another area if geology was not the area of previous university-level concentration). Students are not admitted under provisional or non-degree status.

Prerequisite for both degrees is a Bachelor's degree, including coursework in mineralogy, optical mineralogy, petrology, stratigraphy, paleontology, structural geology, and field geology. One year each of coursework in calculus and chemistry and one year of coursework in biology, physics, or statistics are also required. Applicants lacking any of these may be admitted, but the deficiencies must be removed within the first year without graduate credit.

THE MASTER'S PROGRAM

The department offers the thesis option in the Master's program. Graduation requires successful oral defense of a written thesis and a minimum 3.0 GPA in all graduate coursework.

Course requirements are a minimum of 30 semester hours, including:
The DOCTORAL PROGRAM

The prerequisite for the Ph.D. program, in addition to that for the M.S. program, is either a Master's degree in Geology, or a Bachelor's degree plus completion of 9 hours of coursework from the list in #3. above, including one course from each group. These courses may be taken while completing other course requirements.

Graduation requires passing a comprehensive examination, taken no later than the end of the second year, completion of all course requirements with a minimum 3.0 GPA, completion of the language requirement, and successful oral defense of the dissertation.

The comprehensive examination includes both written and oral parts in which the candidate will be tested on his/her knowledge of the area concerning the proposed dissertation and of related fields. The candidate is expected to be conversant in a wide field of geological sciences. A minimum of 24 hours of graded coursework is required in addition to the 24 hours of Dissertation 600. The coursework includes the sum of 6 hours of 600-level geology courses, 12 hours of 500-level or higher geology courses, and 6 hours of additional graduate courses. Extra-departmental coursework is encouraged. Registration in 595 is required during the first four years in residence.

The student must demonstrate a reading knowledge of one of the foreign languages in which there is a body of geologic literature, as approved by the student's dissertation committee.

GROUNDS COURSES

410 Advanced Mineralogy (3) Crystal chemistry of rock-forming minerals. Interaction of electromagnetic radiation and crystalline solids. Optical properties of minerals, visible and infrared spectroscopy, and x-ray diffraction. Laboratory exercises emphasize thin section and x-ray diffraction methods of mineralogy. 2 hrs and 1 lab.

420 Paleocology (4) Principles of ecological analysis as applied to fossils and fossil assemblages: data collection and interpretation. Laboratory designed around preparation of mineralogic exotic rocks based on text and laboratory analysis. Writing emphasis course. 3 hrs and 1 lab.

421 Invertebrate Paleontology I (3) Survey of preservational processes and geologically important representatives of Protista, Porifera, Cnidaria, Bryozoa, and Brachiopoda. Functional morphology, skeletal structures, ecology, and stratigraphic distribution. Prereq: 320 or consent of instructor. 2 hrs and 1 2-hr lab.

422 Invertebrate Paleontology II (3) Survey of higher invertebrates: Annelida and other worms, Mollusca, Arthropoda, Echinodermata, Graptolida, Conodonta, Chordata. Functional morphology, skeletal structures, ecology, and stratigraphic distribution. Prereq: 320 or consent of instructor. 2 hrs and 1 2-hr lab.


426 Paleobotany and Palynology (3) Evolutionary history of terrestrial vegetation. Interpretation of fossil record of macrobotanical remains, spores, and pollen grains. Origin and diversification of Gymnosperms and Angiosperms; changes in floristic provinces through geologic time. Prereq: 102; Botany 310-20 or consent of instructor. (Same as Botany 426) 3 hrs and 1 lab.

440 Field Geology (6) Summer field course advanced undergraduate geology majors and first-year graduate students in geology. Taught off-campus at Geology Field Station and requires full time of student. Field techniques; methods. Field problem: application, practiced, and applied to solution of geologic problems. Prereq: Completion of major core courses and consent of instructor.


450 Process Geomorphology (3) Integrative approach to development of earth based on understanding of surface history, maps, remote sensing imagery. Prereq: 101-02. (Same as Geography 450.) 2 hrs and 1 2-hr lab.

455 Basic Environmental Geology (3) Applications of geoscientific sciences toward comprehension of effects of geologic processes on humans and effects of human activities on earth's environment. Prereq: 12 hrs of geology courses. 2 hrs and 1 3-hr lab or field period.

460 Principles of Geochemistry (3) Application of chemical principles to geologic problems. Crystal chemistry and relation between basic atomic structure and distribution and behavior of elements in earth's crust. Prereq: Chemistry 120-30. Recommended prereq: 330. 2 hrs and 1 lab.

470 Applied Geophysics (3) Basic principles and applications of seismic, gravity, magnetic, and electrical prospecting methods. Recommended prereq: Mathematics 141-42 and Physics 131. 2 hrs and 1 lab.

480 Principles of Economic Geology (3) Ore-forming processes, classification of mineral deposits, survey of different types of mineral deposits with examples, and metallogeny. Prereq: 310 and 330 or equivalents. Recommended prereq: 460. 2 hrs and 1 2-hr lab.

500 Thesis (1-15) 6/NC only. E

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

510 Clay Mineralogy (3) Origin, chemistry, structures, and properties of clay minerals; application of mineralogical techniques in clay mineral studies. Prereq: 310 and 568 or equivalent. 2 hrs and 1 lab.

520 Advanced Paleontology (3) Detailed analysis of selected groups of fossil organisms; functional morphology, evolutionary development.

521 Data Analysis in Geology and Paleobiology (3) Application of statistical and other quantitative techniques to geologic and paleontological data. 2 hrs and 1 seminar.

525 Biostatistics (3) Examination of principles of stratigraphy and biostatistics through examination of case histories. 1 hr and 1 2-hr seminar.

530 Petrogenesis of Crystalline Rocks (4) Origin and properties of igneous and metamorphic rocks, magmatic and subvolcanic processes and physical properties. Laboratory and petrographic studies of study rocks in thin section. Prereq: 410. 3 hrs and 1 lab.
Germanic and Slavic Languages

(College of Liberal Arts)

MAJORS DEGREES

German M.A.
Modern Foreign Languages Ph.D.

David E. Lee, Head

Professors:

Falen, James E., Ph.D. Pennsylvania
Flene, Donald M., Ph.D. Indiana
Fuller, H. W. (Emeritus), Ph.D. Wisconsin
Kratz, Henry, Ph.D. Ohio State
Osborne, J. C., Ph.D. Northwestern

Rice, Martin P., Ph.D. Vanderbilt
Rittenhoff, U., Ph.D. Connecticut

Associate Professors:

Hodges, Carolyn R., Ph.D. Chicago
Lauckner, Nancy A., Ph.D. Wisconsin
Lee, David E., Ph.D. Stanford
Mellor, C. J., Ph.D. Chicago

Assistant Professor:

Kolodziej, J. I., Ph.D. Indiana

The Department of Germanic and Slavic Languages offers two advanced degrees: the Master of Arts in German and the Doctor of Philosophy in Modern Foreign Languages. Inquiries should be addressed to the head of the department.

THE MASTER'S PROGRAM

The department requires a minimum of 30 semester hours including 15 hours of coursework above the 500 level and 6 hours of Thesis 500.

THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

Admission Requirements

Applicants must have completed a B.A. in either French, German or Spanish to be accepted into this program. Both graduates of institutions in the United States and those with undergraduate degrees from institutions outside the United States must have a grade point average of at least 3.0. Consideration will also be given to applicants who do not have an undergraduate degree in one of the three foreign languages but do have the equivalent of an undergraduate major in one of them.

Degree Requirements

Candidates must complete a minimum of 63 semester hours of course work beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. The program shall consist of a first concentration, a second concentration, and a cognate field.

1. First Concentration: French, German or Spanish. It will consist of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:
   - A minimum of 21 hours at the 500 level (exclusive of thesis hours including French 584 (3), German 560 (3), or Spanish 550 (3); French 512 (3), German 512 (3), or Spanish 512 (3); French 515-18 (2.2), or German 520 (3).
   - At least 12 hours at the 600 level (exclusive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It shall consist of at least 18 hours beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.

3. Cognate Field: 9 hours must be in courses numbered 400 and above in a field outside the department of the first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be administered after completion of the 6 cognate hours by the language section concerned.

4. Additional Requirements: A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized examinations that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI).

If the student has not chosen a third language as his or her cognate area, basic competence (determined by a reading examination of translation into English administered by the department concerned) in a third language is required. If the student's first and second languages are Romance languages, the third language should be chosen from another language branch.

A comprehensive examination on the language literature and literature of the third foreign languages must be passed before the student may be admitted to candidacy. The candidate will be required to defend his/her dissertation in an oral examination. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct in at least two foreign languages, subject to staffing needs.

Doctoral students will be strongly encouraged to reside and study abroad and will be assisted in identifying potential sources of financial support (e.g. Fulbright, McClure, Rotary fellowships).

For additional courses, refer to Romance Languages.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The Ph.D. program in Modern Foreign Languages is available to residents of the state of Alabama. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

German

GRADUATE COURSES

331-332 Elements of German for Upper-Division and Graduate Students (3) Elements of language, elementary and advanced readings and a final 10,000 word translation project. Open to graduate students preparing for language examinations, and upper-division students desiring reading knowledge of the language. No credit for students having completed 191-02 or 107. 332 may be repeated. Maximum 6 hrs. Undergraduate credit only.
### Health, Leisure, and Safety

#### MAJORS

<table>
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<tr>
<th>Major</th>
<th>DEGREES</th>
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<tr>
<td>Public Health</td>
<td>M.P.H.</td>
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<td>Recreation and Leisure Studies</td>
<td>M.S.</td>
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<tr>
<td>Safety Education and Service</td>
<td>M.S.</td>
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<tr>
<td>School Health Education</td>
<td>M.S.</td>
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#### GRADUATE COURSES

455 Introduction to Descriptive Linguistics (3) (Same as French 425, German 425, Spanish 425, and Linguistics 426.)

456 Methods of Historical Linguistics (3) Phonetics, distinctive feature analysis, sound change types, nature of sound change, principles of reconstruction and fundamental assumptions about language change through time. Survey of non-phonological linguistic change, language families, Proto-Indo-European and other proto languages. Prereq: 6 hrs of upper division foreign language courses (excluding courses in translation or graduate reading courses). (Same as Russian 425, French 426, Spanish 428, and Linguistics 426.)

435 Structure of the German Language (3) Contrastive English-German segmental and suprasegmental phonemes, contrastive English-German linguistic structures, selected topics in advanced German grammar and syntactic analysis. Prereq: 6 hrs of upper division German language courses (excluding courses in translation and graduate reading courses). (Same as Linguistics 435.)

436 History of the German Language (3) Development of German language from Indo-European through Proto-Germanic, Old High German, Middle High German to New High German. Internal and external linguistic history of German speech. Prereq: 6 hrs of upper division German language courses (excluding courses in translation or graduate reading courses). (Same as Linguistics 436.)

485 Business German (3) Survey of German used in fields of business, government, administration and economics. Prereq: 6 hrs of upper-division German excluding courses in translation and graduate courses.

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

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.

510 German Phonetics and Advanced Grammar (3) Advanced work in phonetics, pronunciation, and selected topics in German grammar. For teachers and prospective teachers. Prereq: Consent of instructor.

512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic language skills and foreign language skills, and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding GTAs, except those whose previous training or experience warrants excuse by department.

520 Seminar (3) Bibliography; methods; illustrative problems; preparation of papers.

530 Studies in Russian Literature (3) Content varies. May be repeated. Maximum 6 hrs.

541-42 Medieval German Language and Literature (3,3) 541—Introduction to Middle High German; 542—Readings in Medieval German Literature.

550 Studies in German Literature (3) Content varies. May be repeated. Maximum 6 hrs.

551 German Humanism, Reformation and Baroque (3) Content varies. May be repeated. Maximum 6 hrs.

552 German Enlightenment, Rococo and Sturm und Drang (3) Content varies. May be repeated. Maximum 6 hrs.

553 German Classicism and Romanticism (3) Content varies. May be repeated. Maximum 6 hrs.

554 German Realism and Naturalism (3) Content varies. May be repeated. Maximum 6 hrs.

555 Modern German Literature 1890-1945 (3) Content varies. May be repeated. Maximum 6 hrs.

556 Modern German Literature 1945-Present (3) Content varies. May be repeated. Maximum 6 hrs.

560 German Literary Theory and Criticism (3)

561-62 Directed Readings in German Language and Literature (3,3)

571-72 Old Norse Language and Literature (3,3)

591 Foreign Study (1-15) See page 31.

592 Off-Campus Study (1-15) See page 31.

593 Independent Study (1-15) See page 31.

600 Doctoral Research and Dissertation (3-18) P/NP only.

610 Gothic (3) Phonology, morphology, and syntax of Gothic language. Relationship to Indo-European languages and other Germanic languages. Readings from Gothic Bible.

611 Old High German (3) Phonology, morphology, and syntax of Old High German. Representative readings.

612 Old Saxon (3) Phonology, morphology, and syntax of Old Saxon. Representative readings.

621-22 Seminar in German Literature (3,3) May be repeated. Maximum 18 hrs.

631-32 Seminar in German and Germanic Philology (3,3)

### Health, Leisure, and Safety

(College of Education)

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### Health Education

- Ed.D.
- Ph.D.

**Charles B. Hamilton, Head**

**Professors:**
- Gorski, J., Dr.P.H. UCLA
- Hamilton, Charles B., Dr.P.H. Oklahoma
- Hayes, Gene E., Ph.D. North Texas State
- Kirk, Robert H., H.S.D. Indiana
- Wallace, Bill C., Ed.D. Northern Colorado

**Associate Professors:**
- Krick, Ken L., Re.D. Indiana
- McGuire, Joseph L., Ph.D. Michigan
- Neutens, J. J., Ph.D. Illinois
- Pursley, R. Jack, Ph.D. Iowa
- Rockett, Ian R., Ph.D. Brown
- Thompson, A. F., Ph.D. Michigan State

**Assistant Professors:**
- Aldrich, T. E., Ph.D. Texas
- Blackmon, James T., Ed.D. Tennessee
- Blanton, Mary Dale, Re.D. Indiana
- Ellison, Jack S., Ed.D. Tennessee
- Levin, Barbara, M.D. California (San Francisco)
- Pressly, V. W., Ed.D. Tennessee
- Putnam, Sandra L., Ph.D. Brown

**Lecturer:**
- Duffy, Mary, M.D. Pennsylvania

The Department of Health, Leisure, and Safety offers graduate programs leading to the Master of Science, the Master of Public Health, the Specialist in Education, the Doctor of Education, and the Doctor of Philosophy with a major in Education. Inquiries should be directed to the department head.

### Health

Graduate programs are available leading to the Master of Science with a major in School Health Education (thesis and non-thesis options) and to the Doctor of Education with a major in Health Education.

The Master of Science, with thesis and non-thesis options, requires completion of 30 semester hours.

The Doctor of Philosophy with a major in Education offers a concentration in health education and choice of supporting specializations from public health or safety as listed under Education.

### ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The Ed.D. program in Health Education is available to residents of the states of Kentucky or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

### GRADUATE COURSES

400 Consumer Health (3) Survey of major consumer health care providers and health care services; selecting, purchasing, evaluating and financing medical and
health care services/products. (Same as Public Health 400.) E

405 Alcoholism and Alcohol Education (3) Problems of alcoholism. Factors which make alcoholism seri-
ous health and safety problem. Various types of instructional/educational and intervention programs. F,Sp

406 Death, Dying and Bereavement (3) Aspects of dying death and handling of trauma of loss. Medical, financial, physical, legal and social implications of death. F,Sp

414 Physical Activity and Fitness (2) (Same as Physical Education 414.)

420 Sex Education As It Relates to Human Sexuality (3) Exploration of science of human sexuality. Trends, issues, and content of sex education. E

425 Women's Health (3) Factors influencing women's health and women consumers in nation's health ser-
vice delivery systems. Health problems/concerns of women and techniques for prevention, maintenance and/or correction. (Same as Women's Studies 425.) E

430 Suicide and Crisis Intervention (3) Factors which make suicide serious health problem. Assessment, intervention, and prevention techniques. Sp

435 Substance Use and Abuse (3) Drug and alcohol abuse problems and suspected causes; pharmacolo-
y and psychosocial problems and strategies for prevention and intervention. Sp

465 Aging and Health (3) Aging process in health perspective as related to health promotion and well-
ness of aged. F,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 student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeat-
ed. S/NC only. E

510 Trends and Issues in Health Education (3) Conceptual, theoretical, and methodological analysis of best practices in health, lifelong learning, philosophy, principles, problems and trends of and in health and health education. F

520 Sex Education and Human Sexuality (3) Advanced in-depth discussion of educational and health coun-
selng theory, techniques, materials used in school, community, or health care facility. Sp

530 Curriculum Development for Health Education Programs (3) Analysis of current health education curricula for elementary and secondary schools, commu-
nity and health care settings. Sp, Su

540 Evaluation in Health Education (3) Principles of evaluation of health instruction and programs in regard to health knowledge, attitudes, and behavior. Con-
struction of instruments and criticism of existing instruments. Sp

580 Graduate Workshop (1-3) Specific health/well-
ness or health promotion issues. Specific health problems in concentrated period of time. May be repeated. Max-
imum 12 hrs.

570 Special Topics (1-3) For graduate students, in-service teachers and other health professionals. Health/wellness or health promotion issues. May be repeat-
ed. Maximum 12 hrs.

590 Research Methods in Health (3) Basic research techniques in variety of health settings. Development of research skills and problem identification for research topic. (Same as Public Health 590.) F

593 Directed Independent Studies (1-3) Individual identification and study of health/wellness or health promotion problem/issue. Specific proposal to instruc-
tor for registration. May be repeated. Maximum 12 hrs. E

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

601 Internship/Research in Safety and Health (3-6) (Same as Safety 501.)

610 Critical Analysis of Writing and Research (3) F

620 Advanced Research Techniques in Health (3) Advanced theory and techniques of research design and methodologies in health discipline. Prereq: 590, 610. Sp

650 Health Aspects of Gerontology (3) Knowledge and understanding of biological, psychological and sociological aspects of aging in relation to health and wellness of individual. (Same as Public Health 650.) Su

655 Seminar in Nation's Health (3) Comprehensive study of definition, determinants, resources and health status of nation. (Same as Public Health 660.) F

660 International Health (3) Study of quality of health, health promotion and health services in countries throughout world. (Same as Public Health 660.) Sp

680 Seminar in Health (3) Ramifications of health and health education innovations in relation to evolving field and discipline. Prereq: Advanced standing as doctoral candidate. Sp

Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Three professional preparation concentra-
tions are available: community health education, health planning/administration, and occupational/environmental health and safety. The M.P.H. program is accredited by the Council on Education for Public Health.

ADMISSION REQUIREMENTS

A statement of the applicant's educational and career goals and three rating forms are required. Appropriate forms are available from the department's program in Public Health. Preferential consideration for admis-
sion to degree status shall be given to those with a minimum undergraduate grade-point average of 2.8 and with one year of profes-
sional experience in a health-related occupation.

THE MASTER'S PROGRAM

The M.P.H. is a non-thesis program requiring completion of 38 semester hours of coursework including 10 weeks of field prac-
tice. Field practice provides a full-time experience with an affiliated health agency or organization offering one or more health pro-
grams. Of immediate interest is the opportunity to allow the student to apply academic theories, concepts, and skills in a realistic setting. Students must complete two-thirds of their courses with a minimum overall GPA of 3.0 prior to placement in the field.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal resi-
dents of some states to enroll in certain programs at UTK on an in-state tuition basis. The M.P.H. program in Public Health is avail-
able to residents of the states of Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Virginia, or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

400 Consumer Health (3) (Same as Health 400.)

410 Health in the Work Environment (3) Fundamen-
tal activities in field of industrial health aimed at reducing health problems for employees. Workplace health haz-
ards are analyzed, and strategies for dealing with medical, managerial, and environmental factors in industrial health and safety fields. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F

493 Directed Independent Study (1-3) Individual in-
depth study of selected issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F

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 repeat-
ed. S/NC only. E

505 Continuing Education in Public Health (1-3) Selected learning activities and experiences in specialized areas of public health utilization workshop format. May be repeated. Maximum 9 hrs.

509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health as discipline and its interrelation with many other academic and professional disciplines. Speaker-
s both internal and external. May be repeated. Maximum 4 hrs. (Same as Nursing 509, Nutrition and Food Science 509, Social Work 509, and Social Work 509.) S/NC only. E

510 Environmental and Occupational Health (2) Complexities of personal and ambient environment recognizing health as individual's response to diverse and dynamic world. Principles of occupational safety and health. Survey of contemporary issues and their implications for healthful living today and in future. F

511 Fundamentals of Industrial Hygiene (3) Occupa-
tional health theory, practice and regulations. Recognition, evaluation and control of workplace health hazards. Pertinent workplace problems and situations. F

512 Industrial Hygiene Controls (4) Activities in com-

513 Industrial Hygiene Instrumentation and Sam-
ping (3) Instruments for collection of data on industrial environment for personal exposure to chemical and physical stressors affecting worker's health. Lectures, demonstrations, and lab. Prereq. 511 or consent of instructor. Sp

514 Industrial Toxicology and Occupational Exposures (3) Principles of industrial toxicology, basic toxic mech-
aisms, portals of entry, physiologic and biochemical responses. Occupational exposure assessment, phys-
ical factors and environmental conditions that influence exposure characterization, statistical aspects of samp-
ing, and transport of contaminants into general environment. Sp

520 Public Health Policy and Administration (3) Admin-
istrative considerations of community-based health care programs and their impact on health practice. Health policy formulation, political environment and governmental involvement in health, legal responsibilities, and man-
gerial concepts/techniques/process. F, Su

521 Organization Theory and Health Care Delivery (3) Administrative and Organization theory related to health facilities; operation and management of com-
munity hospital. Case discussions and problem-solving exercises, managerial functions and skills. F

523 Management in Extended Care Settings (3) Man-
gerial concepts and theoretical foundations essential to supervision and administration of domiciliary health services programs and operation of health services programs for patients and clients in settings which provide activities of daily living and
special psychosocial environmental needs. Programs for home health services, comprehensive medical rehabilitation, nursing homes, congregate living centers and similar type health programs. Prereq: S21 or consent of instructor. Sp

525 Financial Management of Health Programs (3) Financial management concepts and practices applied to health services. Prereq: Fundamentals of budgeting, costing, financing, rate setting, financial reporting and control. Opportunities to apply techniques. Prereq: S25 or consent of instructor. Sp

530 Biostatistics (3) Application of descriptive and inferential statistical methods to health-related problems and programs. Microcomputer applications, use and interpretation of vital statistics and introductory research methodology preparatory for first course in epidemiology. Prereq: Introductory statistics or consent of instructor. F

540 Research Methods in Epidemiology (3) Basic measurement science of public health. Epidemiologic principles of community organization, community needs assessment, educational interventions, and application of program planning and evaluation techniques. Opportunity to practice skills in realistic setting. Prereq: S20 or consent of instructor. Sp

542 Advanced Epidemiologic Methods (3) (both cohort and case-comparison study designs; conduct and interpretation of study, and general attention to calculations and formulae. Professional literature, contemporary perspective of epidemiologic approaches to problem solving and policy formulation in public health. Prereq: S40 or consent of instructor. F

550 Principles and Practices of Community Health Education (3) Theoretical foundations for community health education; opportunities for skill development in variety of educational processes; and introduction to community health analysis. F

552 Community Health Problem Solving (4) Dynamics of community organization, community needs assessment, educational interventions, and application of program planning and evaluation techniques. Opportunity to practice skills in realistic setting. Prereq: S50 or consent of instructor. Sp


560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodologies; systems-oriented planning process. Major elements of organizational and conceptualization of problem, plan design, evaluation and implementation. Health problems of institutions, community, and nation; development of approaches, and programs for addressing needs. Sp

562 Group Processes in Health Planning (3) Application of group process techniques used in health planning. Tailoring group processes, leadership roles and techniques to encourage innovation and creativity in health planning groups. Su

568 Physical Activity and Positive Health (3) (Same as Physical Education 588.)

569 Fitness Testing, Programming, and Leadership for Diverse Populations (1) (Same as Physical Education 569.)

580 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic, maximum 6 hrs.

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Nursing 585, Educational and Counseling Psychology 585, Physical Education 585, and Social Work 585.)

587-98-88 Internship (3,3,3) Internship in either approved organizational or research setting under supervision of designated preceptor. Prereq: MPH major, one semester research notice and consent of major advisor. S/NC only. E

590 Research Methods in Health (3) (Same as Health 590.)

593 Directed Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

595 Health Aspects of Gerontology (3) (Same as Health 650.)

555 Seminar in Nation’s Health (3) (Same as Health 655.)

600 International Health (3) (Same as Health 660.)

Recreation and Leisure Studies

Graduate study with a major in Recreation and Leisure Studies leads to the Master of Science. Professional preparation concentrations are available in therapeutic recreation, general recreation, and sport administration/management. The third concentration is an interdisciplinary program requiring completion of 32 semester hours.

GRADUATE COURSES

410 Maintenance and Management of Recreation and Sports Related Facilities (3) Principles for operationalizing modern facility maintenance systems and management strategies. Cost tracking, inventory systems, specialized maintenance techniques, safety guidelines, maintenance management systems and security. Prereq: 110, 310 or consent of instructor. F

430 Organization and Administration of Leisure Services (3) Principles of organization 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. Prereq: 310 or consent of instructor. F

440 Dimensions of Private and Commercial Recreation Businesses (3) 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 tourism. Prereq: 110, junior standing, or consent of instructor. Sp

450 Specialized Study in Leisure Education (1-6) Special interest leisure activities; developing positive attitudes toward leisure. Demonstrates how leisure contributes to one’s mental and physical health. May be repeated. Maximum 6 hrs. E

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

520 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

510 Perspectives and Trends in Leisure Studies and Services (3) 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. Prereq: Consent of instructor. Sp

515 Philosophical and Conceptual Foundations of Leisure (3) Philosophy of leisure and recreation; nature of philosophy, concepts of leisure, recreation, play, work, and other, history of field, and relationship of ideas to contemporary society and to professional practice. Prereq: Consent of instructor. Sp

520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of therapeutic recreation. Basic overview of specific delivery systems. Prereq: Consent of instructor. F

521 Leisure Counseling and Facilitation Techniques (3) Investigation of concepts and techniques of leisure counseling; introduction to and practice of various leisure facilitative techniques; use of increased personal leisure awareness as desired but concomitant goal. Prereq: S20 or consent of instructor. Sp

522 Clinical Aspects in Therapeutic Recreation (3) Concepts and techniques utilized by experienced and advanced therapeutic recreation specialist; clinical issues; comprehensive program concerns, administrative funding and trends in practice of therapeutic recreation services. Prereq: S50. Sp

540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Finance, revenue generating strategies, cash and inventory control, commercial/public cooperative ventures and microcomputer applications. Prereq: 430 or consent of instructor. Sp

590 Graduate Practicum (1-6) Required of all graduate students. 100 clock hrs during semester with agency for 2 hrs credit. Two major phases: work experience and written paper. F

591 Directed Study in Leisure & Recreation (1-6) Detailed study of theme, issue, or concern. Designed to meet needs of individual students. May be repeated. Maximum 6 hrs. E

592 Special Topics in Recreation & Leisure Studies (1-6) May be repeated. Maximum 6 hrs. E

Safety

Graduate programs are available leading to the Master of Science with a major in Safety Education and Service (thesis and non-thesis options) and to the Specialist in Education with a major in Safety Education and Service.

The M.S., with thesis and non-thesis options, requires completion of 32 semester hours.

The Specialist in Education (Ed.S.) requires 30 semester hours beyond the M.S.

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 under in-state tuition basis. The M.S. and Ed.S. programs in Safety Education and Service are available to residents of the states of Alabama, Arkansas, Florida, or South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

441 Driver & Traffic Safety Education (3) Preparation of teachers of driver education in schools and colleges. Students are required to teach at least one non-driver. Valid driver’s license required. 2 hrs and 2 labs. E

442 Advanced Driver & Traffic Safety Education (3) Development of competence in teaching of driver education through use of simulation, multimedia, and multiple-car driving range. Teaching skills and supervision. 2 hrs and 2 labs. Sp

443 Sports & Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interrelationship in sports injury and control; risk-taking and decision solution strategies; and contributing factors to sports medicine. 3 hrs and 2 labs. Sp