It offers the Doctor of Education degree program with a major in Education, concentration in educational psychology, specialization in collaborative learning. For details, see website at http://web.utk.edu/~schpsych.

Admission Requirements
Admission requirements include completion of all items in the department's admissions packet and three letters of recommendation (i.e., rating forms). Up-to-date GRE scores are required for application to all degree programs except the master's program. For the doctoral programs, a writing sample is also required.

Application Deadlines
Applications are reviewed throughout the year for applicants to the master's program. For applicants to the doctoral programs who wish to begin a program the next fall semester, the application deadline is January 15th. The adult education area also has a deadline of October 15th for applicants to the Ph.D. level who wish to begin the program spring semester.

GRADUATE COURSES
432 The Disadvantaged Student: Psychoeducational Perspectives (3) Theory and research regarding life, psychosocial behavior and appropriate interventions. F
460 Self-Management in the Helping Professions (3) Theories and research regarding counseling, observational learning, and ethological learning as systems to apply to student motivation, discipline and learning. Su
513 Reflective Practice in Education and Psychology (3) Concepts, theories and processes of reflective practice applied to educational settings. E
514 Individual Study in Adult Education (3) Prereq: Consent of supervising instructor. Approval may be completed in office of unit head. May be repeated. Maximum 6 hrs. E
515 Educational Applications of Behavioral Theories of Learning (3) Behavioral theories and research, counseling, observational learning, and ethological learning as systems to apply to student motivation, discipline and learning. Su
516 Educational Applications of Cognitive Learning Theories (3) Cognitive theory and research, social learning, attributes, information processing as applied to education. Su
518 Educational Specialist Research and Thesis (3) May be repeated. S/NC only. E
520 Survey of Adult Education (3) Historical development, philosophies of adult education agencies, associations, programs, issues, and literature illustrating process of adult education and diversity of continuing education. Prereq: Consent of instructor. F
521 Program Development and Operation in Adult Education (3) Theories and methods from research to practice in planning adult education programs. Prereq: Consent of instructor. Sp
522 Adult Development (3) Theory and research in adult development and change over lifespan and its implications for adult learning in formal and informal contexts. Sp
523 Post-Secondary Education for Adults (3) History, evolution, philosophy, structure and functions of post-secondary, sub-university institutions, their programs and clientele. Prereq: Consent of instructor. F
524 Continuing Professional Education (3) Theories and concepts supporting design and management of educational programs for adults in professions. Prereq: 520 or equivalent. F
525 Characteristics of Adult Learners (3) Key characteristics of adult learners, current theory and research on adult learning, and implications for teaching and learning contexts. F
526 Informal Methods of Assessment (3) Development and use of rating scales, check-lists, observation, test scores and case reports in assessment and counseling of children and adults. Prereq: Counseling Education and Counseling Psychology 525. A
527 Controversies in Adult Education (3) Controversies confronting field of adult education, development of critical analysis skills by looking at controversies from different perspectives. Sp
528 Psychology of Aging (3) Theory and research of aging and gerontology related issues, psychological and related physiological changes that occur in life stages of human development. Implications for treatment programs and policy. Sp
529 Facilitating Adult Learning (3) Theory, research, and practice related to working with adults in teaching-learning situations. Su
530 Methods of Collaborative Inquiry (3) Philosophical and theoretical frameworks for designing and conducting collaborative inquiry projects. Practice in designing studies producing research. Sp
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. F
541 Psychoeducational Assessment (3) Direct, psychometric and related methods, classroom, and counseling learning environments. Prereq: Admission to school psychology program or consent of instructor, and Counseling Education and Counseling Psychology 525 or equivalent. May be repeated. Maximum 6 hrs. F,Sp
542 Practicum in Psychoeducational Assessment (3) Application of assessment skills to client learning environments. Coreq: 541 or consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. F,Sp
545 Psychoeducational Consultation (3) Use of two and three-person models of consultation in educational and therapeutic settings based on behavioral, ecological, social learning and cognitive-behavioral theories. F
546 Practicum in Consultation (3) Application of consulting skills to educational settings. Prereq: 545. Sp
549 Internship in School Psychology (1-6) Supervised employment in unit approved school psychology internship sites. Prereq: Enrollment in school psychology program and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E
560 Discipline and Conflict Resolution (3) Applications of major models of discipline and conflict resolution strategies in development of constructive atmosphere for classroom learning. Sp
572 Cognitive Education: Models and Approaches (3) Models and approaches in field of cognitive education: research and theoretical support for various program components, critical variables of organizational learning that affect success of implementation. Sp
573 Meeting Needs of Nontraditional and Underachieving Learners (3) Exploration of students' needs at any age and level of functioning who are not progressing up to their fullest potential. Causes of academic and motivational problems, and approaches to overcome them. Learning to learn, cultural alienation, and personal world view and interaction with effective teaching and learning. Su
574 Facilitating Group Change (3) Practical issues of group change. Analyses of group and individual experiences in all types of educational settings in relation to systems theory and collaborative learning theory. Needs of individuals and groups involved in change and roles of inside and outside change agents. F,Sp
578 Seminar in Gerontology (1) (Same as Human Ecology 585, Counseling Education and Counseling Psychology 585, Exercise Science 585, Nursing 585, Public Health 585, Social Work 585, and Sociology 585.)
593 Independent Study (1-3) May be repeated. S/NC or letter grade. E
600 Doctoral Research and Dissertation (3-15) P/Sp only. E
602 Directed Research (1-3) Instructor- or student-initiated group investigating a theoretical problem in educational or psychological problems. Prereq: 585. May be repeated. Maximum 15 hrs. S/NC or letter grade. E
609 Advanced Seminar in Curriculum and Learning (3) Team-taught interdisciplinary seminar: trends, themes, and issues in curriculum and learning, reading and discussions based on significant research and scholarly publications. Sp
612 Modes of Inquiry (3) (Same as Educational Administration and Policy Studies 612.)
620 Seminar in Adult Education (3) Issues in adult education, theories and concepts, philosophical positions, research trends and methodologies. Prereq: 520 or equivalent. Sp
621 Advanced Seminar in Program Planning (3) Concepts, principles, and theories related to program planning in adult education. Prereq: 521 or equivalent. A
622 Advanced Seminar in Adult Development and Learning (3) Adult development and adult learning theory and research. Prereq: 522, 525, or equivalent. A
635 Ethical, Legal, and Professional Issues in Psychology (3) (Same as Psychology 635 and Counseling Psychology 635.) F

640 Seminar in Applied Educational Psychology (2) Issues, theories, concepts and research in applied educational psychology. Prereq: Admission to Ph.D. in Education. May be repeated. Maximum 12 hrs. S/N only. F, Sp

649 Advanced Internship in School Psychology (1-9) Supervised experience as school psychologist in unit-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/N only. E

650 Professional Practice in School Psychology (1-9) Field setting to facilitate academic, social and interpersonal development of children and adults. School and mental health settings for intervention, consultation, prevention, and assessment services. May be repeated. Maximum 9 hrs. S/N only. F, Sp

655 Research in Psychoeducational Studies (1) Data analysis, use of computer packages, research, and interpretation. May be repeated. Maximum 9 hrs. S/N only. F, Sp

663 Scale Construction (3) Development, pilot testing, and revision of attitude inventories, rating scales, and other paper-and-pencil techniques for assessing beliefs, personality characteristics, and opinion. Prereq: Counselor Education and Counseling Psychology 525, and two-course sequence in statistical analysis. A

665 Analysis of Research in Instructional Technology (3) Research on human learning, design of learning environments, analysis of teacher behavior, text development, computer software design and video presentations. A

668 Practicum in Instructional Planning (3) Development and management of a full or course program of instruction in educational psychology. Prereq: 665, or consent of instructor. E

669 Internship in Educational Psychology (1-6) Supervised employment in an approved educational psychology internship site. May be repeated. Maximum 12 hrs. S/N only. E

671 Mediated Learning Theory (3) Feuerstein's theory of mediated learning experience and its connections to work of Piaget, Vygotsky and others. Implications for adult, child, learning and building of learning communities for learners of all ages. Prereq: Admission to doctoral program or consent of instructor. F

673 Collaborative Learning (3) Team taught, interactive course on collaborative learning theory related to professional practice. Integration of mediated learning theory with reflective practice theory related to furthering of collaborative learning in professional practice settings. Engagement of class members in collaborative learning. Prereq: 513 and 671 or consent of instructor. Sp

690 Psychopathology of Childhood (3) Descriptive and critical study of psychopathology of childhood and of systems of nomenclature applied to individuals with mental disorders: nomenclature provided in State Department of Education's Student Evaluation Manual and Diagnostic and Statistical Manual of Mental Disorders of American Psychiatric Association. Su

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

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**Electrical and Computer Engineering**

(College of Engineering)

**MAJOR**

**DEGREES**

Electrical Engineering.............. M.S, Ph.D.

Marshall O. Pace, Acting Head

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**Professors:**

Abidi, Mongi A., Ph.D. .......... Tennessee
Alexeff, Igor (Emeritus), PE, Ph.D .... Wisconsin
Bailey, J. Milton (Emeritus),
Ph.D. .................................. Georgia Tech
Birdwell, J. Douglas, Ph.D. .......... MIT
Bishop, Asa O., Jr. (Emeritus), Ph.D .. Clemson
Bodenheimer, Robert E. (Emeritus),
Ph.D. .................................. Northwestern
Bose, Bimal K. (Condra Chair of Excellence),
Ph.D. .................................. Calcutta
Bouldin, Donald W., PE, Ph.D. ...... Vanderbilt
Gonzalez, R. C. (Emeritus), Ph.D. .... Florida
Googe, Joseph M. (Emeritus), PE,
Ph.D. .................................. Georgia Tech
Green, Walter L. (Emeritus),
Ph.D. .................................. Texas A & M
Hung, James C. (Emeritus), PE,
Ph.D. .................................. New York
Karim, Mohammad A. (Liaison),
Ph.D. .................................. Alabama
Kennedy, Eldredge J. (Emeritus), PE,
Ph.D. .................................. Tennessee
Lawler, J. S., Ph.D. ................. Michigan State
Pace, Marshall O. (Liaison), PE,
Ph.D. .................................. Georgia Tech
Pierce, J. Frank (Emeritus), PE,
Ph.D. .................................. Pittsburgh
Pujol, Arfonjo Jr. (UTSI), Ph.D., Ph.D. Vanderbilt
Roberts, M. J., Ph.D. .............. Tennessee
Rochelle, Robert W. (Emeritus),
Ph.D. .................................. Maryland
Roth, J. Reece, Ph.D. ............... Cornell
Symonds, Frederick W. (Emeritus),
Ph.D. .................................. Nottingham
Tillman, James D. (Emeritus), Ph.D. .... Auburn

**Associate Professors:**

Abdallah, C. T., Ph.D. .......... Georgia Tech
Bomar, Bruce W. (UTSI), Ph.D. .... Tennessee
Crilly, Paul B., Ph.D. ........... New Mexico State
Islam, Syed, Ph.D. ............... Connecticut
Joseph, Roy D. (UTSI), Ph.D. .... Case Western
Koch, Daniel, Ph.D. .............. Missouri (Rolla)
Newport, Danny, PE, Ph.D. ....... Tennessee

**Assistant Professors:**

Chilson, John, Ph.D. ............ Minnesota
Howlader, Mostofa, Ph.D. ........ Virginia Tech
Montoya, Tom P., Ph.D. .......... Georgia Tech
Peterson, Gregory,
Ph.D. .................................. Washington (St. Louis)
Qi, Haitong, Ph.D. ............... NC State
Smith, L. Montgomery (UTSI),
Ph.D. .................................. Tennessee
Smith, Phillip W. ................. Virginia
Tolbert, Leon, Ph.D. .............. Georgia Tech

The Department of Electrical and Computer Engineering offers graduate degrees leading to the Master of Science and a Doctor of Philosophy with a major in Electrical Engineering. Graduate students are able to conduct research in a wide variety of electrical engineering areas including communication, computer engineering, computer vision and robotics, electromagnetics, electro-optics, image processing, information intelligence, control, microelectronics, mixed-signal VLSI, monolithic sensors, plasma engineering, power electronics and systems, sensor fusion, and signal processing.

The department sustains a strong joint program in mixed-signal VLSI and monolithic sensors with the Oak Ridge National Laboratory, Instrumentation and Controls Division. This program provides students with unique opportunities to receive career-related training at ORNL while satisfying thesis or dissertation requirements of the graduate program. Departmental graduate programs are also available at the Space Institute, Tullahoma. Some of the electrical engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in the department's graduate program. Further information about these various programs is available from the department.

The Departmental Graduate Committee is responsible for administering, promoting, and advancing the general well-being of the graduate program. Departmental actions regarding a graduate student may be appealed in writing, first to the departmental graduate committee and then to the department faculty.

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**THE MASTER'S PROGRAM**

Graduate work leading to the Master of Science with a major in Electrical Engineering may be completed during one academic year of full-time study, or two to three years of part-time study.

**Admission Requirements**

Applicants for admission to the M.S. degree program are expected to have completed a bachelor's degree in Electrical Engineering with an average of at least 3.0 out of 4.0 both overall and in the senior year. All applicants whose native language is not English, including those who have earned degrees at U.S. institutions, must score at least 550 on the TOEFL exam to be considered for admission to the program.

Students who hold the bachelor's degree in a field other than electrical engineering are also expected to have a minimum cumulative grade-point average of 3.0 and a minimum year average of 3.0 in that field. The department will require that selected undergraduate courses be taken to make the background of these students comparable to that of students who hold a bachelor's degree in Electrical Engineering. These undergraduate courses may include electrical engineering courses from the sophomore and junior years and one senior electrical engineering sequence of the student's choice. The specific set of undergraduate courses required will be chosen in view of the applicant's prior education and experience. The student will be admitted under non-degree status until the required undergraduate courses are successfully completed with a 3.0 average.

**Bachelor's Degree Requirements**

Students may choose between a thesis option and a project (non-thesis) option M.S. program. All students must file a Master's Program Plan with the departmental graduate committee specifying which option they have selected, a semester-by-semester schedule of the courses they intend to take, and the members of the student's master's commit-
tive. Students may change between the thesis and project options, one time, by filing an amended Master’s Program Plan.

**Thesis Option:** Specific requirements of the thesis option are a minimum of 30 semester hours including:

1. Electrical Engineering 503 and 504.
2. Six semester hours of mathematics at the 400 level or above selected from a list approved by the graduate committee, or 6 semester hours of EE courses at the 500 level or above, or 6 semester hours of non-EE courses approved by the student’s master’s committee and the graduate committee.
3. An additional 12 semester hours of 500-level work in electrical engineering including 6 semester hours in the student’s major area of electrical engineering and 6 semester hours in a second area of electrical engineering approved by the student’s master’s committee.
5. A final oral examination covering the thesis and related coursework.

**Non-Thesis Option:** Specific requirements of the project (non-thesis) option are a minimum of 33 semester hours including:

1. Electrical Engineering 503 and 504.
2. Six semester hours of mathematics at the 400 level or above selected from a list approved by the graduate committee, or 6 semester hours of EE courses at the 500 level or above, or 6 semester hours of non-EE courses approved by the student’s master’s committee and the graduate committee.
3. An additional 18 semester hours of 500-level work in electrical engineering courses, with at least 6 hours of 500-level work in each of two areas of electrical engineering.
4. Electrical Engineering 501 (project in lieu of thesis) with a minimum grade of B. This course will be administered by the student’s master’s committee. A written project proposal describing what the student will do in the course must be submitted in advance for the graduate committee’s approval. A written final report and oral presentation is required and one copy of the final draft must be submitted to the graduate committee.
5. A final written and oral examination covering the project and related coursework.

**THE DOCTORAL PROGRAM**

The Ph.D. degree program with a major in Electrical Engineering may be pursued in the concentration areas of circuit theory, computers, electro-optics, communication theory, electromagnetic theory, plasma engineering, power systems, solid-state electronics, power electronics, and control systems.

Applicants are required to submit scores on the General Graduate Record Exam. A TOEFL score of 550 is required for non-native speakers of English, including those who have earned degrees at U.S. institutions. Specific departmental requirements for the Ph.D. include the following:

1. A Master of Science or Master of Engineering degree.
2. A minimum of 24 semester hours of coursework beyond the Master’s, excluding research and dissertation credit. These hours must include:
   a. A minimum of 12 semester hours in electrical engineering at the 500 and 600 levels.
   b. A minimum of 9 semester hours of 600-level coursework. At least 3 hours of this work must be in an area other than the student’s major area.
   c. A minimum of 12 semester hours of mathematics courses at the 500 level or above and approved by the electrical engineering graduate committee.
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 a qualifying examination and on a comprehensive examination. The qualifying examination is prepared by the Electrical Engineering faculty and consists of two 4-hour written examinations covering courses required in the undergraduate electrical engineering curriculum through the junior level. The qualifying examination is offered twice each year (January and August) and is to be taken the first time it is offered after the student enrolls in the program. A student who fails the qualifying examination the first time and pass the examination the next time it is offered is to remain in the program. A minimum of 18 hours of coursework must be completed after the student has taken the qualifying examination the first time.
5. A comprehensive examination is required by the Graduate School. In this department the comprehensive exam is administered by the student’s committee; the exam results are reported to the graduate committee for approval; and the exam is filed in the department. The comprehensive exam is given when the student is ready to apply for admission to candidacy. The comprehensive exam consists of both written and oral parts. The written part consists of at least two sections: a complete review of the literature in the student’s dissertation topic, and a review of the major tools to be used in the dissertation work. The student’s committee may require additional written sections. The students must demonstrate a mastery of the dissertation area, ability to think analytically and creatively, skill in using academic resources, and ability to complete the dissertation satisfactorily. The oral part consists primarily of a professional presentation of a proposal for dissertation work and its defense. The committee may cover additional topics in the oral part.
6. Participation in departmental seminars.

**GRADUATE COURSES**

Note: Courses required in the Electrical 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 Engineering except when required by the program.

400 Senior Design (5) Major design project focusing student’s attention on professional practice, accumulated background of curricular components, and recent developments in field. Directed to topics within field of electrical engineering. Level 3 design projects which require laboratory work. Prereq: Linear System Analysis, Electric Energy System Components, Electronic Circuits, Analog Communication Amplitude and Frequency Modulation, Introduction to Logic Design of Digital Systems.

411 Digital Signal Processing and Filter Design (3) Discrete-time signals and systems, sampling, discrete Fourier transforms, analog filter characteristics, nonrecusive and recursive filter design, and CAD tools for filter design. Level 1 design projects which require laboratory work. Prereq: Frequency-Domain Analysis of Signals and Noise, Linear System Analysis, Systems and Power Laboratory.

412 Linear Control System Design (4) Classical and modern methods for the design and compensation of linear feedback control systems. Bode design, root locus design, state variable pole placement design. Level 2 design projects which require laboratory work. Prereq: 411.

421 Electric Energy Systems (3) Structure and operation of electrical energy grid: load flow; economic dispatch; planning; control; reliability. Balanced and unbalanced faults; system protection; system stability. Level 1 design projects. Prereq: Linear System Analysis, Electric Energy System Components, Systems and Power Laboratory.


423 Electric Machines (3) Principles of electromechanical energy conversion. Design procedures for AC and DC machine windings; construction and performance characteristics. Effectiveness and efficiency of power systems in steady state and dynamic performances; the dq model; reference frames. Level 1 design projects. Prereq: Linear System Analysis, Electric Energy System Components.


432 Electronic Amplifiers (4) Feedback amplifier principles; wideband linear amplifier design; low-noise preamplifier design; audio power amplifier design; linear and digital power supply design and switching regulator principles. Radio frequency amplifier design; oscillator principles. Laboratory experiments and design projects. Level 2 design projects which require laboratory work. Prereq: 431.


451 Microprocessors and Microcontrollers in Electrical Engineering (3) Project oriented course using microcomputer kit having monitor program and development system with cross-assemblers, file management, and emulation capability. Interfacing and hard-
sensor systems. Prereq: 572 or 573 or consent of instructor.

672 Image Processing and Robotics II (3) Stereovision, shape theory. Prereq: 671.

673 Image Processing and Robotics III (3) Time-varying imagery, path planning and navigation. Prereq: 672.

691 Advanced Graduate Seminar (1) Research in department. May be repeated. S/NC or letter grade.

692 Special Topics (1-3) Advanced topics of current interest to Ph.D. students in Electrical Engineering. May be repeated. Maximum 9 hrs.

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### Engineering Science

See Mechanical and Aerospace Engineering and Engineering Science.

### English

(College of Arts and Sciences)

**MAJOR**

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<tr>
<th>DEGREES</th>
<th>Major</th>
<th>Minor</th>
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<tr>
<td>English</td>
<td>M.A.</td>
<td>Ph.D.</td>
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**MAJOR**

D. Allen Carroll, Head

**Professors:**


Trahern, Joseph B., Jr. (Alumni Distinguished Prof.), Ph.D. .... Princeton Wier, Allen (Distinguished Teaching Chair), M.F.A. .... Bowing Green Wheeler, Thomas V. (Emeritus), Ph.D. .... North Carolina White, Jon M. (Emeritus), M.A. .... Cambridge Wright, Nathalia (Emeritus), Ph.D. .... Yale Zomchick, John, Ph.D. .... Columbia

**Associate Professors:**


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, 306 McClung Tower. A prospective student must contact the department to receive the proper information and forms with which to apply. For additional information, please visit the graduate website through the College of Arts and Sciences homepage at www.artsci.utk.edu. The Department of English does not accept students in non-degree or provisional status. A student who wishes to enter the department must apply in degree-seeking status for his/her application to receive consideration for admission to any graduate program in English.

**THE MASTER'S PROGRAM**

**Requirements**

**Coursework:** A minimum of 24 semester hours in English beyond the B.A., to include 6 hours at the 600 level; 12 additional hours at the 500-600 level (3 hours of 593 independent Study may be applied toward the M.A.); and 6 hours for graduate credit at any level, including the 500 level. In this coursework, students must maintain at least a 3.0 GPA.

**Thesis Option:** Written under the direction of a faculty member of the department and approved by a committee of two other faculty members. Six semester hours of credit will be given.

**Non-Thesis Option:** Six hours of additional courses at the 500-600 level, making a total of 30 hours of required coursework.
Language Requirement: Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
1. Completion of the second year of a language at college level with a grade of C or better.
2. Completion of French 302 or German 332 at UT with a grade of B or better.
3. Passing of the regular Ph.D. foreign language examination as currently administered at UT.

Capstone Experience Requirement:
An integral part of all options in the master's degree program in English is a capstone experience which allows the student to synthesize and apply the knowledge and skills gained through the completion of the program in a substantial way. Examples of capstone experiences include, but are not limited to, the completion of a thesis or the formal presentation of a paper at a professional meeting or colloquium. All capstone experiences normally occur after the completion of 24 hours of coursework and must be approved by the Director of Graduate Studies.

Final Examination: A candidate presenting a thesis must pass a one-hour oral examination; a candidate presenting a creative project must pass a ninety-minute oral examination. The examination consists of a short thesis defense, but chiefly of questions covering the general history of English and American literature, not merely the coursework taken. A reading list of primary works designed to help the student prepare for these questions is available in the office of the Director of Graduate Studies in English.

A non-thesis student must pass a written examination, followed by a one-hour oral examination, both consisting of the same sort of questions as the examination taken by the thesis student.

Residence Requirement: There is no residence requirement for the M.A., but students should attempt to pursue a full-time program whenever possible.

WRITING CONCENTRATION

The master's program with writing concentration is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry.

Requirements
The requirements for the writing concentration are the same as those for the thesis option above with the following exceptions:

Coursework: Writing students may substitute two 400-level writing courses for two 500-level courses. Students must take at least 9 hours in writing and 9 in literature, the remaining 6 to be selected from any foreign language courses at the proper level. Of the courses in writing, at least 3 hours must be taken at the 500 level; additional 500-level courses are strongly recommended.

Writing Projects: One of the following writing projects for six hours of credit:
1. A thesis, using research to analyze some aspect of writing or rhetorical theory.
2. A creative project, such as a collection of poems or short stories, a short novel, a play, or a creative work of non-fiction prose.

The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and the project director. In addition to the project director, two other English Department faculty members will supervise and approve the project; at least one should be from the literature faculty.

Final Examination: The reading list may be modified by the A&R examination committee, meeting as a body with the student, to reflect the candidate's particular writing emphasis. However, most of the oral examination should focus upon the literature outlined in the original reading list.

THE DOCTORAL PROGRAM

Requirements
A student must successfully complete a program of study normally 6 full semesters as outlined below, approved by the candidate's committee or the Director of Graduate Studies in English.

Coursework: At least 48 semester hours beyond the B.A. (of which at least 24 semester hours must be beyond the M.A.) to include at least 21 hours at the 600 level; at least 15 semester hours at the 500 level or above (only 3 hours of 693 Independent Study may be applied toward the M.A. and 3 after the M.A.); a 3-hour course in teaching composition, and 15 additional hours at any level approved for graduate credit (including a minimum of 12 hours at the 400 level if approved by the Director of Graduate Studies).

Up to 6 of these additional hours may be taken in some cognate field or fields such as history, philosophy, French. These courses must be drawn from those approved for graduate credit. All other coursework must be in the English department. In this coursework, students must normally maintain a 3.5 GPA.

Dissertation: Twenty-four semester hours of dissertation. These represent the research and composition portion of the dissertation. The research and dissertation will be directed by a faculty member of the department and approved by a doctoral committee of three or four other faculty members.

Language Requirement: A language requirement met in one of the following ways:
1. Two languages approved by the Director of Graduate Studies in English. The requirement for each language may be fulfilled by (a) completion of French 302 or German 332 with a grade of B or better; (b) completion at UT of any two courses on the 300 level or above in the foreign language or literature with at least a grade of B in each course; (c) passing of the regular Ph.D. foreign language examination as currently administered at UT.
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 at UT and completion of two courses in the foreign language at the 300 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 500 or 508. History of the English Language (offered in alternate years only). For the other 3 hours, the student may either complete the history of the language sequence or choose one other course in language taught in the Department of English at the 500 or 600 level and approved by the Director of Graduate Studies in English. These courses will not count toward the minimum number of courses for the Ph.D., and anyone electing this language option may not take the comprehensive examination in linguistics.

Examinations: (1) A 4-hour qualifying examination taken before the end of the first year of Ph.D. coursework; this examination is given three times a year, with the M.A. written examination. (2) A comprehensive written examination which may be divided as the department directs; see the English Department graduate brochure. The comprehensive examination is given twice a year, normally in March and September. Before a student may take it, he/she must have completed all coursework required. A student must also have met all requirements for foreign languages before beginning the first part of the examination.

Dissertation Defense: A one-hour examination on the dissertation and other related areas.

Residence Requirement: Two consecutive semesters as a full-time student. For students not on teaching assistantships, full-time consists of 9 or more hours of coursework and/or dissertation hours each semester. For students on assistantships, full-time consists of at least 6 hours of courses and/or dissertation hours and 3 hours of teaching each semester.

GRADUATE COURSES

Note: Students enrolling in English graduate courses must first register in the office of the Director of Graduate Studies in 306 McClung Tower.

401 Medieval Literature (3) Reading and analysis of selected medieval literary masterpieces in modern English.

402 Chaucer (3) Reading and analysis of Canterbury Tales and Troilus and Cressida in Middle English.

404 Shakespeare I: Early Plays (3) Shakespeare's dramatic achievement before 1601. Reading and discussion of selected plays from romantic comedies, including Twelfth Night; English histories, including Henry IV, and early tragedy, including Hamlet.

405 Shakespeare II: Later Plays (3) Shakespeare's dramatic achievement from 1600 to 1613. Reading and discussion of selected plays from great tragedies, including Othello; problem plays, including Measure for Measure; and dramatic romances, including The Tempest.

406 Renaissance Drama (3) English theatre between 1560 and 1640 through reading of representative plays by Shakespeare's contemporaries: Marlowe, Webster, Jonson, and Lawes.

409 Spenser and his Contemporaries (3) Principal achievements in prose and poetry of sixteenth-century authors: Spenser, Wyatt, Marlowe, More, Sidney, and Bacon.

410 Milton, Donne and their Contemporaries (3) Principal achievements in prose and poetry of first two-
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<tr>
<th>Course Title</th>
<th>Description</th>
<th>Credits</th>
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<tr>
<td>American Humor (2)</td>
<td>Early nineteenth century to twentieth century: Mark Twain.</td>
<td></td>
</tr>
<tr>
<td>Topics in Black Literature (3)</td>
<td>Contents vary: particular genres, authors, or themes from 1845 to present. Examples include Langston Hughes and Harlem Renaissance, Richard Wright and Fwendolyn Brooks, writing by black women, international black literature in English, and black American autobiography.</td>
<td>3</td>
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<tr>
<td>Modern American Novel (3) Hemingway, Faulkner, Steinbeck, Wolfe</td>
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<tr>
<td>Southern Literature (3)</td>
<td>Southern writing from colonial period into twentieth century: frontier humorists, local color writers, and southern literature.</td>
<td>3</td>
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<tr>
<td>American English (3)</td>
<td>Phonological, morphological, and syntactic development of English language: Old and Middle English.</td>
<td>3</td>
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<tr>
<td>History of the English Language I (3)</td>
<td>English grammar necessary to teaching ESL.</td>
<td>3</td>
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<tr>
<td>History of the English Language II (3)</td>
<td>Phonological, morphological, and syntactic characteristics of modern English: origins, functions, and implications for cultural pluralism.</td>
<td>3</td>
</tr>
<tr>
<td>Teaching English as a Second Language (3)</td>
<td>Major issues surrounding teaching ESL: EFL, student language acquisition; learner variables; and second language instruction.</td>
<td>3</td>
</tr>
<tr>
<td>Pedagogical Grammar for ESL Teachers (3)</td>
<td>Aspects of English syntax and morphology presenting difficulties for non-native learners of English.</td>
<td>3</td>
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<tr>
<td>Literary Criticism (3)</td>
<td>Historical survey of major works of literary criticism.</td>
<td>3</td>
</tr>
<tr>
<td>Studies in Folklore (3)</td>
<td>Topics vary: May be repeated with different topic. Maximum 6 hrs.</td>
<td>3</td>
</tr>
<tr>
<td>Major Authors (3)</td>
<td>Content varies: Concentrated study of at least one of the most influential writers in British or American literary history: e.g., Donne, Pope, Austen, Tennyson, Whitman, Faulkner, Lawrence, Baldwin, or Morrison.</td>
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<td>Special Topics in Film (3)</td>
<td>Content varies: Particular directors, film genres, national cinema movements, or other topics: May be repeated with consent of department. Maximum 6 hrs.</td>
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<tr>
<td>Writing, Layout, and Production of Technical Documents (3)</td>
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<td>Prerequisites</td>
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<td>530-31</td>
<td>Readings in English Literature of the Restoration and Eighteenth Century</td>
<td>Topics vary. Genre: poetry, prose, fiction, drama; or period: Restoration, early eighteenth century, late eighteenth century.</td>
</tr>
<tr>
<td>540-41</td>
<td>Readings in English Literature of the Nineteenth Century</td>
<td>Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs. each.</td>
</tr>
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<td>550-51</td>
<td>Readings in American Literature</td>
<td>Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>552</td>
<td>Readings in Black American Literature</td>
<td>Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>560-61</td>
<td>Readings in Twentieth-Century Literature</td>
<td>Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>564</td>
<td>Reading in Critical Theory</td>
<td>Topics vary. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>565</td>
<td>Reading in Creative Writing</td>
<td>Content varies. Connection between theory and practice in writing. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>566</td>
<td>Reading in Rhetoric and Composition</td>
<td>Content varies. Advanced work in theory and/or history of rhetoric and composition. Issues in invention, textuality, literacy, historiography, style and ethics. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>567-71</td>
<td>Studies in Twentieth-Century Literature</td>
<td>Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs. each.</td>
</tr>
<tr>
<td>568</td>
<td>Reading in Rhetoric</td>
<td>Content varies: Writing across curriculum, writing centers, technical communication, text linguistics. May be repeated. Maximum 6 hrs.</td>
</tr>
<tr>
<td>569</td>
<td>Special Topics in Language</td>
<td>Topics vary. May be repeated. Maximum 6 hrs.</td>
</tr>
<tr>
<td>570-74</td>
<td>Special Topics in Literature</td>
<td>Topics vary: genres, modes, and other literary subjects not in standard period divisions. May be repeated. Maximum 6 hrs.</td>
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<td>575</td>
<td>Topics in Feminist Studies</td>
<td>Topics vary. May be repeated. Maximum 9 hrs.</td>
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<td>576</td>
<td>Topics in Invention, Style, and Audience</td>
<td>Theoretical perspective on contemporary research in rhetoric and composition.</td>
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<td>578</td>
<td>History of Rhetoric I (3)</td>
<td>Survey of rhetoric from Sophists to Ramlus.</td>
</tr>
<tr>
<td>579</td>
<td>History of Rhetoric II (3)</td>
<td>Survey of rhetoric from Bacon to present.</td>
</tr>
<tr>
<td>580</td>
<td>Fiction Writing (3)</td>
<td>Advanced fiction writing projects under supervision of instructor and time for independent study. Prereq: Extensive background in reading fiction and writing fiction. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>581</td>
<td>Colloquium in Poetry Writing (2)</td>
<td>Major poetic project or completion of project begun in 463. Individual consultation with instructor supplements class analysis; readings in contemporary poetry and theory. Prereq: 463 or consent of instructor. May be repeated. Maximum 8 hrs.</td>
</tr>
<tr>
<td>582</td>
<td>Special Topics in Writing (1-3)</td>
<td>Topics vary. May be repeated. Maximum 6 hrs.</td>
</tr>
<tr>
<td>583</td>
<td>Special Topics in Literature (3)</td>
<td>Topics vary: genres, modes, and other literary subjects not in standard period divisions. May be repeated. Maximum 6 hrs.</td>
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<td>590</td>
<td>Topics in English Language (3)</td>
<td>Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>591</td>
<td>Foreign Study (1-15)</td>
<td>See College of Arts and Sciences</td>
</tr>
<tr>
<td>592</td>
<td>Off-Campus Study (1-15)</td>
<td>See College of Arts and Sciences</td>
</tr>
<tr>
<td>593</td>
<td>Independent Study (1-15)</td>
<td>See College of Arts and Sciences</td>
</tr>
<tr>
<td>595</td>
<td>Film History, Form, and Analysis (3)</td>
<td>Issues in film studies; history of narrative film; concept of film form; critical approaches to film study (genre, auteur, formalist, and others); and critical analysis of individual films.</td>
</tr>
<tr>
<td>600</td>
<td>Doctoral Research and Dissertation (3-15)</td>
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<tr>
<td>610</td>
<td>Studies in Old English Language and Literature (3)</td>
<td>Old English grammar with readings in prose and poetry.</td>
</tr>
<tr>
<td>611</td>
<td>Studies in Beowulf (3)</td>
<td>Translation and critical study of Beowulf. Prereq: English 610 or consent of instructor.</td>
</tr>
<tr>
<td>620</td>
<td>Studies in Medieval English Literature</td>
<td>Seminar in literature and literary genres of Medieval English literature, read in Old and Middle English. Subject matter varies from year to year. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>621</td>
<td>Studies in Chaucer (3)</td>
<td>Seminar in text, interpretation, and criticism of Chaucer's writings. Prereq: Previous course in Chaucer. May be repeated. Maximum 6 hrs.</td>
</tr>
<tr>
<td>630-31</td>
<td>Studies in Renaissance Literature</td>
<td>Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs. each.</td>
</tr>
<tr>
<td>640-41</td>
<td>Studies in Restoration and Eighteenth-Century Literature</td>
<td>Topics vary. Swift, satire, Restoration literature. Johnson and Boswell, Addison and Steele, restoration dramas, Dryden. May be repeated. Maximum 9 hrs. each.</td>
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<tr>
<td>650</td>
<td>Studies in English Romanticism</td>
<td>Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs.</td>
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<tr>
<td>651-52</td>
<td>Studies in Victorian Literature</td>
<td>Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs. each.</td>
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<tr>
<td>660-61</td>
<td>Studies in American Literature</td>
<td>Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs.</td>
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<td>670-71-72</td>
<td>Studies in Twentieth-Century Literature</td>
<td>Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs. each.</td>
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<td>682</td>
<td>Studies in Rhetoric and Composition</td>
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<td>683</td>
<td>Studies in Literary Criticism</td>
<td>Content varies. Advanced work in theory and history of literary criticism. May be repeated. Maximum 9 hrs.</td>
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<td>684</td>
<td>Studies in Critical Theory</td>
<td>Topics vary. History of ideas, humor, biography, autobiography, extra-literary disciplines. May be repeated. Maximum 9 hrs.</td>
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<td>694</td>
<td>Studies in Film (3)</td>
<td>Content varies. Advanced work in film history and analysis. May be repeated. Maximum 6 hrs.</td>
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</tbody>
</table>

**Entomology and Plant Pathology**

*(College of Agricultural Sciences and Natural Resources)*

<table>
<thead>
<tr>
<th>MAJOR</th>
<th>DEGREE</th>
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</thead>
<tbody>
<tr>
<td>Entomology and Plant Pathology</td>
<td>M.S.</td>
</tr>
</tbody>
</table>

**Professors:**

- Bernard, Ernest C., Ph.D. .......... Georgia
- Bost, Steven C., Ph.D. .......... NC State
- Burgess, Edward E., Ph.D. .......... Tennessee
- Gerhardt, Reid R. (Liaison), Ph.D. .......... NC State
- Grant, Jerome F., Ph.D. .......... Clemson
- Hilty, James W. (Emeritus), Ph.D. .... Ohio State

**Ph.D.**

- Johnson, Leander F. (Emeritus), Ph.D. .......... Louisiana State
- Jones, Carl W., Ph.D. .......... Wyoming
- Lambdin, Paris L., Ph.D. .......... VPI
- Newman, Melvin A., Ph.D. .......... Texas A & M
- Patrick, Charles R., Ph.D. .......... Georgia
- Piers, Charles D., Ph.D. .......... Clemson
- Southards, Carroll J. (Emeritus), Ph.D. .......... NC State
- Windham, Alan S., Ph.D. .......... NC State
- Windham, Mark T., Ph.D. .......... NC State

**Assistant Professor:**

- Pereira, Roberto M., Ph.D. .......... Florida

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 soil and fungal diseases, scab/borne pathogens, disease physiology, biocatalysis, 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) general inorganic chemistry, 6-8 hours; (4) organic chemistry, 3 hours. In addition, three completed ratings 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 passed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include at least 6 hours and not more than 10 hours of graduate-level credit in the minor department. The student's committee shall include a member of the faculty from the minor department to assist in designating courses required for the minor.
GRADUATE COURSES

410 Diseases and Insects of Ornamental Plants (3) Symptoms, identification and management of diseases and insect pests that affect plants in greenhouses, nursery, and landscape environments. Prereq: Plant Pathology or Economic Entomology or consent of instructor. Sp,A

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 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. (Same as Ornamental Horticulture and Landscape Design 511.) F,A

512 Soilborne Plant Pathogens (3) Causal agents; host-parasite-plant relationships; epidemiology; and structural, cultural, and chemical control. Prereq: Plant Pathology or consent of instructor. F,A

514 Bacterial Plant Diseases (4) Morphology, taxonomy, ecology, physiology, and genetics of bacterial plant pathogens; infection and disease development, pathogenesis and resistance; diagnosis, detection, effect of environment, and management of bacterial plant diseases; beneficial plant-bacterial interactions. Prereq: Plant Pathology or consent of instructor. 3 hrs and 1 lab. Sp,A

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

520 Plant Parasitic Nematodes (4) Morphology, taxonomy, ecology, and management of plant parasitic nematodes, host-parasite relationships. Prereq: 6 hrs biological science or consent of instructor. 2 hrs and 2 labs. Sp,A

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

523 Field Crop and Vegetable Insects (2) Identification, biology and management of insects affecting crops and vegetables. Prereq: 321 or basic entomology course. 1 hr and 1 lab. F,A

525 Medical and Veterinary Entomology (3) Morphology, taxonomy, biology and control of arthropod parasites and vectors of pathogens of humans and animals. Ecology and behavior of vectors in relation to host-parasite-plant relationships. Prereq: 321 or 325, or consent of instructor. 2 hrs and 1 lab. Sp,A

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

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

532 Special Problems in Plant Pathology (1-4) Comprehensive individual study of current problems. May be repeated. Maximum 8 hrs. E

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

541 Seminar (1) Review of literature and current research in entomology and plant pathology. May be repeated. Maximum 2 hrs. E

Environmental Engineering

See Civil Engineering

Exercise Science and Sport Management

(College of Education)

MAJORS

Exercise science (exercise philosophy; biomechanics; sports medicine)

Sport management

Doctor of Philosophy

Education

Exercise science (exercise philosophy; biomechanics; sports medicine)

Dance

GRADUATE COURSES

415 Teaching Creative Dance for Children (2) Theory, methods, materials and practical experience in presentation and integration of creative dance in grades K-6. Mini-teaching experience.

416 Dance throughout the 15th Century (3) Dance of various societies and culture from pre-history through 19th century.

419 Dance in the 20th Century (3) History and philosophy of dance.

455 Dance Pedagogy (3) Principles and methods of teaching dance with practical application in mini-teaching experience. Prereq. Upperclass or graduate standing and consent of instructor.
Exercise Science

GRADUATE COURSES

480 Physiology of Exercise (3) Functions of body in muscular work: physiological aspects of fatigue, training and adaptation to environment. Prereq: Biochemistry and Cellular and Molecular Biology 230 Human Physiology or 440 General Physiology. Prereq for 533 and 567. May be repeated. Maximum 9 hrs. S/NC only.


483 Physical Activity and Health (3) Provides knowledge and skills to develop physically active lifestyles in people of all ages. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

484 Graduate Seminar in Exercise Science (1) Independent study and organization of seminars. Prereq: Graduate standing in Exercise Science or consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

485 Seminar (1) Survey of pertinent literature in refereed journals. Prereq: consent of instructor. May be repeated under different topic. Maximum 9 hrs. S/NC only.

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

501 Problems in Lieu of Thesis (2-3) May be repeated under different top. Maximum 9 hrs. 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.

503 Research in Exercise Science (3) Research for publication in refereed journals. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

504 Research in Exercise Science (3) Research for publication in refereed journals. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

505 Seminar (1) Survey of pertinent literature in refereed journals. Prereq: consent of instructor. May be repeated under different topic. Maximum 9 hrs. S/NC only.

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

501 Problems in Lieu of Thesis (2-3) May be repeated under different top. Maximum 9 hrs. S/NC only.

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503 Research in Exercise Science (3) Research for publication in refereed journals. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

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

501 Problems in Lieu of Thesis (2-3) May be repeated under different top. Maximum 9 hrs. S/NC only.

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503 Research in Exercise Science (3) Research for publication in refereed journals. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.
551 Financial Management of a New Enterprise (3) Financial issues associated with formation, control, and long-term planning of new enterprise. Acquisition of venture capital. Prereq: Business Administration 504 and 505 or consent of instructor.

581 Real Estate Investment and Finance (3) Financial and market analysis used to make real estate investment decisions. Effects of various financing options on the rate of return on income-producing properties. Effect of various financing options on cash flow and decisions to purchase. Relationship between primary and secondary mortgage markets and impact of those decisions on mortgage rates. Effect of government intervention (taxation, regulation, and market) in both the mortgage and the treasury markets. Prereq: Business Administration 504 and 505 or consent of instructor.

599 Special Topics in Finance (1-3) Topics vary. Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs. S/N only or letter grade.

600 Doctoral Research and Dissertation (3-15) Ph.D. only: E

641 Seminar in Finance (1-3) Capital markets, utility theory, asset pricing, theory of the firm, capital structure, dividend policy. Prereq: Consent of Instructor. S/N only or letter grade.

651 Seminar in Corporate Finance (1-3) Recent theoretical and empirical developments in micro-financial analysis. Topics vary. Prereq: 641 and consent of instructor. May be repeated. Maximum 6 hrs. S/N only or letter grade.


653 Seminar in Financial Institutions (1-3) Theoretical and empirical studies of financial institutions. Topics vary. Prereq: 641 and consent of instructor. May be repeated. Maximum 6 hrs. S/N only or letter grade.

654 Special Topics (1-3) Recent developments in finance. Topics vary. Prereq: 641 and consent of instructor. May be repeated. Maximum 6 hrs. S/N only or letter grade.
research plan. Registration for 6 hours of 500 Thesis is required.

2. In addition to the thesis requirement, a minimum of 24 semester hours of graduate coursework is required. This work must be approved by the student's committee and a minimum of 14 hours must be courses numbered above 500. The committee may require additional coursework if the student's progress or background indicates such need.

3. All students are required to take 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their master's program. Completion of 510 or equivalent is also required.

4. An oral, final examination covering the thesis and coursework is required.

Non-Thesis Option

1. In lieu of a thesis, students are required to complete a problem in cooperation with their employer (company or governmental agency) and their faculty committee. Students working on a problem must register for 6 hours of 500 Thesis and participate in discussions during their master's program. Completion of 510 or equivalent is also required.

2. In addition to the requirement for 6 hours of 503, a minimum of 24 semester hours of graduate coursework is required. This work must be approved by the student's committee and a minimum of 14 hours must be courses numbered above 500. The committee may require additional coursework if the student's progress or background indicates such need.

3. All students are required to take 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their master's program. Completion of 510 or equivalent is also required.

4. Students will be required to take a written comprehensive examination covering their course work. In addition, an oral, final examination covering the program is required. The oral examination will be held on the Knoxville campus.

THE DOCTORAL 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.


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.

4. At least 24 hours of coursework numbered above 500 are required exclusive of doctoral research and dissertation. At least 6 of the 24 hours must be courses numbered above 600.

5. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Science and Technology. Students will be held on the Knoxville campus.

6. All candidates must complete 601 (2 hrs.) and are expected to attend 601 during their Ph.D. program.

7. 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 dissertation committee considers appropriate.

GRADUATE COURSES

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

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


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


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

469 Meat Science Lab (1) Slaughter and processing methods for beef, pork, lamb and poultry. Coreq: 450. Sp

470 Food Crop Products (3) Food products from plants; types, manufacturing systems, quality attributes and utility. Prereq: Food Preservation and 3 hrs biological science or consent of instructor. Sp, A

480 Cereal Science and Bakery Products (3) Chemistry and technology of processing cereal grains, interactions of ingredients during production and storage of baked products. Prereq: Food Laws and Regulations, Food Chemistry, Food Microbiology and Lab or consent of instructor. 2 hrs and 1 lab. Sp

490 Food Laws and Regulations (3) Laws and regulations designed to preserve safety, wholesomeness, and nutritional quality of United States food supply; precedent case studies and their impacts on laws and regulations. Prereq: The Food Industry; consent of instructor for non-majors. Recommended prereq: Core courses in Food Science and Technology. F

495 Food Processing System Analysis and Evaluation (3) Design and evaluation of food processing operation to produce safe and acceptable quality food product. Prereq: Food Chemistry, Food Microbiology, Food Preservation or consent of instructor. Sp

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

501 Seminar (1) Individual reports and discussion on topics from current literature. May be repeated. Maximum 3 hrs. F, Sp

502 Registration for Use of Facilities (3-15) Required for the student who 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. NC only. F

503 Problems in Lieu of Thesis (2-3) May be repeated. S/NC only. E

507 Professional Development Seminar (1) Same as Agriculture and Natural Resources 507, Animal Science 507, Biosystems Engineering 507, Biosystems Engineering 510, Ornamental Horticulture and Landscape Design 507, and Plant and Soil Sciences 507. S/NC only. F

509 Thesis Proposal Preparation (1) Same as Agriculture and Natural Resources 509, Animal Science 509, Ornamental Horticulture and Landscape Design 509, and Plant and Soil Sciences 509. S/NC or letter grade. Sp

510 Instrumental Analysis of Foods (3) Modern instrumental methods for control of food manufacturing processes. Prereq: Food Chemistry. 2 hrs and 1 lab. F

512 Flavors of Foods (2) Chemical basis, measurement, and reactions involved in flavor changes in foods. Manufacture and application of flavorings in foods. Prereq: Food Chemistry or equivalent. 1 hr and 1 lab. F, A

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

521 Advanced Food Microbiology (3) Extrinsic and intrinsic factors associated with foods and food processing that relate to growth, survival, inhibition, detection, and recovery of foodborne pathogens and spoilage microorganisms; traditional and current approaches to microbiological food safety and quality. Prereq: Food Microbiology and Lab or equivalent. 2 hrs and 1 lab. Sp, A

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

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

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

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

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

601 Seminar (1) Reports and directed discussion on research topics from current literature. May be repeated. Maximum 3 hrs. F, Sp

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

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

Forestry, Wildlife and Fisheries

(College of Agricultural Sciences and Natural Resources)

MAJORS

Forestry ................................................. M.S.
Natural Resources ........................................ Ph.D.
Wildlife and Fisheries Science ............... M.S.
George M. Hopper, Head

Professors:
Barrett, J. W. (Emeritus), Ph.D. .... Syracuse
Buckner, E. R. (Emeritus, Distinguished Prof.), Ph.D. .... NC State
Core, H. A. (Emeritus), Ph.D. .... Syracuse
Dearden, B. L., Ph.D. .... Colorado State
Dimmick, R. W. (Emeritus), Ph.D. .... Wyoming
Hill, T. K., Ph.D. .... Auburn
Hopper, G. M., Ph.D. .... Virginia Tech
Ostermeier, D. M., Ph.D. .... Syracuse
Peton, M. R., Ph.D. .... Georgia
Rennie, J. C. (Emeritus), Ph.D. .... NC State
Schlarskem, S. E. (Liaison), Ph.D. .... Colorado State
Young, T. M., M.S. .... Tennessee
Van Manen, F. T., Ph.D. .... Tennessee
Harper, C. A., Ph.D. .... Clemson
Buckley, D. S., Ph.D. .... Michigan Tech
Harper, C. A., Ph.D. .... Clemson
King, S. L., Ph.D. .... Texas A&M
Knowe, S. A., Ph.D. .... Georgia
Muller, L. J., Ph.D. .... Georgia
Van Manen, F. T., Ph.D. .... Tennessee
Wang, S., Ph.D. .... Nanjing Forestry (China)
Young, T. M., M.S. .... Tennessee

Associate Professors:
Buehler, D. A., Ph.D. .... Virginia Tech
Clark, J. D., Ph.D. .... Arkansas
Clatterbuck, W. K., Ph.D. .... Mississippi State
Fly, J. M., Ph.D. .... Michigan
Hay, R. L., Ph.D. .... Duke
Hodges, D. G., Ph.D. .... Georgia

Assistant Professors:
Bond, B. H., Ph.D. .... Virginia Tech
Buckley, D. S., Ph.D. .... Michigan Tech
Harper, C. A., Ph.D. .... Clemson
King, S. L., Ph.D. .... Texas A&M
Knowe, S. A., Ph.D. .... Georgia
Muller, L. J., Ph.D. .... Georgia
Van Manen, F. T., Ph.D. .... Tennessee
Wang, S., Ph.D. .... Nanjing Forestry (China)
Young, T. M., M.S. .... Tennessee

Graduate study leading to the Master of Science with majors in Forestry and in Wildlife and Fisheries Science and the Doctor of Philosophy with a major in Natural Resources is offered by the Department of Forestry, Wildlife and Fisheries. The doctoral program is pending approval of the Tennessee Higher Education Commission.

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

THE MASTER'S PROGRAMS

Both thesis and non-thesis options are available for the major in Forestry; a thesis is required in Wildlife and Fisheries Science. For admission, the student must have a Bachelor's degree from an accredited institution in forestry, wildlife, fisheries, or other natural resource area. Applicants must be familiar with the applicant's academic ability. The department also has an application that must be submitted at the time of application to The Graduate School.

Thesis Option
1. Prior to research for the thesis, the student is required to develop a detailed written research proposal. Registration for 6 hours of Thesis (Forestry 500 or Wildlife and Fisheries Science 300) is required.
2. A graduate committee of no fewer than 3 faculty members must be selected by the second semester of residence. At least one member must be outside the department. In addition to the thesis requirement, a minimum of 24 hours of graduate coursework is required. This work must be approved by the student's committee and no more than 10 hours of the minimum 30 can be below the 500 level. The committee may require additional coursework if the student's progress or background indicates such need.
3. All students are required to include Forestry 512 or Wildlife and Fisheries Science 512 in their program. This is required of each graduate student in residence fall semester.
4. An oral examination covering the thesis and coursework is required.

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

THE DOCTORAL PROGRAM

The doctoral program with a major in Natural Resources emphasizes interdisciplinary research approaches toward the understanding and management of natural resources in a broad context. Areas of study include forest, wildlife, and fisheries biology; ecosystem function and structure; natural resource economics and policy; human dimensions of natural resource management; natural resource organization and management; forest sciences; and multidisciplinary natural resources management.

Admission Requirements
Applicants to the Ph.D. program normally should have completed a master's degree prior to beginning the doctoral program. Specific admission requirements include:
1. A minimum grade-point average of 3.0 on a 4.0 scale.
2. A minimum composite score from the general Graduate Record Examination (GRE) on the verbal, quantitative, and analytical sections of 1100, with a minimum of 400 on the verbal and quantitative sections.

3. A statement of professional goals, natural resource management philosophy, and reasons for applying to the program.
4. Three letters of reference from individuals capable of evaluating the applicant's potential for graduate work in interdisciplinary natural resource management.

Degree Requirements
A candidate for the doctoral degree must complete 72 semester hours of coursework beyond the bachelor's degree. Forty-eight hours must be in graduate coursework approved by the student's doctoral committee. Up to 24 hours of master's-level coursework may be applied to the 48-hour requirement. A minimum of 6 hours must be taken in UT courses at the 600-level, exclusive of dissertation hours. Specific requirements are:
1. Research Methods and Analysis (9 credits in at least two of the subject areas)
   Research/Experimental Design
   Statistics/Econometrics/Biometrics
   GIS/Remote Sensing
2. Core Subject areas (33 credits to be determined by Doctoral Committee)
3. Professional Development (6 credits)
   Teaching - All students will be expected to complete FWF 601 and assist in teaching a course during their tenure in the program.
   Problem Solving - FWF 610 will be required of all doctoral students. This course will include participation in an interdisciplinary team to address a significant regional or natural resource issue.
   Professional Communications - all students will be required to complete FWF 612 as part of their program of study. Part of the seminar requirement will consist of assisting in the development and conduct of FWF 512.
4. FWF 600 Doctoral Research and Dissertation (24 credits)
   A doctoral committee consisting of at least four faculty members must be identified by the student and major professor. At least two of the committee members must be from the Department of Forestry, Wildlife and Fisheries and one member must be from an academic unit other than Forestry, Wildlife and Fisheries. Three of the committee members, including the major professor, must be approved by the Graduate School to direct doctoral research. The committee should be formed during the first year of the student's program.
   All students are required to successfully complete an oral and written examination on all coursework completed as part of the Ph.D. requirements. The exam is scheduled when the student has completed all or nearly all of the coursework. The Ph.D. committee will determine the content, nature, and schedule of the comprehensive exam and certify the results.
   During the first year, the student should develop a research prospectus that outlines the research problem to be addressed as part of his/her doctoral research. The prospectus is presented to the student's committee and the committee will approve the research topic and approach.
   All students are required to complete, present, and defend a dissertation. The student should provide each member of the committee a copy of the dissertation at least
two weeks prior to the scheduled defense. All students are required to present a seminar on their dissertation as part of the degree requirements. The seminar can be part of the dissertation defense or presented before the formal defense.

MINOR IN ENVIRONMENTAL POLICY

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

Forestry

GRADUATE COURSES

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

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

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

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

434 Wood Processing and Machining (2) Primary log breakdown and secondary processing into major products. Fundamental principles of machining technology for major types of cutting operations: sawing, boring, planing, veneer cutting, and laser machining; day field trip. Prereq: Wood Properties and Uses and Wood Identification, or consent of instructor. 1 hr and 2 labs. Sp

435 Wood Drying and Preserving (2) Discussion of wood-moisture relationships. Introduction to commercial wood drying equipment and practices. Proper use, specification, and disposal of preservative treated wood. Day field trips. Prereq: Wood Properties and Uses and Wood Identification, or consent of instructor. F

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

502 Registration for Use of Facilities (3-15) Required for the degree and cannot be registered for 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. Must have approval of graduate committee. Available only to students in nonthesis option for M.S. in Forestry. E

512 Seminar (1) Current developments in forestry. Required of all graduate students in residence in fall. May be repeated. Maximum 2 hrs. S/NC only. F

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

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

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

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

540 Genetics in Forestry (3) Genetic improvement of forest trees, selection, genotypes, population geneticists; field testing for genetic variability; tree breeding; development of seed orchards; hybridization; tree cytology and tissue culture; biotechnological aspects of forest genetics and breeding. Prereq: Silvicultural methods and Biology 220 or consent of instructor. Sp

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

570 Management & Policy of Forest Resource Organization (3) Theory and application of management as applied to natural resource organizations: institutions, regional direction and literature, 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 forest resource organizations. Forest administration and policy or consent of instructor. F,A

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

585 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory; fixed and variable plot sampling; list sampling; Poisson sampling; regression estimators; multistage and multiple stage sampling. Growth and yield predictors for uneven-aged and uneven-aged stands. Land Measurement Techniques and Forest Resource Inventory or consent of instructor. F,A

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

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


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

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

Forestry, Wildlife & Fisheries

GRADUATE COURSES

410 Wildlife Habitat Evaluation and Management (3) Ecological relationships between wildlife and habitat. Evaluation, modeling, and management of wildlife habitat. Effects of land-use practices on wildlife habitat. Weekend field trips. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. Evaluation of natural resources in different parts of world: Northern Europe, Latin America, Asia, Africa, and South America. In-depth case study and class presentation required by student teams. Not available for students who have taken 420, F,A

416 Planning and Management of Forest, Wildlife and Fisheries Resources (3) Integrated forest and wildlife resource management through developing land use plans and analyzing case studies including conflict resolution. Applicable to majors in Forestry and in Wildlife and Fisheries Science. Prereq: Senior standing in 1 hr and 2 labs. Sp

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

525 Management of Forestry, Wildlife and Fisheries Resources (2) Current technologies and management strategies concerning wise use of forest, wildlife, and fisheries resources. Prereq: Senior-level in decision making and implementation. Prereq: 6 hrs of biological sciences or consent of instructor. Not available to students in forestry or wildlife and fisheries science. 4 hrs and 1 lab for 6 weeks. Sp, A

535 Environmental Impacts to Natural Ecosystems (3) Current environmental problems impacting natural ecosystems: climatic change, acid deposition, air pollution, species declines, and introductions of exotic species. Applicable to majors in Forestry and in Wildlife and Fisheries Science. Sp,A

540 Seminar on Integrated Resources Management in Biosphere Reserves (2) MAB program, UNESCO-sanctioned global conservation initiative. Analysis of integrated resource management in Biosphere Reserves. Applicable to majors in Forestry and in Wildlife and Fisheries Science. Sp

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


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

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

GRADUATE COURSES

440 Wildlife Techniques (3) Methods of wildlife damage control, nest and habitat estimation, identification of wildlife food sign, wildlife capturing techniques and management plan preparation. Weekend field trip. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. 1 hr and 1 lab or field. F

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

444 Ecology and Management of Wild Mammals (3) Biological and ecological characteristics of large wild mammals and endangered mammals. Current principles and practices of wild mammal management. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. 2 hrs and 1 lab. Sp

446 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: Principles of Wildlife and Fisheries Management or consent of instructor. 2 hrs and 1 lab. Sp

490 Ethics in Wildlife and Fisheries Management (1) Ethical bases for decision-making and application of methodologies in practice of wildlife and fisheries management. Seminars by ethicists, wildlife and fisheries scientists and managers, and foresters to acquaint students with diverse perspective of ethical behavior in practices of wildlife and fisheries management. Lectures, panel discussions, and case studies. Team taught. Prereq: Senior standing. Sp

500 Thesis (1-15) F,N,P only. E

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

512 Seminar in Wildlife and Fisheries Science (1) Current developments in wildlife and fisheries science. Required of all graduate students in residence in fall. May be repeated. Maximum 2 hrs. S/N only. F

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

520 Planning and Administration of Fisheries and Wildlife Programs (3) Factors influencing policy and program planning activities of fisheries and wildlife agencies. Decision-making policies, case histories. S,A

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

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

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

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

545 Population and Habitat Analysis (2) Detail characteristics, assessment of methods, and present technologies for fish and wildlife population analysis. Technological, methodological, and goals for wildlife habitat analysis. Use of computers. Prereq: Animal Science 571 or Statistics 538 or consent of instructor. F,A

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

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

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

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

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

French

See Modern Foreign Languages and Literatures

Geography

(College of Arts and Sciences)

MAJOR

DEGREES

Geography ......................................... M.S., Ph.D.

Bruce Ralston, Head

Professors:

Aiken, Charles S., Ph.D. ................. Georgia
Bell, Thomas L., Ph.D. ..................... Iowa
Foresta, Ronald, Ph.D. .................... Rutgers
Hammond, E. H. (Emeritus), Ph.D. .... California
Harden, Carol P., Ph.D. ................... Colorado
Horst, Sally P., Ph.D. ....................... California
Jumper, Sidney R. (Liaison), Ph.D. ... Tennessee
Long, Robert G. (Emeritus), Ph.D. .......
Minkel, C. W., Ph.D. ....................... Northwestern
Mintz, E. .................................. Syracuse
Puschke, Lida, Ph.D. ....................... Southern Illinois
Reineau, Bruce, Ph.D. ..................... Northwestern
Rehder, John B., Ph.D. .................... Louisiana State
Schmid, Theodore H. (Emeritus), Ph.D. 
Wisconsin

Associate Professors:

Brinkman, Leonard W., Jr., Ph.D. ........ Wisconsin
Orvis, Kenneth H., Ph.D. ............... California
Shaw, Shih-Lung, Ph.D. ................. Ohio State

Assistant Professor:

Griswold-Mayor, Henri, Ph.D. .......... Arizona

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 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 graduate work in location analysis, transportation geography, urban and rural geography, cultural ecology, and the geography of the natural environment (especially biogeography and geomorphology). The faculty is qualified to direct students from a variety of approaches ranging from historical and humanistic to rigorously analytic and GIS-based.

THE MASTER'S PROGRAM

The department offers the thesis and nonthesis options for the Master of Science. Both options require a minimum of 30 semester hours beyond the baccalaureate degree and completion of a sound undergraduate major program. At least two-thirds of the total 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, 6 hours must be Thesis 500. 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 a broad foundation and understanding of the discipline; these should have been achieved in a comprehensive master's program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program must include 504, 515, and 516, 9 hours of 600-level seminars, and (at each offering during residency) 501. A minimum of 9 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 area of research specialization.

Examinations required for admission to candidacy include a written comprehensive examination, comprised of two written examinations in which the student will be tested on his/her knowledge of two special fields, and related areas of geography, an oral examination on the student's program, the special fields and related areas, and the dissertation proposal. All parts of the written
Major: Geological Sciences

Degree: M.S., Ph.D.

William M. Dunne, Head

Professors:
- Broadhead, Thomas W., Ph.D. ............................................ Iowa
- Byerly, Don W. (Emeritus), Ph.D. ........................................... Tennessee
- Driese, Steven G. (Liaison), Ph.D. .......................................... Wisconsin
- Dunne, William M., Ph.D. ..................................................... Bristol
- Hatcher, Robert D., Jr. (Distinguished Scientist), Ph.D. ................. Tennessee
- Kopp, Otto C. (Emeritus), Ph.D. .............................................. Columbia
- Labotka, Theodore C., Ph.D. ................................................. Caltech
- McSween, Harry Y., Ph.D. .................................................... Harvard
- Miller, Kula C., Ph.D. .......................................................... Western Ontario
- Taylor, Lawrence A., Ph.D. .................................................... Lehigh
- Walker, Kenneth R. (Carden Prof.), Ph.D. .................................. Yale

Associate Professors:
- Clark, G. Michael, Ph.D. ..................................................... Penn State
- McKay, Larry D. (Jones Prof.), Ph.D. ...................................... Waterloo
- McKinney, Michael L., Ph.D. .................................................. Yale
- Mora, Claudia I., Ph.D. .......................................................... Wisconsin
- Williams, Richard T. II., Ph.D. .............................................. Virginia Tech

Assistant Professors:
- Kah, Linda C., Ph.D. ............................................................ Harvard
- Uhle, Maria (Jones Prof.), Ph.D. .............................................. Virginia

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 (general). Students are not normally admitted under non-degree status. Prerequisite for both degrees is a Bachelor’s degree, including coursework in mineralogy, optical petrology, stratigraphy, paleontology, structural geology, and field geology. One year each of coursework in calculus and chemistry and one year of coursework in biology, physics, or statistics are also required. Applicants lacking any of these may be admitted, but the deficiencies must be removed within the first year without graduate credit. Substitutions may also be allowed.

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:
1. Six hours of Thesis 500.
2. Registration in 595 during the first two years in residence. Two hours may be counted toward the 30-hour minimum. This requirement may be waived in unusual circumstances.
3. Sixteen hours of geology courses, with at least 14 hours at the 500 or 600 level, including at least one course from any three of the following five groups:
   - Group 1: 410, 460, 480, 530, 563, 565
   - Group 2: 420, 545, 548, 556
   - Group 3: 470, 570, 575, 576
   - Group 4: 401, 485, 510, 521, 535, 550
   - Group 5: Any 400-600 level courses with graduate credit from related departments (ecology, mathematics, and engineering), selected with approval of advisor.
4. Eight hours of additional graduate coursework.

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 beyond the master’s degree is required in addition to the 24 hours of Dissertation 600. The coursework includes the sum of 9 hours of 600-level geology courses, 9 hours of 500-level or higher geology courses, and 6 hours of additional graduate coursework from a non-departmental coursework is encouraged.

The student must demonstrate a reading knowledge of a foreign language in which there is a body of geologic literature, as approved by the student’s dissertation committee. The foreign language requirement may be waived for Ph.D. students whose native language is not English and who have demonstrated mastery of the English language, as determined by the student’s dissertation committee.

Graduate Courses

401 Quantitative Methods in Geology (3) Applications of calculus and differential equations to problems in earth sciences. Examinations of diffusion equation in hydrogeology; wave equation in geophysics; mechanical modeling and boundary conditions in structural geology and tectonics. Prereq: The Dynamic Earth or Earth, Life, and Time, 2 semesters of Calculus.


411 Optical Mineralogy (2) Laboratory course on principles of optical microscopy. Use of petrographic microscope to identify rock-forming minerals with applications to petrology and environmental mineralogy. Prereq: Mineralogy.

412 Elements of X-ray Diffraction (2) Laboratory course on principles and applications of X-ray diffraction. Phase identification, quantitative determination of mineral abundances in mixtures, and crystal structure determination. Prereq: 310. 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 scientific reports based on field and laboratory analysis. Writing emphasis course. 3 hrs and 1 lab.

421 Invertebrate Paleontology (4) Survey of invertebrate animal phyla: skeletal structure and preservation, functional morphology, osteology, and stratigraphic distribution. Prereq: Paleobiology or consent of instructor. 2 hrs and 2-3 hrs lab.

440 Field Geology (5) Summer field course for advanced undergraduate geology majors and first-year graduate students in geology. Taught off-campus and requires full time of student. Synthesis of major aspects of geological sciences in societal context. Field techniques demonstrated, practiced, and applied to solution of geologic problems. Prereq: Completion of major core courses and consent of instructor.

450 Process Geomorphology (3) Integrative approach to development of surface of earth based upon case histories, maps, remote sensing imagery. Prereq: 101-02. (Same as Geography 450.) 2 hrs and 1-2 hrs lab.

455 Basic Environmental Geology (3) Applications of geological sciences toward comprehension of effects of geological processes on humans and effects of human activities on earth environments. Prereq: The Dynamic Earth 2 hrs and 1-3 hr lab or field period.

460 Principles of Geochemistry (4) Applications of chemical principles to geologic systems: problem-solving techniques. Phase diagrams, partitioning of trace elements, thermodynamic principles for evaluating stabilities of mineral assemblages, aqueous solutions, and applications of radiogenic and stable isotopes to geologic systems. Prereq: Chemistry 120-130 General Chemistry, Mathematics 141-142 Calculus I, II. Recommended prereq: Geology 330 Igneous and Metamorphic Petrology or consent of instructor. 3 hrs and 1-2 hrs lab.


471 Fieldwork in Geophysics (2) Geophysical investigations applied to solution of problems in tectonics, hydrogeology, or environment. Summer field course off-campus. Requires full time for 2 or more weeks. Prereq: 470 or consent of instructor.

475 Physical and Chemical Systems of the Earth (3) Development of physical earth from solar nebula to present. Formation, composition and evolution of hydrosphere, crust, mantle, and core. Interdependence of earthquakes, volcanism, plate tectonics, etc.
geomagnetism, chemical and isotopic processes of interior, and earth's temperature. Historical perspective on major controversies of past, and problems unresolved today. Prereq: 16 hrs of geology courses numbered 300 and above. 2 hrs and 1 discussion.

480 Principles of Economic Geology (4) Ore-forming processes and economic deposits, survey of different types of mineral deposits with examples, and metallogenesis. Prereq: 310 and 330 or equivalents. Recommended prereq: 480. 1 hr and 2-1/2 hr lab.

485 Principles of Hydrogeology (3) Physical principles of flow, flow equations, geologic controls, aquifer analysis, water well design/heading, introduction to transport processes. Prereq: The Dynamic Earth: Calculations; Fundamentals of Physics or equivalent, or consent of instructor. (Same as Geoscience 485).

486 Hydrogeology Laboratory (1) Application and demonstration of hydrogeological principles in field and laboratory. Prereq or coreq: 485 or Environmental Engineering 535 or consent of instructor.

500 Thesis (1-15) P/N P 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 is consumed. May not be used toward degree requirements. May be repeated. S/N only. E

505 Structure of the Southern and Central Appalachian (2) Structural development of Southern and Central Appalachian belts, including Appalachian-late Paleozoic—early Paleozoic rift-drift-platform margin through processes related to continental events producing accretionary belts that formed Appalachian through the Paleozoic. Comparisons to similar orogens. Prereq: Structural Geology.

510 Clay Mineralogy (3) Origin, chemistry, structure, and properties of clay minerals; application of mineralogical techniques. Prereq: 310 and 588 or equivalent. 2 hrs and 1 lab.

521 Data Analysis in Geology and Environmental Science (3) Application of statistical and other quantative techniques using computers to analyze geological data: environmental problems.

530 Petrogenesis of Crystalline Rocks (4) Origin and properties of igneous and metamorphic rocks, magmatic and subvolcanic processes and physical conditions. Laboratory involves petrographic study of crystalline rocks in thin section. Prereq: 410. 4 hrs and 1 lab.

535 Ground Water Hydrology (3) (Same as Environmental Engineering 535.)

540 Seminar in Local Geology (1) Introduction of geology of Southern Appalachians. 1 hr plus fieldtrips.

544 Paleopedology (3) Field, microscopic, and geochemical analysis of fossil soils (paleosols) and comparison with modern analog soils; interpretation of changes in paleoweathering processes, paleoclimate and paleoatmospheric chemistry over 4.6 billion years of earth history based on paleosols. Prereq: 340 or equivalent, general chemistry, or consent of instructor.

545 Sandstone Petrology/Physical Sedimentology (4) Field and microscopic analysis of tennurigenic classic rock types; physical processes of sedimentation, transport of sediment, and formation of sedimentary structures. Prereq: 340 or equivalent. 3 hrs and 1 lab.

546 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonate sediments and diagenesis of resultant rocks; field and laboratory analysis of sample material and preparation of scientific reports. 3 hrs and 1 lab.

550 Regional Geomorphology (3) Integrative approach to study of natural geomorphological regions stressing links and similarities across areal boundaries, unique characteristics of major divisions, provinces, sections, and districts. May be repeated with consent of instructor. Maximum 6 hrs.

556 Ice-Age Environments and Global Climate Change (3) (Same as Ecology and Evolutionary Biology 555.)

557 Quaternary Ecology (3) (Same as Ecology and Evolutionary Biology 557.)

563 Stable Isotope Geochemistry (3) Theoretical aspects of isotope fractionation and applications to geologic systems, isotopic exchange, variations in natural waters, dia genetic, hydrothermal and metamorphic systems. Prereq: General Chemistry or equivalen.


568 Geochemical Analysis (3) Collection and treatment of geochemical data using electron microprobe, x-ray fluorescence, and atomic absorption spectrophotometric techniques. Prereq: 310 or consent of instructor. 2 hrs and 1 lab.

570 Advanced Structural Geology (4) Current topics in structural geology and tectonics of mountain belts; recent literature. Prereq: 370 or equivalent, or consent of instructor. 3 hrs and 1 lab or seminar.

572 Fracture Analysis (3) Field and subsurface characterization, and mechanical development of natural fractures. Prereq: Physical Chemistry or equivalent, or consent of instructor. (Same as Civil Engineering 572.)

575 Tectonics (4) Evolution of Earth's lithosphere in context of plate tectonics theory. Formation of continents through comparative anatomy of mountain belts, including Appalachians, Alps, Urals, fold-thrust belts, Cordillera, Andes, and Himalayas. Prereq: Structural Geology or consent of instructor. 3 hrs and 1 seminar.

576 Reflection Seismology (3) Imaging subsurface structures using reflected seismic waves. Application to tectonic and environmental problems. Prereq: 470 or consent of instructor.

585 Contaminant Hydrogeology (3) Physical transport processes, isotopes and groundwater age dating, processes influencing inorganic, organic and microbial contaminants, sampling and monitoring methods, remediation of contaminated groundwater, aquifer protection. Prereq: 485 or 535; 460 or 561; or Environmental Engineering 553 or equivalent; and consent of instructor.

586 Field and Laboratory Methods in Hydrogeology (3) Research methods. Measurement of hydraulic properties, drilling, sampling and instrumentation, tracer experiments. Formulation of hypotheses and research plans. Prereq or coreq: 485 or Environmental Engineering 553; and consent of instructor.

590 Special Problems in Geology (1-3) Directed study or special topics. Prereq: Consent of instructor. May be repeated. Maximum 10 hrs.

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

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

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

595 Selected Topics in Geology (1-3) Presentation of research by faculty and visiting scientists. Registration required each semester for resident full-time graduate students, except in summer and when registered for 596. S/N only.

596 Geology Colloquium (1) Preparation and oral presentation of scientific material. Grade based on content, preparation, presentation, and instructor critique in departmental format. Taken only once during residence for each graduate student.

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

620 Seminar in Paleontology (3) May be repeated with consent of department. Maximum 9 hrs.

630 Seminar in Petrology (3) May be repeated with consent of department. Maximum 9 hrs.

640 Seminar in Sedimentary Geology (3) May be repeated with consent of department. Maximum 9 hrs.

650 Seminar in Geomorphology and Quaternary Geology (3) May be repeated with consent of department. Maximum 9 hrs.

660 Seminar in Geochemistry (3) May be repeated with consent of department. Maximum 9 hrs.

670 Seminar in Structural Geology (3) May be repeated with consent of department. Maximum 9 hrs.

675 Seminar in Geophysics (3) Advanced treatment of selected topics in geophysics. Prereq: 470 or consent of instructor.

685 Seminar in Hydrogeology (3) May be repeated with consent of department. Maximum 9 hrs.

German

See Modern Foreign Languages and Literatures

Health and Safety Sciences (College of Human Ecology)

MAJORS DEGREES

Health Promotion and Health Education ... M.S.
Human Ecology ........................................... Ph.D.
Public Health ........................................... M.P.H., M.S.-M.P.H.
Safety ..................................................... M.S.

Dorel Smith, Interim Head

Professors:
Gorski, June, Dr.,P.H. ................. UCLA
Hamilton, Charles B. (Liaison), Dr.P.H. ................. Dr.P.H. (Liaison)
Kirk, Robert H., H.S.D. ........ Indiana
Wallace, Bill C. (Liaison), Ed.D. ........ Northern Colorado

Associate Professors:
Puraley, R. Jack, Ph.D. ............... Iowa
Zemel, Paula (Liaison), Ph.D. ...... Wayne State

Assistant Professor:
Smith, Susan M. (Liaison), Ed.D. ...... Tennessee

The Health and Safety Sciences Department offers graduate programs leading to the Master of Science with majors in Health Promotion and Health Education and in Safety, and to the Master of Public Health degree in Public Health. The department provides doctoral preparation through a concentration in Human Ecology. Inquiries should be directed to the department head. Application packets are available by request to the department.

The department fosters development of pre-professional and professional competencies by those interested in the disciplines of health education/promotion, public health, and safety. The Health and Safety Sciences academic programs emphasize health promotion (lifestyle behaviors) and health protection (regulatory, environmental and safety) strategies for improving individual and community well-being, directly relating to two UT thematic areas of strength, health.
and biomedical sciences and children and families. The faculty are committed to the educational values of community-based service learning, applied research, and community outreach. For more information, http://hss.he.utk.edu.

Health

A graduate program is available leading to the Master of Science with a major in Health Promotion and Health Education (thesis and non-thesis options), requiring completion of 33 semester hours. The program emphasizes research skills development by those already employed in the health professions with each student completing a realistic health-related research proposal as a major developmental activity.

The Doctor of Philosophy with a major in Human Ecology offers a concentration in community health. Perspectives of social, behavioral and biomedical sciences are incorporated with educational models appropriate for addressing community health needs.

THE PH.D. CONCENTRATION

The community health concentration integrates the behavioral and natural sciences with public health, community health education, health promotion and the safety sciences to prepare scholars with an interest in improving the health of the nation.

Requirements include:
1. Minimum 21 hours of foundation courses: 610, 620, 6 hours of statistics, 3 hours of specialized research methods, and 6 hours of natural or behavioral sciences.
2. Minimum 21 hours in primary specialization: 530, 540, 650, 655, 660 and 6 hours of electives.
3. Minimum 12 hours in supporting specialization in a focused area: public health, safety, gerontology or a program approved by doctoral committee.
4. Minimum 6 hours in a cognate area.

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.) Sp

405 Alcoholism and Alcohol Education (3) Problems of alcoholism. Factors which make alcoholism serious health and safety problem. Various types of instructional/educational and intervention programs.

406 Death, Dying and Bereavement (3) Aspects of terminal/educational and intervention programs.

500 Substance Use and Abuse (3) Drug and alcohol abuse problems and suspected causes; pharmacology of drugs and effects on society; strategies for intervention and education. Sp

406 Aging and Health (3) Aging process in health perspective as related to health promotion and wellness 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 repeated. S/N/C only. E

520 Sex Education and Human Sexuality (3) Advanced in-depth discussion of educational and health counseling theory, techniques, materials used in school, community or health care facility. Sp

530 Health Promotion and Health Education Program Development (3) Theories and principles of health promotion program development; methodology, marketing, public relations. Health education as vehicle for health promotion. F

540 Evaluation in Health Promotion and Health Education (3) Evaluating principles and methodologies as related to health promotion products, processes and programs. Construction of instruments for use in assessing health education outcomes. Sp

570 Special Topics (1-3) For graduate students, inservice teachers and other health professionals. Health/wellness or health promotion issues. May be repeated. 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 instructor before 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 601.)

610 Critical Analysis of Writing and Research (3) Analysis of writing and research in health-related areas. 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 as related to health and wellness of individual. (Same as Public Health 650.) Su

555 Seminar in Nation's Health (3) Comprehensive study of definition, determinants, resources and health status of nation. (Same as Public Health 655.) 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


430 Suicide and Crisis Intervention (3) Factors which make suicide a health problem. Assessment, intervention, and prevention techniques.

Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Three professional preparation concentrations are available: community health education, gerontology, and health planning/administration. Preparation for professional practice in improving community health emphasizes a population perspective, service-learning and application opportunities through rigorous internships. The M.P.H. program is accredited by the Council on Education for Public Health. A minor in statistics is available to interested M.P.H. students due to public health affiliation with the Intercollegiate Graduate Statistics Programs.

ADMISSION REQUIREMENTS

A statement of the applicant's educational and career goals and three rating forms are required. Request an application packet from the department. Preference consideration for admission to degree status shall be given to those with a minimum undergraduate grade-point average of 2.8 and with at least one year of professional experience in a health-related occupation. As a restricted program, non-degree admission requires department recommendation. Deadlines for completed applications are 1 February for Summer term and 1 April for Fall semester.

THE MASTER'S PROGRAM

The M.P.H. is a non-thesis program requiring completion of 33 semester hours of coursework including 9 weeks of field practice. The field internship provides a full-time experience with an affiliated health agency or organization offering one or more health programs. Of importance, field practice allows the student to apply academic theories, concepts, and skills in an actual work setting. Students must complete all assigned prerequisite courses and 21 semester hours of the curriculum with a minimum overall GPA of 3.0 prior to placement in the field.

As an alternative to field practice, preparation of a master's essay may be used to fulfill the professional development component of the curriculum. Approval must be received from the Public Health Academic Program Committee and is contingent on consent of major advisor, formal written proposal by the student, and completion of an additional research methods course. Written guidelines stipulating expectations and eligibility criteria are available.

Requirements include:
1. Public Health Foundation courses (16 hours): 609, 510, 520, 530, 540, 555.
2. Internship (6 hours): 567, 568.
3. Concentration of Study (16 hours). Required and recommended electives will be selected by the student in consultation with the major advisor. A list of courses is available for each concentration: community health education, gerontology, and health planning/administration.

For more information, refer to the website: http://hss.he.utk.edu/pubhealth.

DUAL M.S.-M.P.H. PROGRAM

The College of Human Ecology offers a coordinated dual program leading to the conferment of both the Master of Science with a major in Nutrition (public health nutrition concentration) and the Master of Public Health. The dual program allows students to complete both degrees in less time than would be required to earn both degrees independently.
The program is designed to meet the needs of students who are interested in the benefits of majors in both nutrition and public health. Therefore, it accommodates the interests of students who: 1) plan a career in public health nutrition and want to acquire the knowledge and skills of the nutritionist and public health professional; 2) plan a career in nutrition and want to acquire the knowledge and skills and the perspective of the public health professional; or 3) plan a career in public health and want to acquire the knowledge, skills and perspective of the nutritionist.

Admission Requirements

Applicants for the M.S.-M.P.H. program must make separate application to, and be competitively and independently accepted by, the Department of Nutrition in the M.S., Department of Health and Safety Sciences for the M.P.H., and the Public Health Academic Programs Committee.

Students who have been accepted by both departments may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both departments. Such approval will be granted, provided that dual program studies be started prior to entry into the fourth semester of the M.S. and M.P.H. programs.

Curriculum

A dual degree candidate must satisfy the requirements for both the M.S. (public health nutrition concentration) and the M.P.H. degrees, as well as the requirements for the dual program. All candidates for the dual degree must successfully complete Health and Safety Sciences (PH 555), two credits of Seminar in Public Health (PH 509), and a minimum of 60 credits. The Department of Nutrition will award a maximum of 9 semester hours of credit toward the M.S. degree for successful completion of approved graduate level courses offered in the Department of Health and Safety Sciences. The Department of Health and Safety Sciences will award a maximum of 11 semester hours of credit toward the M.P.H. degree for successful completion of approved courses offered in the Department of Nutrition. All courses for which such cross-credit is awarded must be approved by the Public Health Academic Program Committee and the student's graduate committee. A single block field experience (or public health internship) is required of all students and the analytical field paper incorporates public health nutrition and the student's public health concentration.

Dual degree candidates must receive credit toward both degrees. Students will not receive credit from the program before completion of the requirements for both degrees will not receive credit towards the M.S. or M.P.H. degrees for courses taken in the other program, except as such courses qualify for credit without regard to the dual program.

Approved Dual Credit

M.S. courses to be counted toward the M.P.H. program must include 10 semester hours of Field Study in Community Nutrition (NTR 515) or Seminar in Public Health (NTR 509). M.P.H. courses to be counted toward the M.S. include Public Health Administration (PH 520), Biostatistics (PH 530), and Epidemiology (PH 540).

MINOR IN GERONTOLOGY

Graduate students in Public Health may pursue a specialized minor in gerontology. This interunit/interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to Human Ecology for specific requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.P.H. program in Public Health is available to residents of the state of Arkansas. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Student Services.

COURSE REGISTRATION

Non-degree students must obtain permission from the M.P.H. program director to register for 500-level public health courses. Prerequisite coursework assigned as a condition of admission to the M.P.H. program must be completed prior to entry with a grade of B or better, typically within the first semester or two of enrollment in graduate studies.

GRADUATE COURSES

400 Consumer Health (3) (Same as Health 400.)
410 Worksite Health Promotion (3) Foundations of health promotion programs delivered in worksite that revolve around issues relative to employees and management: theory, program design, implementation and evaluation from perspective of health promotion specialist. Prereq: Health Education, Promotion, and Behavior Sp.
493 Directed Independent Study (1-3) Individual in-depth study of selected issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E.
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester where University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E.
509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health as discipline and its interaction with many other academic and professional disciplines. Speakers both internal and external. May be repeated. Maximum 4 hrs. (Same as Nutrition 509, Nursing 509, Exercise Science 509 and Social Work 509). S/NC only. F,Sp.
510 Environmental and Occupational Health (2) Complexities of personal and ambient environment recognizing health as an intrinsically 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.
523 Management in Extended Care Settings (3) Managerial concepts and theoretical foundations essential to supervision and administration of domiciliary health services programs. Management and operation of health services programs for patients and clients in settings which provide activities of daily living and special psychosocial environmental needs. Prereq: M.P.H. major, one semester advance notice and consent of major advisor. 589: available only for approved extended placements. S/NC only. E.
525 Financial Management of Health Programs (3) Financial management concepts and practices applied to health services programs. Fundamentals of budgeting, costing, financial management, financial reporting, and control. Opportunities to apply techniques. Prereq: M.P.H. or consent of instructor. Sp.
530 Biostatistics (3) Application of descriptive and inferential statistical methods to health-related problems; statistical programming. 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,Sp.
540 Principles of Epidemiology (3) Distribution and determinants of health-related outcomes in specified populations, with application to control of health problems. Historical origins of discipline, hypothesis formulation, research design, data and error sources, measures of frequency and association, etiologic reasoning, disease screening, and injury control. Prereq or coreq 530. F,Sp.
550 Principles and Practices of Community Health (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: F.
560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodologies; systems-oriented planning process. Major elements of planning: formulation and conceptualization of problems, plan design, evaluation and implementation. Health problems of institutions, communities and selected population groups, appropriate diagnoses, and programs for addressing needs. Sp.
568 Physical Activity and Positive Health (3) (Same as Exercise Science 568.)
569 Clinical Exercise Physiology (3) (Same as Exercise Science 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, Counseling Education and Counseling Psychology 585, Exercise Science 585, Nursing 585, Psychobiological Studies 585, Social Work 585, and Sociology 585.)
587-88-89 Internship (3,3,3) Internship (community health education, gerontology, or health planning/administration) in either approved organization or research setting under supervision of designated preceptor. Prereq: M.P.H. major, one semester advance notice and consent of major advisor. 589: available only for approved extended placements. S/NC only. E.
590 Research Methods in Health (3) (Same as Health 590.) F.
593 Directed Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

560 Health Aspects of Gerontology (3) (Same as Health 650.) Su

555 Seminar in Nation's Health (3) (Same as Health 655.) F

560 International Health (3) (Same as Health 660.) Sp

Safety

Graduate study with a major in Safety (thesis and non-thesis options) leads to the Master of Science degree. Graduate students may concentrate in safety management or in emergency management. The M.S. degree program requires completion of 33 semester hours. Degree requirements include completion of the 18-hour core curriculum and completion of a concentration area (15 hrs.). Concentration course options include specific courses offered by the departments of Human Resource Development, Industrial Engineering, Civil and Environmental Engineering, and Political Science (Public Administration) in addition to those offered by the Department of Health and Safety Sciences. A list of courses is available for each concentration. Students may elect an internship experience with private industry or non-profit organizations to fulfill part of their course requirements. Curricular experiences will assist graduates in preparation for certified safety professional (CSP) examination.

The graduate program contributes to the University of Tennessee's mission of health protection by preparing safety professionals with the knowledge and skills necessary to create and maintain safe human environments in the workplace (industrial and commercial), home, school, and community. The offering of all core classes and required concentration courses on an evening class schedule enables those working full-time in a safety-related field to pursue the M.S. degree with a major in Safety on a part-time basis.

For more information, refer to the website: http://hss.he.utk.edu/safety.

GRADUATE COURSES

443 Sports & Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interrelationships in sports injury and control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs. and 2 labs. Sp

452 Safety Principles and Practices (3) General principles, practices, and procedures in occupational and community safety. Historic and present safety issues, programs and practices addressing safety of individuals and groups in work-site, school, community, transportation, and industrial settings. Prereq: Junior or Senior standing or consent of instructor. F, Su

460 Fire Risk Management (3) Development, implementation, and management of comprehensive fire safety program. Basic fire risk management concepts, interpretation of codes and exposure to basic fire analysis techniques. Prereq: Coreq: Senior standing or consent of instructor. Su

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. SNC only. E

532 Behavioral Problems in Safety Education & Accident Prevention (3) Problems of behavior, causes of accidents, and application of principles of psychology in development of safety behavior in all segments of environment. F

533 Problems and Research in Accident Prevention (3) Safety problems found in wide variety of accidents that occur in community; findings of current research in behavioral sciences as related to variation incidence of accidents. Sp

534 Organization, Administration and Supervision of Safety Programs (3) National, state and local level programs: administrative, instructional, and supervisory aspects. Implementation of relevant programs. Sp

535 Emergency Management (3) Civil and defense problems: tornadoes, floods, fires, mass civil disorders, and nuclear and personnel attack by alien countries. F

536 Safety Instrumentation (3) Selection, calibration, maintenance, and use of sampling instruments available to safety practitioner for evaluating exposures of workers to physical stresses and airborne contaminants. F

537 Advanced Emergency Management (3) Advanced study in emergency and hazard mitigation, planning, response and recovery. Theory and practice in identification of appropriate emergency warning systems, hazard assessment, facility inspection, plan development and implementation. Prereq: 535. Sp

572 Graduate Workshop in Safety (3) Special safety education problems. For advanced graduate students, teachers, supervisors, and administrators. May be repeated. Maximum 12 hrs.

590 Special Topics (1-3) Advanced study in selected disciplinary or professional area of safety education management. May be repeated. Maximum 12 hrs.

593 Directed Independent Study (1-3) Individual study and research. May be repeated. Maximum 12 hrs.

601 Internship/Research in Safety and Health (3-6) Field experience. Significant problem identified, researched, and reported in acceptable form. May be repeated. Maximum 6 hrs. (Same as Health 601.) E

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. program includes a thesis and non-thesis option. The doctoral program has concentrations in American history, European history, and special focuses in the areas identified under group I and II of the program. The graduate program is designed to allow for specialization in the areas of concentration.

The History department offers a wide range of courses in American, European, and comparative history. The department is committed to maintaining a strong program of research and scholarship in the field of history.

History

(College of Arts and Sciences)

MAJOR

DEGREES

History ........................................ M.A., Ph.D.

William B. Wheeler, Head

Professors:

Bergeron, Paul H., Ph.D. Vanderbilt
Chmielewski, Edward V. (Emeritus), Ph.D. Harvard
Cutter, E. Wayne, Ph.D. (Emeritus) Texas
Farris, W. Wayne, Ph.D. Harvard
Finger, John R. (Emeritus), Ph.D. Washington
Haas, Arthur G., Ph.D. Chicago
Hap, Yun-Ping (Lindsay Young Prof.), Ph.D. Harvard
Haskins, Ralph W. (Emeritus), Ph.D.
Klein, Milton M. (Emeritus) California
Kleine, Milton M. (Emeritus) (Distinguished
Prof.), Ph.D. Columbia
Moser, Harold D., Ph.D. Wisconsin
Norrell, R. Jeff (Bernadotte Schmitt Prof.), Ph.D.

Ratner, Lorman A. (Emeritus), Ph.D. Cornell
Utile, Jonathan G. (Emeritus) Illinois
Wheeler, W. Bruce, Ph.D. Virginia

Associate Professors:

Ash, Stephen V., Ph.D. Tennessee
Ash, Stephen V., Ph.D. Tennessee
Bast, Robert J., Ph.D. Arizona
Bohstedt, John, Ph.D. Harvard
Bradley, Owen P., Ph.D. Cornell
Brunner, Palma R., Ph.D. Chicago
Burman, Thomas E., Ph.D. Toronto
Diacon, Todd A., Ph.D. Wisconsin
Higgs, Catherine A., Ph.D. Yale
Pinckney, Paul J., Ph.D. Vanderbilt

Assistant Professors:

Appler, Janis, Ph.D. California (Riverside)
Brosnan, Kathleen, Ph.D. Chicago
Dessel, J. P., Ph.D. Arizona
Glover, Lorri, Ph.D. Kentucky
Lulevic, Veser, G., Ph.D. Pennsylvania
Pietler, G. Kurt, Ph.D. Rutgers
Sahadea, Jeff, Ph.D. Illinois

The MASTER’S PROGRAM

Admission Requirements

1. Successful completion of a baccalaureate degree from an accredited institution, preferably with a major in history.
2. Acceptable scores on the Graduate Record Examination (general).

General Requirements

Complete 510 and a 600-level research seminar normally during the fall and spring semesters of the first year in the graduate program. Complete 521 in preparation for the M.A. examination. As many as 9 related hours may be taken outside the department. As many as 3 graduate credits taken elsewhere may be applied toward the M.A. degree. Except by prior approval of the Director of Graduate Studies, a student’s coursework must be at the 500 level or above.

Thesis Option

Twelve-four hours of coursework and 6 hours of Thesis 500 for a total of 30 hours are required. Thesis students are required to select one M.A. field and write a thesis. At the end of the program, the thesis student will stand for a two-hour oral examination on both the thesis and the field.

Non-Thesis Option

A total of 30 hours of coursework is required. At least 6 hours must be completed in each of two M.A. fields. The primary field is examined by a two-hour written examination within one week by one-hour oral examination with the single grade of pass/fail.
Retention and Termination
A 3.0 overall grade-point average is required to remain in good standing. M.A. students must take the M.A. examination no later than the semester following the completion of 30 hours. A student who fails the M.A. examination must repeat the examination no later than the following semester. A student who fails the examination a second time or does not take the examination when required will be dropped from the graduate program.

THE DOCTORAL PROGRAM

Admission Requirements
1. Successful completion of the M.A. degree from an accredited institution.
2. Acceptable scores on the Graduate Record Examination (general).

Residence and Coursework
Before being admitted to doctoral candidacy, a student must:
1. Complete History 510 at UT (may be waived for comparable experience elsewhere).
2. Complete a minimum 6 related hours outside the department.
3. Spend two consecutive semesters in residence.
4. Complete 9 hours in one Group I doctoral field. There is no minimum hours requirement for a Group II field. Complete 9 hours in one Group III field, including the appropriate 511, 512, or 513 course and two additional courses at the 500 level. The Group III field must be in a different geographic area from the Group II field. Courses taken to fulfill M.A. degrees may be counted toward all field requirements.
5. Fulfill the foreign language requirement.
6. Complete two 600-level research seminars. (One must be completed at UT.) Students who have completed a master's thesis need complete only one research seminar (must be taken at UT), and History 621.
7. Maintain a 3.0 overall grade-point average in graduate work attempted.
8. Complete 24 hours of graduate coursework (21 hours graded A-F) at UT beyond that required for the M.A.
9. Except by prior approval of the Director of Graduate Studies, a student's coursework must be at the 500 level or above.

Language Requirements
Students must demonstrate competence in one foreign language through coursework or examination. The student's doctoral committee from an accredited foreign language or research tools, such as statistics, is essential for the student's preparation. The foreign language requirement must be fulfilled before taking the comprehensive examination.

Group III (Teaching Field) Examination
This is a one-hour oral exam which must be completed at any time before the comprehensive examination is taken. If a student fails this exam, he or she may retake the exam one time only and must do so the following semester.

Comprehensive Examination
The comprehensive examination is to be taken no later than the semester following the term in which the student has completed the residence, coursework, and language requirements. A student's stands examination in one field selected from Group I and one field selected from Group II below. Both parts are 4-hours, written, and taken during the same semester. A general oral exam will be taken following the successful completion of the two written portions. The two written and one oral exams are separate examinations, and Group I must be passed before taking Group II, and the letter passed prior to taking the oral portion. A student who fails any one of the three parts (Group I or Group II or the Oral) which constitute the Comprehensive Exam must repeat the failed exam the following semester, excluding summer. A second failure on any one of the three parts (regardless of which one) will cause the student to be dropped from the History graduate program. Likewise, a student who does not repeat a failed exam within the allotted time (one semester) will be dropped from the program.

Admission to Candidacy
Upon successful completion of the above requirements, a doctoral student may be admitted to candidacy.

Doctoral Fields
Group I:
- Premodern Europe
- Modern Europe
- United States (colonial to present)

Group II:
- To be defined by the student's doctoral committee from within one of the following fields:
  - United States
  - Colonial and Early Republic
  - 18th century
  - 20th century
  - Regional
  - Military and Foreign Relations
  - Social and Cultural
  - American Political
  - European
  - Medieval
  - Early Modern
  - Modern
  - Political and Diplomatic
  - Intellectual and Cultural
  - Social and Economic
  - National Fields

Group III (Examined Teaching Field):
- World Civilization
- Western Civilization
- U.S. Civilization

Dissertation and Defense
Original research forms the basis for the dissertation. Doctoral candidates must register for a minimum of 3 hours of 600 Dissertation Research each semester and must complete 24 hours of dissertation credit. A final oral defense is given on the dissertation in its historical context. The program must be completed within eight years from admission as a potential candidate.

GRADUATE COURSES

415 Western Economic Thought Since the 18th Century (3) Methods of study of doctrinal history. Origins and evolution of major doctrines: classical and neoclassical economics, economics of Keynes and his followers, principal developments of second half of 20th century. Major writing requirement. May not be used toward graduate degree in History. Prereq: Introductory Economics or consent of instructor. (Same as Economics 415.)

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

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

510 Foundations of Graduate Study in History (3) Assumptions and methods of historians. Required of all candidates for advanced degrees. E.

511 Teaching World Civilization (3) Methodology, conceptualization, historiography, text-book selection and syllabus construction to prepare students to teach courses in world civilization.

512 Teaching Western Civilization (3) Methodology, conceptualization, historiography, text-book selection and syllabus construction to prepare students to teach courses in western civilization.

513 Teaching United States History (3) Methodology, conceptualization, historiography, text-book selection and syllabus construction to prepare students to teach courses in U.S. history.

521 M.A. Readings (3) Directed readings in preparation for M.A. examinations. Open only to master's candidates in history. May be repeated. Maximum 6 hrs. S/NC only.

531 Topics in Premodern Europe (3) Reading seminar: secondary sources on premodern European movements and trends. Focus varies. May be repeated. Maximum 15 hrs.

532 Topics in Modern Europe (3) Reading seminar: secondary sources on movements and trends that are multinational in focus. Focus varies. May be repeated. Maximum 15 hrs.

533 Topics in European National History (3) Reading seminar: secondary sources on intra-national topics, usually British, Russian, German or French. Focus varies. May be repeated. Maximum 15 hrs.

541 Topics in Early American History (3) Reading seminar: secondary sources on early North American history. Focus varies. May be repeated. Maximum 15 hrs.

542 Topics in 19th-Century United States (3) Reading seminar: secondary sources on 19th-century United States. Focus varies. May be repeated. Maximum 15 hrs.

543 Topics in 20th-Century United States (3) Reading seminar: secondary sources on 20th-century U.S. Focus varies. May be repeated. Maximum 15 hrs.

544 Topics in U.S. Environmental History (3) Reading seminar: secondary sources on U.S. environmental history. Focus varies. May be repeated. Maximum 15 hrs.

551 Topics in the History of Foreign Relations (3) Reading seminar: secondary sources on foreign relations. Focus varies. May be repeated. Maximum 15 hrs.

552 Topics in Military History (3) Reading seminar: secondary sources on military history, military operations, social impact of war and naval strategy in foreign policy. May be repeated. Maximum 15 hrs.

555 Topics in United States Social and Economic History (3) Reading seminar: secondary sources on
Human Ecology

(College of Human Ecology)

MAJOR

DEGREE

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

The College of Human Ecology offers the Doctor of Philosophy degrees with a major in Human Ecology.

ADMISSION REQUIREMENTS

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

THE DOCTORAL PROGRAM

Graduate study leading to the Doctor of Philosophy degree with a major in Human Ecology is available in the Departments of Child and Family Studies; Consumer and Industry Services Management; Education and Safety Sciences; Human Resource Development; and Nutrition. Concentration areas are child and family studies, community health, human resource development, nutrition science, textile science, and retail and consumer sciences. A major challenge of the doctoral program in Human Ecology is to draw upon basic research generated from the natural sciences, social sciences, and humanities, and to provide a holistic perspective that contributes to the improvement of individual and family well being. Within the College of Human Ecology, research from one discipline is enhanced by encompassing and utilizing the findings of research from other disciplines.

The Ph.D. is a research degree granted only to individuals who demonstrate proficiency in conducting original research. Course requirements for the degree are determined by the student's faculty committee, based upon college and departmental requirements and student needs and interests. The Graduate School sets minimum requirements for the doctoral degree.

More specific information about the course of study is given under the individual academic departments that administer the Ph.D. concentrations.

MINOR IN GERONTOLOGY

An interdepartmental/interdisciplinary minor in gerontology gives the graduate student an opportunity for combining the knowledge and experience about aging in American society with his/her own major concentration.

Core courses and a practicum are offered by the College of Social Work and selected departments within the colleges of Human Ecology, Education, and Arts and Sciences. A cross-listed seminar between contributing departments within an academic department is awarded two credits toward the minor.

Declaration of a Minor

Prior to earning more than one-half the total hours required for this minor, students must complete a "Declaration of a Minor in the College of Human Ecology" form. Copies of this form are available in the Dean's Office, Room 110, Jessie Harris Building.

Core Experience

Students must complete a core experience of 12 semester hours taken from at least three different departments including nine hours taken from outside the major department. Coursework needs to comply with the following framework:

1. Coursework, 9 hours required. A variety of coursework is required toward satisfaction of this requirement. Courses which are offered on a regular basis include: Health 406, 465, Health/Public Health 450, Nutrition 518, Public Health 523, Retail and Consumer Studies 560, Social Work 566, Sociology 415, Psychosocial Education Studies 504, 522, 525, 528.

2. Applied practicum, 2 hours required. Students should register under practicum experiences in the "home" department of the supervising faculty.


4. Successful completion of a written comprehensive examination covering subject matter of the minor.

Graduate Committee

At least one faculty member from the Gerontology Policy Committee who is qualified to work with graduate students, must serve on the graduate committee of each student who declares a gerontology minor. Contact Dr. Billie Collier, Associate Dean in Human Ecology, for a current list.

Admission to Candidacy

When application is made for admission to candidacy, indication of the minor must be noted on the Admission to Candidacy form.

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 on an in-state tuition basis. The Ph.D. program in Human Ecology is available to residents of Alabama, Kentucky, Mississippi, or West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Student Services.

GRADUATE COURSES

450 Special Topics: Human Ecology (1-3) Study in selected professional area within College of Human Ecology. Topics vary. May be repeated. Maximum 6 hrs.

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

502 Registration for Use of Facilities (3-15) P/ NP only. E

504 Directed Study in Human Ecology (1-3) Directed readings to prepare candidate for doctoral comprehensive examination. May be repeated. Maximum 15 hrs.

505 Seminar in Human Ecology (3) Requirements for the degree are determined by the student's faculty committee, based upon college and departmental requirements and student needs and interests. The Graduate School sets minimum requirements for the doctoral degree.

510 Integrative Nature of Home Economics (3) History and philosophy of home economics. Analysis of current programs and future directions in field. Examination of research, integrative framework. F.A

520 Directed Study in Human Ecology (1-3) Integra- tive topics. Prereq: At least 9 hrs of graduate study in college including courses from at least two departments or consent of instructor. May be repeated. Maximum 6 hrs. E

525 Practicum in Human Ecology (1-4) Field based experiences. Prereq: Consent of instructor. E

545 Evaluation in Home Economics Education (3) Assessment of programs and pupil progress; techniques, methods and purposes. Prereq: 540, Coreq: 575, F, Sp, A

574 Analysis of Teaching for Professional Development (2) Strategies to document and analyze effec-
Human Resource Development

(College of Human Ecology)

MAJORS

DEGREES

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

Human Resource Development ............... M.S.

Billie J. Collier, Interim Head

Professors:

Brewer, Ernest W. (Lielson), Ed.D. ..... Tennessee

Campbell, Clifton P. (Emeritus), Ed.D. Maryland

Cheak, Garland D. (Emeritus), Ph.D. ..... Kansas State

Coakley, Carroll B. (Emeritus), Ph.D. ..... Wisconsin

Craig, David G. (Emeritus), Ed.D. ....... Cornell

DeJonge, Jacqueline O., Ph.D. .... Iowa State

Haskell, Roger W. (Emeritus), Ph.D. .... Purdue

Mathews, John I. (Emeritus), Ph.D. ......... Arizona State

Pety, Gregory C., Ph.D. ...................... Missouri

Associate Professor:

Stout, Vickie J., Ed.D. ...................... Tennessee

Assistant Professors:

Bartley, Mary H., Ph.D. ................. Tennessee

Bartley, Sharon, Ph.D. ............... Tennessee

Kupritz, Virginia, Ph.D. ................ Virginia Tech

Lim, Doo, Ph.D. .......................... Illinois

Pierce, Randall, Ph.D. ..................... Ohio State

The Department of Human Resource Development advances economic development through the integration of occupational education, training, career development, and organizational development. HRD requires (core courses and HRD electives are offered in evening/online formats and for workshop formats enabling working professionals to obtain the master's or doctoral degree.

THE MASTER'S PROGRAM

The Master of Science degree with a major in Human Resource Development provides a flexible graduate program for professionals wishing to pursue in-depth study within and across subject areas of Human Resource Development; those who work with individuals to help them enter the workforce; those who train individuals already in the workforce; and those who need to train individuals in the workforce advance their potential.

The M.S. degree with a major in Human Resource Development offers two concentrations, each providing opportunities for specialized interests. Both concentrations require a thesis. The training and development concentration is designed to meet the needs of professionals who work in programs encompassing all areas of human resource development. Without an undergraduate degree in an area related to human resource development may be required to take 501 as a prerequisite and complete an internship as part of their program. The teacher licensure concentration is specifically for students who seek initial teacher licensure in family and consumer sciences education, business and marketing education, and technology education. This program requires admission to Teacher Education and has specific prerequisites.

Admission Requirements

Training and Development Concentration applicants are to submit an application for admission to The Graduate School, three letters of reference from persons familiar with their potential for success in doctoral work, a statement describing personal career objectives, and a sample of written work. Any student below this level of academic quality must justify admission via an essay. An candidate must have a minimum 600 SAT combined score or a 21 ACT composite score. Good candidates may be considered.

The Ph.D. CONCENTRATION

Admission Requirements

Applicants are to submit an application for admission to The Graduate School, three letters of reference from persons familiar with their potential for success in doctoral work, a statement describing personal career objectives, and a sample of written work. Any student below this level of academic quality must justify admission via an essay. An candidate must have a minimum 600 SAT combined score or a 21 ACT composite score. Good candidates may be considered.

Degree Requirements

The Doctor of Philosophy degree with a major in Human Resource Development provides a flexible graduate program for professionals wishing to pursue in-depth study within and across subject areas of Human Resource Development; those who work with individuals to help them enter the workforce; those who train individuals already in the workforce; and those who need to train individuals in the workforce advance their potential. The curriculum is designed to enable students to achieve professional objectives, develop needed competencies, and gain desirable experiences and understanding of human resource development. Students must possess a master's degree before acceptance to the program. A minimum of 60 hours beyond the baccalaureate degree is required.

The Ph.D. is a 36-hour thesis program that includes 3 hours of research methodology and 3 hours of statistics. All students must take the departmental core of eighteen hours consisting of 504, 510, 511, 512, 557 and 558. The thesis requires six hours of Thesis 500 and an oral comprehensive examination.

Teacher Licensure Concentration is a 36-hour program that includes 3 hours of research methodology (504) and 3 hours of statistics. The core (9 hours) of the internship experience is 521, 522, HE 574 and 591 (1 hour). The internship experience (575) is twelve hours of credit and is the culminating experience. Students choose another 3 hours of coursework to support the teaching field. The thesis requires six hours of Thesis 500 and an oral defense.

Human Resource Development

(College of Human Ecology)
Departmental Core (27 hours): Must include 510, 511, 512, 557, 559 or equivalents and 12 hours of 604.

Specialization (12 hours): Must support a career path of manager of education/training or faculty member or manager of education/training.

Cognate (6 hours): Must be obtained from an academic unit outside the department, support specialization, and be represented by a committee member.

Research and Statistics (15 hours): Must include based on advising and research methodology, such as multivariate analysis and computer application, 9 hours minimum; research methodology must include 504 and 610 or equivalents, 6 hours minimum.

Internship (0-6 hours): Required for those changing career path.

Dissertation (24 hours): Must be original research project.

The department offers an alternative approach to residence for the Ph.D. degree. This alternative residence involves, among other requirements, a two-year, continuous enrollment in an ACADEMIC COMMON MARKET Research Forum in Human Resource Development.

Detailed information regarding the Ph.D. concentration program of study may be obtained from the departmental liaison for graduate studies.

Note: For latest update, check the homepage of Department of Human Resource Development (http://hrd.he.uky.edu).

GRADUATE COURSES

501 Survey of Human Resource Development (3) Training and development perspectives; evaluation measures; evaluation job performance; and measuring learner progress. Prereq: 210 Microcomputer Applications or equivalent and 320 Program Planning for Training, Development and Education.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities for a course. Prereq: Consent of instructor. May be repeated. S/NC only. E

503 Problems in Lieu of Thesis (3) May be repeated. Maximum 6 hrs. S/NC only. E


505 Selection, Placement, and Follow-up Procedures in Human Resource Development (3) Methods and procedures utilized in establishing criteria for trainee selection and placement in instructional programs and in jobs. Collecting, analyzing, and reporting follow-up data appropriate for making program improvements. Prereq: Consent of instructor. Sp, Su

506 Developing Organizational Resources (3) Strategies for developing human and organizational resources through community partnerships and learning. Effective utilization of human resources through active learning programs. Sp

507 Internship in Human Resource Development (3) Practical field experiences in selected settings under supervision of practitioner and departmental representative. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

510 Foundations of Human Resource Development (3) Historical, philosophical, economical, social, and psychological foundations of vocational, technical and adult education and human resource development; fundamental principles and contemporary objectives. F,Sp

511 Issues and Trends in Human Resource Development (3) Analyze research-based investigations of problems and issues in human resource development. Prereq: 455 or equivalent. 504, F, Sp

512 Human Resource Management (3) Processes/systems approach to human resource management: interdependent human resource activities (planning, work design, staff development, training and development, compensation, and employee relations) and organizational goals.

513 Special Topics in Human Resource Development (1-3) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

514 Individual Study in Human Resource Development (3) Prereq: Consent of instructor. Approval form must be filed in office of department head. May be repeated. Maximum 6 hrs. E

515 Microcomputer Operations and Programming in Education (3) Operating procedures and BASIC programming for education and training applications. Hands-on experience in operating and programming microcomputers, writing, debugging, and running educational programs using sequential data files. Prereq: Teaching, administrative, or related experience in education or training, or consent of instructor.

516 Microcomputer Software Development (3) Advanced software design in BASIC: random access and binary files, search and sort algorithms, and bitmask graphics for education and training programming and program development. Prereq: 515 or consent of instructor.

521 Design and Development of Instruction (3) Prereq: Consent of instructor. Curriculum development and program planning; design of instruction; development of teaching materials for classroom and educational purposes. Intended for students in family and consumer sciences, business, marketing, technology, and industrial education. F

522 Professional Practices for Educators (3) Topics essential to effective classroom teaching; evaluation of student, youth organizations, advisory committees, classroom management, and issues impacting school/work preparation. Coreq: Human Ecology 575 and 591. Sp

531 Leadership Development for Business Education and Marketing Education Professionals (3) Change management with implications for continuous quality improvement of self and one's work and work place. Sp

550 Administration of Industrial Education Programs (3) Developing, staffing, administering, and evaluating trade, industrial and technical education programs in secondary and post-secondary school settings. Prereq: Consent of instructor. Sp, Su

551 Supervision of Industrial Education Programs (3) Techniques used to improve industrial education programs. Staff development, curriculum improvement, and program updating techniques. Prereq: 455 or equivalent. F,Sp

552 History and Philosophy of Industrial Education (3) Social, political, and economic events that impact development of industrial education. Philosophical problems: justification, values, principles and concepts of industrial education. Prereq: Consent of instructor. F,Sp

553 Planning Technical Education Facilities (3) Preparation of educational specifications, site selection, and working relationships with other professionals involved in process of technical education facilities. Prereq: Consent of instructor. Sp, Su

554 Program Planning (3) Instructional systems analysis; development, implementation, and evaluation of training. Prereq: 555 or equivalent.

555 Curriculum Planning (3) Developing performance-based, criterion-referenced instructional programs. Su

556 Organizational Development (3) Strategies and interventions for organizational development; training and development of staff. Models, assessment, organizational change and consultant's role. Prereq: 512 or consent of instructor. F

557 Methods of Teaching Conceptual Content (3) Proper selection and effective application of methods for teaching and learning conceptual content. Prereq: Consent of instructor. F

558 Research Forum in Human Resource Development (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

559 Program Evaluation (3) Concepts, principles, theories, and trends related to program evaluation. Prereq: 555 or equivalent. F

560 International Perspective of Workforce Training (3) Examination and comparison of workforce systems in highly industrialized countries. Prereq: Consent of instructor. F,Sp

562 Grant Writing and Project Implementation (3) Writing grant proposals, negotiating with funding sources, implementing and evaluating funded programs, and closing out projects at end of funding source. E

564 Self-Directed Work Teams (3) Theory and practice of implementing self-directed work teams, motivating employees, increasing employee productivity via teams and related issues. F

600 Doctoral Research and Dissertation (3-15) Prereq: 555 or equivalent.

661 Curriculum Planning in Human Resource Development (3) Curriculum theory, models, contents, planning evaluation and implementation of specialized program areas. Prereq: 555 or equivalent.


665 Research Development in Human Resource Development (3) Proposal development, theoretical basis, design, implementation, and evaluation of research in human resource development. Prereq: 6 hrs of advanced statistics courses and consent of instructor.

666 Internship in Human Resource Development (3) Field experience in human resource training. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs. E

668 Special Topics in Human Resource Development (3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs. E
Ordinarily, an undergraduate grade-point average of 3.7 or above is required with no evidence of special weakness in mathematics and physical sciences. Test scores on the verbal section of the Graduate Record Examination (GRE) are required. Customarily, these students admitted to the program have performed at or above the 69.79th percentile on the general tests. (This corresponds to a raw score of approximately 600 on each of the tests.)

THE DOCTORAL PROGRAM

The Ph.D. degree with a major in Industrial and Organizational Psychology can be completed within a minimum of 90 semester hours in the major. Students must be in residence full-time for one year; must maintain an overall 3.0 grade-point average with no more than one grade below B in the I/O Psychology, General Psychology, and Research core; must complete an approved research project prior to beginning dissertation work; must pass a comprehensive examination; and must pass a final oral examination on their dissertation research.

Course Requirements:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Psychology Core</td>
<td>9</td>
</tr>
<tr>
<td>567, 568, &amp; 569 Research Core</td>
<td>12</td>
</tr>
<tr>
<td>Statistical Principles (Statistics 537 &amp; 538 or equivalents)</td>
<td>3</td>
</tr>
<tr>
<td>Multivariate Statistics (Statistics 579, 679 or equivalent)</td>
<td>3</td>
</tr>
<tr>
<td>Advanced Research Methods (605 or equivalent)</td>
<td>3</td>
</tr>
<tr>
<td>General Psychology Core</td>
<td>9</td>
</tr>
<tr>
<td>One course in each of the following areas: biological bases of behavior, cognitive bases of behavior, history and systems of psychology.</td>
<td></td>
</tr>
<tr>
<td>I/O Psychology Seminars</td>
<td>9</td>
</tr>
<tr>
<td>600 level IOPSY courses, from a program committee approved list.</td>
<td></td>
</tr>
<tr>
<td>Approved Electives</td>
<td>9</td>
</tr>
<tr>
<td>Courses supporting the student's course of study.</td>
<td></td>
</tr>
<tr>
<td>Supervised practicum, internship, or field training (690)</td>
<td>3</td>
</tr>
<tr>
<td>Ethics (635 or equivalent)</td>
<td>3</td>
</tr>
<tr>
<td>Discrimution (600)</td>
<td>24</td>
</tr>
<tr>
<td>TOTAL</td>
<td>90</td>
</tr>
</tbody>
</table>

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 on an in-state tuition basis. The Ph.D. program is available to residents of Kentucky, Virginia, and West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Student Services.

GRADUATE COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>502 Registration for Use of Facilities (3-15)</td>
<td>3</td>
</tr>
<tr>
<td>Required for the student not otherwise registered during any semester when the student uses University facilities and/or faculty time before degree is complete. May not be used toward degree requirements. May be repeated. S/NC only.</td>
<td></td>
</tr>
<tr>
<td>525 Research in Industrial/Organizational Psychology (1-3)</td>
<td>3</td>
</tr>
<tr>
<td>Available only to students admitted to program or by prearrangement with program director. May be repeated. Maximum 6 hrs. S/NC or letter grade.</td>
<td></td>
</tr>
</tbody>
</table>

507-68 Proseminar in Industrial/Organizational Psychology (3,3) Basic thought, concepts, and issues required for advanced graduate study in industrial and organizational psychology. Must be taken during first year of study in program. Consent of instructor required for non-program students.

659 Applied Measurement for Industrial/Organizational Psychology (3) Basic techniques for collection and evaluation of individual and organizational data using both classical and modern psychometric techniques. Relevant statistical models: reliability analysis, and exploratory and confirmatory factor analyses.

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


610 Individuals in Organizations Seminar (3) Bridging principles and processes which link individual attributes with more macro organization concerns: culture, climate, and group decision-making.

611 Seminar in Organizational Leadership (3) Current theories, concepts, and issues associated with psychology of organizational leadership. Prereq: 567-68 or consent of instructor.

612 Seminar in Work Motivation (3) Current theories, concepts, and issues associated with work motivation. Prereq: 567-68 or consent of instructor.

613 Seminar in Performance Appraisal (3) Current issues, problems, and research in performance appraisal and criterion development; applications in compensation. Prereq: 567-68 or consent of instructor.

614 Seminar in Employee Selection (3) Current issues, concerns, and methods used in employee selection. Prereq: 567-68 or consent of instructor.

615 Seminar in Organizational Training and Development (3) Current issues, problems, and research in training and development. Prereq: 567-68 or consent of instructor.

625 Topics in Organizational Psychology (3) Topics vary. May be repeated. Maximum 9 hrs.

626 Topics in Industrial Psychology (3) Topics vary. May be repeated. Maximum 9 hrs.

627 Structural Equation Models in Organizational Research (3) Issues related to analysis of organizational data using structural equation and related techniques.

628 Personality Assessment (3) Review of key domains of social cognition: measurement systems which use individual differences in social-cognitive biases as basis for measuring personality.

635 Ethical and Professional Issues in Industrial/Organizational Psychology (3) Issues involved with ethical practices in research, academic, organizational, and consulting situations.

690 Supervised Practicum, Internship or Field Training in Industrial/Organizational Psychology (1-15) One credit hour per 30 hours of practice. S/NC or letter grade.
implementing various production strategies, analysis of production planning and scheduling systems, and supplier and distribution integration. Dual degree students can select manufacturing systems engineering as an option.

Product Development and Manufacturing
This product development and manufacturing concentration is a non-thesis option, available only to students taking the dual M.S.-MBA program.

DUAL M.S.-MBA PROGRAM
The College of Business Administration and the College of Engineering offer an integrated program leading to the conferral of the Master of Business Administration degree with a major in Business Administration (concentration in operations management) and the Master of Science degree with a major in Industrial Engineering (concentration in manufacturing systems engineering or product development and manufacturing).

The Industrial Engineering program is also open to students with undergraduate engineering majors other than industrial engineering.

The establishment of the dual program addresses the critical need for personnel trained in both engineering and management who can integrate an increasingly complex body of knowledge for rapid introduction of new products to the marketplace. The objective of the dual degree program is to prepare graduates to take a leading management role in companies that must react quickly to a dynamic market where forces of competition require rapid changes in design and manufacturing and a short product development cycle.

Admission Requirements
Applications are accepted for fall semester only. Applicants for the M.S.-MBA program must make separate application to, and be competitively and independently accepted by, the Graduate School for the Master of Business Administration degree program and the Master of Science degree program with a major in Industrial Engineering, and by the Dual Program Committee. Students will initially apply for the MBA program, indicating on their application the intent to pursue the dual M.S.-MBA program and the Industrial Engineering major (refer to the MBA program for separate instructions). Students accepted for both the MBA and the M.S. with a major in Industrial Engineering degree programs will be assigned to Dual Program Committee advisors, who will be responsible for course approval and supervision of the students' progress through the dual program.

Applications by U.S. citizens and permanent residents received after the MBA application deadline (March 1) will be considered as space allows. Additional information is required and different application dates are established by The Graduate School for international students.

Curriculum
All engineering students enrolled in the dual program must complete common coursework designed to provide them with an integrated, multidisciplinary teamwork experience. The MBA curriculum consists of 33 hours of common coursework in the College of Business Administration and 15 hours of common coursework in the College of Engineering. Engineering common coursework includes a culminating 3-hour integrated project course requiring a comprehensive report, and a final examination as required by the Dual Program Committee, to be taken during the first session of summer following the second year.

During the second year dual degree candidates will take courses in their engineering major. The coursework for each option is designed to provide students with a concentration in their major and advanced skills to accomplish their team work assignments.

Curriculum for Dual M.S.-MBA Degree

August - First Year
BA 511 MBA Core I
Fall - First Year
BA 512 MBA Core II
IE 504 Product Development Process 1
Spring
BA 513 MBA Core III
IE 506 Product Selection and Evaluation 2
IE 508 Integrated Product, Process, and Manufacturing System Design 3
Summer
Internship
BA 514 Integrated Business Simulation 3
IE 509 Project Management 1
Fall - Second Year
IE 503 Survey of Manufacturing Systems Engineering 1-3
IE 511* Business Planning and Commercialization 3
IE 509 Project Management 1
IE 510 Advanced Topics in Manufacturing Systems 3
IE 524 Advanced Integrated Manufacturing Systems 3
Elective (IE 514, 519, or 523) 3
Spring
MBA "hub" course elective 3
IE 509 Project Management 1
IE 522 Optimization Methods in Industrial Engineering 3
IE 512* Process Development and Market Feasibility 3
Elective (IE 514, 519, or 523) 3
Summer (first session)
IE 594 Culminating Integrated Project Report 3
TOTAL 66-69

*The IE 503 class is required for students enrolling in this option with undergraduate degrees in disciplines other than Industrial Engineering.

**Students in manufacturing systems engineering concentration may substitute other selected IE courses for these courses.

The dual degree candidate must satisfy the curriculum and graduation requirements of the engineering major being pursued and the College of Business Administration. Students withdrawing from the dual degree program before completing both degrees will not receive credit toward graduation in either degree program for courses taken in the
6. Knowledge of theoretical and practical evolution of information sciences and technologies and their relationship with other disciplines.
7. Competence in creating, managing and accessing information in a variety of formats.
8. To provide services to the state, region, and nation in association, consulting and continuing education activities which will promote the development and improvement of information systems and services such that the school's contributions reach beyond its immediate academic programs. The school will provide:
   1. Continuing education for information professionals and, on a selective basis, to persons outside the information field.
   2. Advisory services to information organizations.
   3. Leadership for professional associations.
   4. To conduct basic and applied research which promotes the generation of new knowledge, services and technology. The school will encourage:
      1. Research which strengthens its instructional and public service programs.
      2. The use of a variety of research methods.
      3. Sharing the results of its research.
      4. Increased research quality and productivity.

ADMISSION REQUIREMENTS
Applicants to the Information Sciences program must have a minimum undergraduate grade-point average of 3.0 or a satisfactory graduate degree grade-point average for admission as a potential candidate for the M.S. degree.

The verbal, quantitative and analytical aptitude portions of the Graduate Record Examination (GRE) are required of all applicants unless a graduate degree has been completed prior to application for admission. Applicants should take the GRE at least one semester in advance of application for admission and are expected to score 1500 points or better.

A personal data sheet and three recommendations (obtained from the School of Information Sciences) should be returned to the admissions office of the school. Foreign applicants are required to take the Test of English as a Foreign Language.

THE MASTER'S DEGREE
The program leading to the Master of Information Sciences involves a total of 42 semester hours of graduate courses including 5 required courses of all students. Either a thesis or a non-thesis option is available with 6 hours required for thesis credit. At least 36 hours must be taken in the School of Information Sciences, allowing up to 6 hours outside the school with a maximum of 6 from outside the University.

Required Courses
Five courses are required of all students: 490, 520, 530, 560 and 580. (Students seeking licensure see track requirements below.) These courses address the evolving information environment; organization and representation of information; information access and retrieval; developing and managing collections; and principles and concepts of the information sciences. Three courses, 490, 520 and 530, are prerequisite to all courses for students enrolled in the M.S. degree program.

Individualized Curriculum Approach
Students, in consultation with their advisor, may wish to pursue a curricular focus to develop an individualized program of study. Graduates of the school have prepared themselves for a variety of careers, including positions as: corporate information specialist, public librarian, records manager/archivist, webpage designer, indexer/abstractor, online information retrieval specialist, medical or law librarian, reference librarian, youth services specialist, and many others. Students are encouraged to take advantage of the individualized curricular approach.

Whatever individualized curriculum is chosen, all students who complete the program receive an M.S. degree accredited by the American Library Association (ALA). For those pursuing Tennessee Department of Education licensure as a school library information specialist, stipulated requirements apply. See following section.

Tennessee State Department of Education School Library Information Specialist Requirements
The Tennessee State Department of Education requires School Library Information Specialists to hold the master's degree. The School of Information Sciences offers four tracks for School Library Information specialist endorsement.

Initial Endorsement for Non-Licensed Teachers with No Master's Degree in Library or Information Sciences: For those students who do not hold the master's degree, the requirements for initial endorsement include the 5 required courses plus 551, 567, 571, 572, 585, and 596. In addition, students must complete two corequisite courses from the College of Education (5 credit hours) which do not count toward the master's degree requirements. Students pursuing the initial endorsement must follow the non-thesis option. Upon completion of the requirements, students will earn an additional endorsement as a School Library Information Specialist.

Additional Program Requirements
For application forms and information about financial aid and other information about the M.S. in Information Sciences, write to the Admissions Office of the School Library Information Specialist.

FINANCIAL ASSISTANCE OPPORTUNITIES
Employment with the University of Tennessee Libraries may provide a work-study opportunity for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students usually work at least 20 hours each week and thus may extend the period required for the degree. Other opportunities exist with some other libraries and information agencies in the Knoxville area.

Work opportunities in a scientific-technical environment are available through subcontractors with Oak Ridge National Laboratory and the Department of Energy. A limited number of graduate teaching assistantships are available through the school. Assistantships of this type carry a waiver of tuition and fees as well as stipend and require that recipients work 10 hours per week in the school.

For application information and forms, contact the Office of Financial Aid and other information about the M.S. in Information Sciences, write to the Admissions Office of the School Library Information Specialist.
measurement and reverse engineering principles and other selected topics. Prereq: 401.

525 Systems Modeling and Simulation (1-3) Modeling of discrete, continuous, and combined systems using current simulation software and Monte Carlo simulation. Problem definition, input distributions, output data analysis, model validation and verification, reduction techniques, animation of models, and design of simulation experiments. Case studies in variety of domains for simulation modeling. Prereq: Consent of instructor.

526 Advanced Applications of Systems Modeling and Simulation (3) Modeling of discrete, continuous, and combined systems using current simulation software. Development of flexible simulation models to enhance accessibility of simulation models for experimentation. Development of distributed simulation models to represent and test production and supply chain systems. Prereq: 306 Simulation or 526. (Same as Management Science 526.)

527 Lean Production Systems (3) Characteristics and performance of mass and lean production systems. Lean production concepts and principles. Planning, designing, and implementing lean production systems: line balancing, set-up time reduction, cost management, maintenance support and other selected topics. Application at enterprise level to achieve strategic competitive goals. Prereq: 515 or consent of instructor.

591-92-93 Special Topics in Industrial Engineering (1-3,1-3,1-3) Individual or group research projects. Prereq: Consent of instructor. May be repeated.

594 Culminating Integrated Project Report (3) (Same as Mechanical Engineering 594).

601 Operations Research Models in Engineering Economy (3) Mathematical programming techniques applied to capital budgeting, advanced topics in multiple attribute decision analysis; Bayesian analysis of sequential decision making; artificial intelligence in complex decision analyses. Prereq: 518, 523.

602 Nonlinear Optimization (3) (Same as Management Science 602.)


691-92-93 Advanced Topics in Industrial Engineering (3,3,3) Forum to study individually or in groups. Prereq: Graduate standing and consent of instructor. May be repeated with consent of instructor.

Engineering Management

GRADUATE COURSES

501 Capstone Project (3-6) Application-oriented project to show completion of academic area. Prereq: Enrollment in engineering management. May be repeated. Maximum 6 hrs. S/N only.

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

531 Motivation and Culture in Engineering Management (3) Motivation theories and practice to improve individual and organizational capabilities. Success in meeting goals, improving creativity/innovation, and leadership and personal interpersonal skills. Improvements through organizational structure, policies, and work design. Prereq: 533 or consent of instructor.

532 Productivity and Quality Engineering (3) Productivity and quality measures defined and used to analyze current competitive position of important sectors of American industry with respect to national and international competition. Study of management theories and systems which promote or inhibit productivity or quality improvements.

533 Theory and Practice of Engineering Management (3) Manager's perspective; business definition; strategic planning and management; marketing and competition in global economy; finance; organizations; systems thinking; team building; corporate culture and leadership in new organization; and quality, empowerment, and learning organizations. Principle application to work settings and case studies.


535 Management of Technology (3) Creativity and innovation: incorporation of advanced technology equipment; application of systems thinking; new methods in business and manufacturing organizations; justifying technology; assimilating and managing changing management roles; and impacts of new technologies. Prereq: 539 and Industrial Engineering 518.

536 Project Management (3) Development and management of engineering and technology projects. Project proposal preparation; resources and cost estimating; and project planning, organizing, and controlling: network diagrams and other techniques. Role of project manager: team building, conflict resolution, and negotiation. Discussion of typical problems and alternative solutions. Case studies and student projects. Prereq: 537 or consent of instructor.

537 Analytical Methods for Engineering Managers (3) Survey of management analysis and control systems through IE techniques. Qualitative and quantitative methods: methods analysis, work measurement, incentive systems, wage and salary development, production and inventory control, facility layout, linear programming, and applied operations research techniques. Not for credit for students with undergraduate degrees in Industrial engineering.

538 New Venture Formation (3) Factors other than managerial or entrepreneurial which enter into successful establishment of manufacturing or service enterprise. Organizational and financial planning and evaluation. Cost accounting and location analysis. Marketing analysis to determine commercial feasibility of new ventures. Prereq: 539.

539 Strategic Management in Technical Organizations (3) Strategic planning process and strategic management in practice. Corporate vision and mission; product, market, organizational, and financial strategies; external factors; commercialization of new technologies; and competition and beyond. Prereq: 533 and 518 or consent of instructor.


541 Total Quality Management and Beyond (3) Continuous improvement in capabilities, competitiveness, and productivity of organizations. Principles of total quality management; systems theory and analysis; performance measurement; application of statistical techniques in continuous improvement. Team building and leadership issues, and case studies. Prereq: 516.


543 Legal and Ethical Aspects of Engineering Management (3) Legal aspects imposed by government and ethical considerations in engineering practice. Selected readings, lecture, discussion, and student presentations. Current topics from government and industry.

Information Sciences

(Office of the Provost)

MAJOR DEGREE

Information Sciences ............................................. M.S.

Elizabeth Aversa, Director

Professors:

Aversa, Elizabeth, Ph.D. .................................. Drexel
Tenopir, Carol, Ph.D. ........................................... Illinois
Wilson, P. (Emeritus), Ph.D. .................................. Michigan

Associate Professors:

Fisher, Patricia L., Ph.D. ................................ Florida State
Pemberton, J. Michael, Ph.D. .................. Tennessee
Pollard, Richard, Ph.D. .................................... Brunel (UK)
Robinson, William C., Ph.D. ....................... Illinois

Assistant Professors:

Bilal, Dania, Ph.D. .................................. Florida State
Raber, Douglas, Ph.D. ................................ Indiana
Wang, Pelling, Ph.D. ................................ Maryland
Watson, Jinx, Ed.D. ................................ Vanderbilt
Whitney, Gretchen, Ph.D. ......................... Michigan

The School of Information Sciences provides a program leading to the preparation of librarians and information professionals for work in all types of libraries and information centers. The program of study includes a graduate curriculum leading to the Master of Science degree. The program is accredited by the American Library Association. A Ph.D. degree program may also be pursued in a major in Communications, concentration in information sciences. The mission of the school is to educate people to live, work and flourish in an information society through excellence in teaching, research, and public service in information Sciences. The goals and objectives of the school are:

A. To prepare students to understand the nature of information and the role of the library and other information agencies in the management of information resources, and the facilitation of information transfer. Students will demonstrate:

1. Knowledge of the generation, production, management, dissemination and use of information.

2. Knowledge of the roles of various organizations/institutions in promoting the flow of information.

3. An understanding of the role of the information professional as mediator between information resources and their users.

4. An understanding of the roles of various tools and technologies in facilitating access to information.

5. An understanding of the structure and content of information resources in various formats and subjects.
6. Knowledge of theoretical and practical evolution of information sciences and technologies and their relationship with other disciplines.
7. Competence in creating, managing, and accessing information in a variety of formats.

B. To provide services to the state, region, and nation in association, consulting, and continuing education activities which will promote the development and improvement of information systems and services such that the school's contributions reach beyond its immediate academic programs.

The school will provide:
1. Continuing education for information professionals and, on a selective basis, to persons outside the information field.
2. Advisory services to information organizations.
3. Leadership for professional associations.
4. To conduct basic and applied research which promotes the generation of new knowledge, services and technology. The school will encourage:

A. Research which strengthens its instructional and public service programs.
B. To provide services to the state, region, and nation in association, consulting, and continuing education activities which will promote the development and improvement of information systems and services such that the school's contributions reach beyond its immediate academic programs.

II. The Tennessee State Department of Education School Library Information Specialist Requirements

A. The Tennessee State Department of Education requires School Library Information Specialists to hold the master's degree. The School of Information Sciences offers four distinct School Library Information Specialist endorsement programs:

1. Initial Endorsement for Non-Licensed Teachers without a Master's Degree in Library or Information Sciences: For those students who do not hold the master's degree, the requirements for initial endorsement include the 5 required courses plus 551, 567, 571, 572, 573, 585, and 596 (which must be taken twice). In addition, students must complete two corequisite courses from the College of Education (5 credit hours) that focus on the school library specialist's role. Students pursuing the initial endorsement must follow the non-thesis option. Upon completion of the requirements, students will earn a master's degree in Information Sciences and a Tennessee State Department of Education license as a School Library Information Specialist.

2. Additional Endorsement for Licensed Teachers with a Master's Degree in Library or Information Sciences: For those students who do not hold the master's degree, the requirements for initial endorsement include the 5 required courses plus 551, 567, 571, 572, 585 and 596 (which must be taken twice). Upon completion of the requirements, students will earn a Tennessee State Department of Education additional endorsement as a School Library Information Specialist.

III. Additional Program Requirements

A. Thesis Option: Students electing the thesis option will write a master's thesis under close supervision of a thesis committee. Six hours of Thesis (IS 500) must be taken for School Library Information Specialist endorsement. Students must register for IS 500 in the semester they complete and defend their thesis. The oral defense of the thesis (final comprehensive examination) substitutes for the written examination that is taken by non-thesis students. The writing of the master's thesis serves as the culminating experience.

B. Non-Thesis Option: Upon completion of the program, all students who elect the non-thesis option must take and pass a written comprehensive examination. A culminating examination is scheduled for each course, and students must complete two comprehensive examinations that focus on the school library specialist's role. Such students usually work at least 20 hours per week and thus may extend the period of time required for the degree.

FINANCIAL ASSISTANCE OPPORTUNITIES

Employment with the University of Tennessee Libraries may provide a work-study award for selected students who wish to obtain experience in academic libraries while pursuing the degree. Such students usually work at least 20 hours each week and may extend the period required for the degree. Similar opportunities exist with other libraries and information agencies in the Knoxville area.

Work opportunities in a scientific-technical environment are available through contracts with Oak Ridge National Laboratory and other organizations.

A limited number of graduate teaching assistantships are available for full-time students who wish to obtain experience in instructional and research activities. Such students usually work at least 20 hours each week and may extend the period required for the degree.

Application forms and information about financial aid and other information about the M.S. in Information Sciences, write to:
ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal non-resident status in any accredited graduate program at UT on an in-state tuition basis. The M.S. program in Information Sciences is available to residents of the states of Arkansas, Georgia, or West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Student Services.

GRADUATE COURSES
436 History of the Book (3) History of writing and various methods of bookmaking.
484 Writing About Science, Technology and Medi-
cine (3) (Same as Journalism 440.)
485 Introduction to Electronic Communications and Information Resources on the Internet (3) Exploration of web-based information and communica-
tion resources: e-mail, newsgroups, and new world-wide services; implications for traditional copyright, ownership, privacy and access.
486 Advanced Electronic Communications and Information Resources on the Internet (3) Explora-
tion of advanced information and communication services, resources and forms, surfing and searching engines. Prereq: 485 or consent of instructor.
489 Information Environment (3) Generation, production, management, dissemination, and use of information. Roles of library in society, informa-
tion seeking and user behavior, information industry, emerging technologies, decision making, technology selection, service development, technological and organizational change, information professionals, and ethics.
500 Thesis (1-15) P/NP only. E
502 Registration and use of Facilities (2-15) Required for the student to be informed regarding existing and future library and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E
503 Organization and Representation of Informa-
tion (3) Classification and organization of information systems; descriptive cataloging, non-subject indexing, and use of subject access terms; storage and retrieval systems; classification systems; descriptive cataloging, non-subject indexing, and use of subject access terms; storage and retrieval systems.
521 Cataloging and Classification (3) Basic theoreti-
ical concepts: cataloging, classification, subject access, subject indexing, cataloging and classification of nonprint and nontextual materials: library and information science principles and practices of description and access to information resources: non-subject organization of information: access to non-subject resources: non-subject cataloging and classification: authority control, bibliographic utility, online cataloging.
522 Organization and Representation of Multime-
tial Information Resources (3) Principles and prac-
tices of description and access to information resources including non-subject organization of information: access to non-subject resources: non-subject cataloging and classification: authority control, bibliographic utility, online cataloging.
531 Cataloging and Indexing (3) Philosophies, standards, and practices for cataloging and subject 
document indexing, books of the index, bibliographic control, reference, and subject access.
532 Sources and Services for the Social Sciences (3) Information sources in political science, sociology, psychology, geography, history, anthropology, busi-
ness, and education.
533 Sources and the Role for Science and Engine-
neering (3) Information sources in engineering, physical and life sciences.
534 Information Sources for the Humanities (3) Information sources in philosophy, religion, fine arts, performing arts, and language. Organization of information; subject access terms; storage and retrieval systems. Se-
patic: Consent of instructor. E
535 Government Information Sources (3) Selection, acquisition, organization, and utilization of government information in a variety of formats: legislative, executive and judicial, and ethics of government and international and intergovernmental agencies. F
536 Advanced Information Retrieval (3) Biblio-
graphic, non-bibliographic, tele-databases, etc., non-bibliographic formats and subject databases, and search techniques. Prereq: 534. E
537 Information Industry (3) Issues and trends in the information industry: products and ser-
ices. Standards, enabling technologies, choice of distribution media, entrepreneurial opportunities. Ga-

tical, ethical, and legal issues. F
538 Economics of Information (3) Costing and pricing of information, value of information and value added services; cost-benefit analysis and productivity; policy issues related to economic aspects of informa-
tion exchange and transfers.
539 Information Policy (3) Role of government in creation and exchange of information; views of key national and international policy areas, and important information creation, production, and distribution decision making in the United States. F
540 Research Methods (3) Research methods in various areas of information environments: primary and secondary sources; data collection; data analysis; research design; data interpretation; analysis of published research. F
542 Management of Information Organizations (3) Supervisory and management concepts, strategies, and techniques applicable to information professionals as they relate to the management of information and other organizations. F
543 School Library Media Centers (3) Planning, implementation, and evaluation of school library programs. Corequisite: Information retrieval and information technology. F
544 Sources and Services for Science and -Engineering (3) Information sources in science, education, and other information organizations. F
545 Public Library and Management Services (3) Concepts, roles, political environment, govern-

gance, organization, fiscal management, services, and performance. F
550 Information Technology (3) Evolution, standards, enabling technologies, choice of distribution media, entrepreneurial opportunities. Le-
volution of scientific and technical communication; current trends and future of the field of computer networking; applications. Prereq: 545. F
551 Information technologies and Information Man-
agement Systems (3) Selection and using information technologies and Information Management Systems. F
552 User Instruction (3) Theory, strategy, design, and practice in providing instructional services and technology for end users of information and informa-
tion systems. Includes practical experience.
557 User Instruction (3) Theory, strategy, design, and practice in providing instructional services and technology for end users of information and informa-
tion systems. Includes practical experience.
558 Development and Management of Collaboration (3) Establishing and preserving a network of financial and technical resources for the purpose of information community; policies and procedures; evaluation; technology and business buying. F
559 Contemporary Book Publishing (3) Creation, content, marketing, and sales distribution; vari-
ous types of publishers.
560 Graphic Design and Media (3) Principles and positions in visual aspects of communications. Graphic design, typographic, production techniques and publi-

cation design, as they apply to electronic information design, delivery, and retrieval.
562 Corporate Information Systems (3) Objectives and system requirements for corporate informa-
tion systems. Design and implementation of information systems. Management of information internal to organizations.
563 Electronic Publishing and Imaging (3) Docu-
mentation, document imaging, data compression, document interchange formats and standards, docu-
ment transfer and reading, electronic publishing mechanisms, and electronic document delivery sys-
tems.
564 Business Intelligence for Information Profes-
sionals (3) Principles and practices of synthesizing and synthesizing business intelligence: competitive intelli-
genence, environmental scanning, and issues manage-
ment; information evaluation and synthesis; role of information technology in modern organizations.
567 Information Network Applications (3) Scholarly and commerce-based electronic communications, National and international standards, tools, resources, identification, analysis, evaluation, and management of tools and resources: construction of total technol-
gies as developed and applicable. F
568 Advanced Production of Audiovisual Software (3) Information science, Mathematics, Research and Technology (558) F
572 Resources for Young Adults (3) Critical survey of books and other materials for young adults, personal, vocational, and recreational needs and inter-
ests. Evaluation, selection, and utilization for school and public libraries. Su
573 Creative Writing for Children and Young Adults (3) Philosophy and objectives of public and school library programs in the selection, purchase, collection development, servicing, securing, and evaluating guidance for individual students. F
574 Information Services and Standards (3) Popular informa-
tional and professional journals and services and standards. Development of specialized collections.
575 Foundations of Information Science and Information Technology (3) Definitions of information, informa-
tion management, information retrieval and information technology, the role of information in our society. Information: retrieval, and information technology; the role of information management in the information and knowledge society. F
579 Seminar in Radio and Television (3) (Same as Broadcasting 581.)
581 Library Automation (3) Computer-based applica-
tions and systems for libraries including MARC, bibliog-

graphic utilities, retrospective conversion, circulation systems, online catalog, computer-based reference services, acquisitions and serials control, systems planning and implementation.
582 Information Systems (3) Concepts, design, testing, and analysis of design and implementation of information systems. Selecting and using information systems to support various user needs. User involvement in the development process. F
584 Database Management Systems (3) Defining data needs, data structures, role of defining and data management systems, logical data models, internal data models and database implementation; data design and implementation of application using database management systems. F
585 Information Technologies (2) Evolution, trends, capacities, and layers of technologies applied to information capture, storage, preservation, access, and distribution. F
586 Information Sciences 131
506 Information Retrieval Systems (3) Historical perspective on research retrieval, statistical and probabilistic retrieval techniques, cognitive user modeling; expert intermediary systems; associations, relations and hypertext.

508 Human-Computer Interaction (3) Survey of human-computer interaction and introduction to human and technological factors of importance to design of usable information systems. Basic phenomena of human perception, cognition, memory, and problem solving, and relationship to user-centered design. Methods and techniques for interaction design and evaluation. Sp


590 Problems in Information Sciences (3-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

591 Supervised Readings in Information Sciences (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

592 Seminar in Information Sciences (3-6) Prereq: Consent of instructor. May be repeated with consent of advisor. Maximum 6 hrs.

593 Independent Study (3-6) Prerequisite: Consent of advisor. Maximum 6 hrs. F,Sp

594 Graduate Research Participation (3) Advanced research techniques under supervision of staff research director whose area coincides with interests of student. Prereq: Consent of advisor and research director. S/NC only. Sp

595 Student Teaching in School Library Information Center (8) Planned professional semester: full day school library work and classroom observation activities. S/N only.

596 Field-Based Experience in School Library Information Centers (3) Prescribed activities to gain competencies in a school library information center setting. Must be taken twice. May be repeated. Maximum 6 hrs. S/N only.

599 Practicum (3-6) Opportunity to translate theory into practice under guidance of qualified information professionals. Prereq: Completion of core and pertinent advanced courses relevant to student's practicum design. Minimum 3.0 cumulative GPA. Written consent of advisor and approval of practicum coordinator. May be repeated. Maximum 6 hours. S/N only. E

601 Advanced Seminar in Information Sciences (3) Theories, research, and traditional practices of information representation, organization, and access and retrieval. Research opportunities and methods. Relationship to and interaction with other disciplines.

Hipple, Theodore W., Ph.D. ....... Illinois
Myer, M. E., (Liaison), Ed.D. ......... Florida
Ray, John R., Ed.D. ................... Tennessee
Roeske, Edward L. (Emeritus), Ed.D. ........ Ohio State

Associate Professors:
Connelly, Mary Jane, Ed.D. ............. VPI
Grant, A. D., Ph.D. .................... Wisconsin
O'Bannon, Blanche, Ed.D. ......... Memphis

Assistant Professor:
Norris, Alane, Ph.D. ............. Virginia

The Department of Instructional Technology, Curriculum and Evaluation offers graduate programs leading to degrees, majors, and concentrations in:

Master of Science

Education

Track 1-curriculum

Track 1-instructional technology

Educational Specialist

Education

Curriculum

Instructional technology

Doctor of Education

Education

Curriculum, educational research, and evaluation

Instructional technology

Doctor of Philosophy

Education

Curriculum, educational research, and evaluation

Instructional technology

See Education under Fields of Instruction for full description of all degree requirements.

The mission of department focuses on the preparation of teachers and instructors in curriculum and in the preparation of various other professionals who desire to utilize educational research and instructional technology.

GRADUATE COURSES

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

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

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


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

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

521 Computer Applications in Education (3) Use and integration of technology in educational settings to support teaching and learning. Prereq: Basic computer operations or consent of instructor. E

532 Instructional Research: Analysis and Application (3) Analysis of research on instruction. Translation and application of research findings into instructional performance. E

535 Program Evaluation in Education (3) Issues and principles in planning and conducting program and curriculum evaluation in variety of settings. Fundamentals of design, measurement, philosophy, ethics, and underlying values; proper role and use of evaluation in educational organizations. Prereq: Consent of instructor. (Same as Higher Education 534.) Sp, Su

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

552 School Law for Educators (3) Case and statutory material for public school educators; problems concerning law and public education.

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

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 applications for improved learning. E

560 Student Assessment (3) Processes for assessing and reporting student progress; interpretation and use of available assessment data. Methods of assessment other than tests and measurements: portfolios, performance tasks, exhibitions. F

561 Educational Statistics (3) Applications of descriptive and inferential statistics to educational and instructional problems. Use of electronic calculators in educational research. Prereq: One year of college mathematics, an elementary course in statistics, or consent of instructor. E

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

569 Media and Technology Production Techniques (3) Workshop strategy: basic photography, audio production, multi and single camera TV production, basic digital video editing, and other media technology techniques important for improving communication in variety of presentation or instructional settings. (Same as Information Sciences 569.)

570 Instructional Systems Design (3) Application of theory and research of instructional systems design to solve instructional problems in educational settings. F, Sp

571 Desktop Publishing for Educators (3) Use of computer-based desktop publishing software and related hardware in designing and producing instructional and informational products. Prereq: 521, 570, or consent of instructor. Sp

573 Introduction to Multimedia in Instruction (3) Selection of computer-based software tools and use to produce instructional materials based on specific learner characteristics and objectives. Prereq: 521 or consent of instructor. Sp, Su

575 The Internet: Implications for Teaching and Learning (3) Projects and survey theories for using Internet as information, research, and instructional tool. Variety of browsers, search engines, and web page construction software. Prereq: 521 or consent of instructor. Sp, Su

576 Advanced Interactive Multimedia for Instruction (3) Design and production of educational and interactive Web sites using advanced software. Development of effective interactive methods for enhancing teaching and learning supported by principles of planning, designing, creating, testing, and evaluating. Prereq: 521, 570, 573, 575. F

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

580 Techniques for Research in Curriculum and Instruction (3) Fundamentals of research methodology applicable to curriculum, instruction, an other areas of educational inquiry. Critical reading of research and development of skills needed for proposal development. E

588 Instructional Theory and Design (3) Relationship of curriculum to instruction; examination of Instructional Technology, Curriculum and Evaluation

(200x226)

MAJOR DEGREES

Education M.S., Ed.S., Ed.D., Ph.D.

M. Everett Myer, Head

Professors:

Counts, Edward L., Ed.D. ............ Texas A&M
Desart, Donald J., Ph.D. ......... Maryland
Doak, E. Dale (Emeritus), Ed.D. .... Colorado
French, Russell, Ph.D. ........... Ohio State
The College of Arts and Sciences offers a series of interdisciplinary undergraduate majors and minors through its Interdisciplinary Programs. These programs include African and African-American Studies, American Studies, Asian Studies, Cinema Studies, Comparative Literature, Environmental Studies, Latin American Studies, Legal Studies, Judaic Studies, Linguistics, Medieval Studies, Urban Studies and Women's Studies. Certain courses within these programs are available for graduate credit as listed below. See the Undergraduate Catalog for program descriptions and directors.

### African and African-American Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>443 Topics in Black Literature (3)</td>
<td>Same as English 443.</td>
</tr>
<tr>
<td>452 Black African Politics (3)</td>
<td>Same as Political Science 452.</td>
</tr>
<tr>
<td>473 Black Male in American Society (3)</td>
<td>Development of historical images, myths, and stereotypes. Impact of critical factors: Black feminism, violence, concepts of masculinity, family, white males, white females, homosexuality, nationalism, and athletics. Prereq: 521, 570, 573, 575, or consent of instructor.</td>
</tr>
<tr>
<td>483 African-American Women in American Society (3)</td>
<td>Historical and contemporary socio-economic-political factors in American society related to Black women. (Same as Women's Studies 483.)</td>
</tr>
<tr>
<td>510 Special Topics (3)</td>
<td>May be repeated. Maximum 6 hrs.</td>
</tr>
</tbody>
</table>

### American Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>423 Geography of American Popular Culture (3)</td>
<td>Same as Geography 423.</td>
</tr>
<tr>
<td>510 Special Topics (3)</td>
<td>May be repeated. Maximum 6 hrs.</td>
</tr>
</tbody>
</table>

### Asian Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>471 Selected Topics in Asian Studies (3)</td>
<td>Content varies. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>510 Special Topics (3)</td>
<td>May be repeated. Maximum 6 hrs.</td>
</tr>
</tbody>
</table>

### Comparative Literature

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>401-02 Special Topics in Comparative Literature (3,3)</td>
<td>Content varies. May be repeated. Maximum 9 hrs.</td>
</tr>
<tr>
<td>452 Modern Drama, 1880-1945 (3) (Same as English 452.)</td>
<td></td>
</tr>
<tr>
<td>454 Twentieth-Century International Novel (3) (Same as English 454.)</td>
<td></td>
</tr>
<tr>
<td>510 Special Topics (3)</td>
<td>May be repeated. Maximum 6 hrs.</td>
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</tbody>
</table>

### Judaic Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>405 Modern Jewish Thought (3) (Same as Religious Studies 405.)</td>
<td></td>
</tr>
<tr>
<td>425 Early Christian and Byzantine Art, to 1350 (3) (Same as Art History 425.)</td>
<td></td>
</tr>
<tr>
<td>431 Medieval Art of the West, 800-1400 (3) (Same as Art History 431.)</td>
<td></td>
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</tbody>
</table>

### Latin American Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>456 Latin American Government and Politics (3) (Same as Political Science 456.)</td>
<td></td>
</tr>
<tr>
<td>465 Latin American Film and Culture (3) (Same as Spanish 465 and Cinema Studies 465.)</td>
<td></td>
</tr>
<tr>
<td>479 Disenched Texts in Hispanic Literature (3) (Same as Spanish 479.)</td>
<td></td>
</tr>
<tr>
<td>510 Special Topics (3)</td>
<td>May be repeated. Maximum 6 hrs.</td>
</tr>
</tbody>
</table>

### Legal Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Mass Communications Law and Ethics (3) (Same as Communications 400.)</td>
<td></td>
</tr>
<tr>
<td>424 Psychology and Law (3) (Same as Psychology 424.)</td>
<td></td>
</tr>
</tbody>
</table>
Urban Studies

GRADUATE COURSES

401 The City in the U.S. (3) (Same as Planning 401.)
441 Urban Geography of the United States (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.
410 Gender Role Development: Implications for Education and Counseling (3) (Same as Counselor Education and Counseling Psychology 410.)
422 Women Writers in Britain (3) (Same as English 422.)
425 Women's Health (3) (Same as Health 425.)
426 The Development of Diachronic and Synchronic Linguistics (3) Development of Western linguistic thought from Hebrews and Greeks through modern times. Readings from Boas, Sapir, Bloomfield, and others. Prereq: 9 hrs of courses required for Linguistics major (300-level or above) or consent of instructor.
427 Introduction to Descriptive Linguistics (3) (Same as French 427, German 425, and Spanish 425.)
428 Methods of Historical Linguistics (3) (Same as German 426, French 426, and Spanish 426.)
429 Romance Linguistics (3) (Same as French 429 and Spanish 429.)
430 Topics in Hispanic Linguistics (3) (Same as Spanish 430.)
431 Advanced Editing (3) Sensitivity to language and editing skills. Headline writing, layout, and production. Prereq: Editing. Sp
432 History of the German Language (3) (Same as German 432.)
433 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 (3) (Same as English 475.)
476 Second Language Acquisition (3) (Same as English 476.)
477 Pedagogical Grammar for ESL Teachers (3) (Same as English 477.)
485 Special Topics in Language (3) (Same as English 485.)
490 Language and Law (3) (Same as English 490 and Legal Studies 490.)
510 Special Topics (3) May be repeated. Maximum 6 hrs.

Medieval Studies

GRADUATE COURSES

510 Special Topics (3) May be repeated. Maximum 6 hrs.

Journalism and Public Relations

(Major of Communications)

MAJOR
Communications ......................................... M.S., Ph.D.
James A. Crook, Director

Professors:
Adamson, June N. (Emeritus).
Ashdown, Paul G., Ph.D. Bowling Green
Bowers, Dorothy, Ph.D. .................................. Wisconsin
Cade, Dozier C. (Emeritus), Ph.D. ............. Iowa
Caudill, C. Edward, Ph.D. ..................... North Carolina
Crock, James A., Ph.D. .......................... Iowa State
Everett, George A. (Emeritus), Ph.D. ........ Iowa
Haskins, Jack B. (Emeritus), Ph.D. .......... Minnesota
Leiter, B. Kelly (Emeritus), Ph.D. ............... Southern Illinois
Littmann, Mark (Chair of Excellence), Ph.D. .... Southern Illinois
Miller, M. Mark, Ph.D. ......................... Northwestern
Morgan, Jerry, J. P., Ph.D. ...... Michigan State
Singletary, Michael W., Ph.D. Southern Illinois
Tucker, Willis C. (Emeritus), M.S. ......... Kentucky

Associate Professors:
Foley, Daniel, M.S.J. ............................... Northwestern
Heller, Robert B., M.A. .............................. Syracuse
Morrow, Jerry L., Ph.D. ............................ Toledo

Assistant Professors:
Fall, Lisa T., Ph.D. .................................... Michigan State
Riechert, Bonnie P., Ph.D. ...................... Tennessee
White, Candace L., Ph.D. .......... Georgia

The School of Journalism and Public Relations offers a concentration area for the master's with a major in Communications and participates in the interdisciplinary doctoral program. See Communications for additional information.

Journalism

GRADUATE COURSES

403 International Communications (3) Development and operations of world mass communications channels and agencies. Comparative analysis of media, media practices, and flow of news throughout world. Print and broadcast systems in terms of relevant social, political, economic, and cultural factors. Relation of communication practices to international affairs and understanding.
412 Opinion Writing (3) Analysis of editorial positions, practices, and pages. Writing of editorials and columns for newspapers, magazines and company publications. Study and use of rhetorical devices and logic. Prereq: Writing for Mass Communication or consent of instructor. (Same as Public Relations 412.)
414 Magazine Article Writing (3) Techniques of writing in-depth articles of mass circulation and specialized magazines. Organizing and presenting material, problems in specialized areas: business, science, agriculture, humanities. Prereq: Writing for Mass Communication or consent of instructor.
416 Issues in Journalism (3) Topics vary. Prereq: of instructor. May be repeated. Maximum 6 hrs.
420 Print Media Management (3) Current business practice among print news media, especially newspapers. Problems in management and production and outlook for new technologies. Prereq: 6 hrs mathematics and/or accounting and senior standing. Sp
433 Advanced Editing (3) Sensitivity to language and editing skills. Headline writing, layout, and production. Prereq: E
444 Journalism as Literature (3) Study of writers from 17th century to modern era whose works have endured as both journalism and literature. Emerging genre called literary journalism: means of cultural reporting with personal narrative style. Prereq: Consent of instructor.
450 Writing About Science, Technology, and Medicine (3) Writing workshop to analyze examples of successful science writing and writing series of articles for general public based on scientific journals, news conferences, technical meetings, and interviews. Prereq: Consent of instructor. (Same as Information Sciences 450.)
451 Environmental Reporting (3) Writing for news media on such environmental issues as strip-mining, water pollution, air pollution, allergens, nuclear power, fossil fuel power, and solid waste. Presentations from and interviews of experts in environmental science and reporting. Exemplary popular literature in environmental reporting. Prereq: Editing for majors; consent of instructor for non-majors.
455 Issues in Science Communications (3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
Large Animal Clinical Sciences

See College of Veterinary Medicine and Comparative and Experimental Medicine

Law

(College of Law)

MAJOR DEGREES

Law J.D., J.D.-MBA, J.D.-M.P.A.

Thomas C. Galligan, Jr., Dean

Professors:

Ansley, Frances Lee, LL.M. Harvard
Best, Reba, M.L.S. Florida
Blaza, Douglas A., J.D. Georgetown
Cohen, Neil P., LL.M. Harvard
Cook, Joseph G., LL.M. Yale
Galligan, Jr., Thomas C., LL.M. Columbia
Hardin, Patrick, J.D. Chicago
Hess, Amy M., J.D. Virginia
Jones, Dunvard S. (Emeritus), J.D., North Carolina
King, Joseph H., J.D. Pennsylvania
Lacey, Forrest W. (Emeritus), S.J.D. Michigan
Le Clercq, Frederic S. (Emeritus), LL.B. Duke
Lloyd, Robert M., J.D. Michigan
Phillips, Jerry J., J.D. Yale
Piquet, Cheryl, M.S.L.S. Tennessee
Reynolds, Glenn H., J.D. Yale
Rivkin, Dean H., J.D. Vanderbilt
Sewell, Toxey H. (Emeritus), L.L.M. Georgia Washington
Sobieski, John L., Jr., J.D. Michigan
Stark, Barbara, J.D. New York
Wirtz, Richard S., J.D. Stanford
Zwier, Paul J., II, LL.M. Temple

Associate Professors:

Aarons, Dwight, J.D., UCLA
Anderson, Gary L., LL.M. Harvard
Barton, Benjamin H., J.D. Michigan
Beitema, William J., J.D. Miami
Black, Jerry P., Jr., J.D. Vanderbilt
Coffin, Judi M., J.D. Tennessee
Davies, Thomas Y., J.D. Northwestern
Gray, Grayfred B., J.D. Vanderbilt

Public Relations

GRADUATE COURSES

412 Opinion Writing (3) (Same as Journalism 412.)

416 Issues in Public Relations (3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

417 Public Relations Campaigns (3) Research, planning and communication and evaluation of major public relations campaigns. Oral and written presentation of public relations project from inception to completion. Extensive out-of-class work. Prereq: 320 Public Relations Communications and 376 Public Relations Cases or consent of instructor. FSp

516 Seminar in Public Relations Issues (3) Topics vary. May be repeated. Maximum of 6 hrs.

520 Press-Government Relations (3) (Same as Journalism 520.)

523 Public Opinion (3) (Same as Journalism 523.)

530 Fund Raising and Proposal Writing (3) History, philosophy and practice of philanthropy in U.S. Sources of funds from foundations, corporations and public agencies. Research and preparation of fund-raising proposals.

560 Publishing on World Wide Web (3) (Same as Journalism 560.)

571 Public Relations Management (3) Analysis and management of problems in communication between institutions and organizations and the public. Measurement and evaluation of effectiveness of communication programs. Prereq: 470 or consent of instructor.

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

598 Internship (3) Professional work in public relations supervised by communications manager with faculty approval. No retroactive credit for previous work experience. Prereq: Completion of core curriculum.

The College of Law offers the Doctor of Jurisprudence degree program; a dual degree program with the College of Business Administration leading to the J.D. and the Master of Business Administration degree; and a dual degree program with the Department of Political Science, College of Arts and Sciences, leading to the J.D. and Master of Political Administration. In addition graduate students may be eligible to take a limited number of law courses to count toward a graduate degree.

Current information regarding admission, financial aid, course requirements, academic policies, extracurricular activities, and student services is available from the Admissions Office, The University of Tennessee, College of Law, 1505 W. Cumberland Ave., Knoxville, Tennessee 37996-1810. Completed application should be received before February 1 of the year of requested admission.

DEGREE OF DOCTOR OF JURISPRUDENCE

The degree of Doctor of Jurisprudence will be conferred upon candidates who complete, with the required average, six semesters of resident law study and who have 89 semester hours of credit, including all required courses. The required average is 2.0 and that average must be maintained on the work of all six semesters and also for the combined work of the grading periods in which the last 28 credit hours taken in residence were earned. Averages are computed on weighted grades. Grades are on an alphabetical scale from A+ to F. No credit toward the J.D. degree is awarded for grades of D- or F.

Eligible law students may receive up to six (6) semester hours of credit toward the J.D. degree for acceptable performance (a grade of B or higher) in upper-level courses that materially contribute to the study of law and which are taken in other departments at The University of Tennessee. Course selection and registration are subject to guidelines approved by the law faculty which include the requirement that any such course be acceptable for credit toward a graduate degree in the department offering the course.

Refer to the Law Catalog and Student Handbook for current degree requirements.
Concentration in Business Transactions
Students interested in a concentration in business transactions must complete all of the following law courses:

- 818 Fundamental Concepts of Income Taxation
- 826 Introduction to Business Transactions
- 827 Business Associations
- 972 Income Taxation of Business Organizations
- 940 Land Finance Law
- 840 Commercial Law
- 842 Contract Drafting Seminar
- 853 Representing Enterprises

None of the above courses may be taken on an S/NC basis (with the exception of 826).

*This course is not required for students who have an undergraduate major in accounting, finance, or business administration, who hold the MBA degree, or who are enrolled in the dual J.D.-MBA program. Waivers may also be granted to students who have acquired the requisite business knowledge through other coursework or through practical experience.

Concentration in Advocacy and Dispute Resolution
Students interested in a concentration in advocacy and dispute resolution must complete all of the following courses:

- 813 Evidence
- 615 Introduction to Advocacy and Professional Responsibility
- 905 Advocacy Clinic
- 920 Trial Practice
- 921 Pretrial Litigation
- 922 Advanced Trial Advocacy
- 928 Case Development and Resolution

Students electing a concentration in advocacy and dispute resolution may not take any of the above courses on an S/NC basis.

DUAL J.D.-MBA DEGREE 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 approximately 15 hours of Business Administration. The dual program is designed to accommodate the many aspects of the graduate programs of the College of Law and the College of Business Administration, and the intellectual benefits 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 and College of Business Administration for the MBA degree, and by the Dual Program Committee.

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program students will be started prior to entry into the last 28 semester hours of J.D. coursework and prior to the third semester 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 without regard to the dual program.

The College of Law will award up to 9 semester hours of credit toward the J.D. for acceptable performance in approved graduate-level courses offered by the College of Business Administration. The College of Business Administration will award up to 6 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.

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. During the first year in the MBA program, students register as graduate students. After the first two years, any term in which students take law courses or a mixture of law and graduate courses, they are classified and registered as law students. If taking only graduate courses, they are classified and registered as graduate students.

Approved Dual Credit
MBA courses in which the student has earned a B grade or higher and are to be counted toward the J.D. program must include 9 semester hours approved by the College of Law. The 6 hours of law courses in which the student has earned a 2.3 or C+ grade or higher and are to be counted toward the MBA must be selected from those approved by the Asst. Dean of the MBA Program.

DUAL J.D.-M.P.A. PROGRAM
The College of Law and the Department of Political Science in the College of Arts and Sciences offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and Master of Public Administration degrees. In this program, a student may earn the M.P.A. and J.D. degrees in about four years rather than the five years that otherwise would be required. Students pursuing the dual degree program should plan to be enrolled in coursework or an internship for one semester in addition to taking normal course loads for four academic years.

Admission
Applicants for the J.D.-M.P.A. program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and the Department of Political Science and the Graduate School for the M.P.A. degree. Applicants must also be accepted by the Dual Degree Committee.

Curriculum
A dual degree candidate must satisfy the graduation requirements for both degrees. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either degree program. Students may not take courses in the opposite area without the approval of the Dual Program Committee.

Approved Dual Credit
MBA courses in which the student has earned a B grade or higher and are to be counted toward the J.D. program must include 9 semester hours approved by the College of Law. The 6 hours of law courses in which the student has earned a 2.3 or C+ grade or higher and are to be counted toward the MBA must be selected from those approved by the Asst. Dean of the MBA Program.

The approval of courses is the responsibility of the Dual Program Committee.

Students may begin their studies in either the J.D. or the M.P.A. 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. During the first year in the MBA program, students register as graduate students. After the first two years, any term in which students take law courses or a mixture of law and graduate courses, they are classified and registered as law students. If taking only graduate courses, they are classified and registered as graduate students.
receive credit toward either the J.D. or the M.P.A. degree for courses taken in the other program except as such courses qualify for credit without regard to the dual program.

**Awarding of Grades**

For grade recording purposes in the College of Law and the Department of Political Science, grades awarded in courses in the other unit will be converted to either Satisfactory or No Credit and will not be computed in determining a student's GPA or class standing. The College of Law will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for an approved law course in which the student earns a grade of C+ or higher and a grade of No Credit for any lower grade. 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.

**POLICY FOR GRADUATE STUDENTS TAKING LAW COURSES**

Students pursuing a graduate degree in another college may, upon approval of the College of Law and the major chairperson, take up to 8 semester hours of law courses and receive credit toward the graduate degree. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a C or above is earned in a law course, an S will be recorded on the transcript. If a student earns below a C, an NC will be recorded, and the course cannot be used toward meeting degree requirements. Grades for law courses will not be reflected in the cumulative average. Law courses may be taken for credit only by students enrolled in a graduate degree program.

Different rules apply to the student enrolled in the Dual J.D.-MBA or J.D.-M.P.A. Programs. Grades must be earned according to the grading system of the respective college, e.g., numerical grades for law courses, letter grades for graduate courses. Refer to section on Grades for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, at which time both the graduate and the law cumulative will be shown on the permanent transcript. Grades for law courses will not be reflected in the cumulative average. Law courses may be taken for credit only by students enrolled in a graduate degree program.

**PROFESSIONAL COURSES**

801 Civil Procedure I (3) Binding effect of judgments, selecting proper court (jurisdiction and venue), ascertaining applicable law, and federal and state practice.

802 Civil Procedure II (3) Pleading, joinder of claims and parties, discovery, trials, verdicts, judgments and appeals. Emphasis on Motion Practice. "Elements of Civil Procedure."

803 Contracts I (3) Basic agreement process and legal protections afforded contracts: offer and acceptance, consideration and other bases for enforcing promises; the Statute of Frauds; unconscionability and other controls of promissory liability. Introduction to relevant portions of Article 2 of the Uniform Commercial Code.

804 Contracts II (3) Continuation of Contracts I. Issues arising after formation: interpretation, duty of good faith; conditions, impracticability and frustration of purpose; remedies; third party beneficiaries; assignment and delegation. Considerable coverage of Article 2 of the Uniform Commercial Code with respect to remedies, anticipatory repudiation, impracticability and good faith.

805 Legal Process I (3) Lawyer-like use of cases and statutes in prediction and persuasion. Analysis and synthesis of common law decisions; statutory interpretation; fundamentals of expository legal writing and legal research.

806 Legal Process II (3) Continuation of Legal Process I. Formal legal writing, appellate procedure, and oral advocacy.

807 Torts I (3) Intentional torts, defenses and privileges related to intentional torts; negligence: standard of care, professional malpractice, and liability of owners and occupiers of land; defenses based on plaintiff's conduct; contributory and comparative negligence, assumption of risk, failure to take precautions, and avoidable consequences; causation, proximate cause; duty rules, and questions of joint and several or several liability.

808 Torts II (3) Vicarious liability and related concepts; strict liability for dangerous animals and abnormally dangerous activities; products liability; nuisance, defamation and invasion of privacy; economic torts; misrepresentation and intersection with contract and prospective opportunities; immunities: those of government, government employees, charities and family members, and damages.

809 Criminal Law (3) Substantive aspects of criminal law; general principles applicable to all criminal conduct; specific analysis of particular crimes; defenses to offenses.

810 Property (4) Introductory course treating issues of ownership, possession, and title in the areas of: landlord-tenant relations; estates in land and future interests; co-ownership and marital property; real estate transactions; real estate in the context of other areas of practice; and personal property law.

811 Constitutional Law (3) Fundamental principles of American constitutional law: federalism, separation of powers, equal protection of law, and constitutional protection of other fundamental individual rights.

812 Evidence (4) Rules regulating introduction and exclusion of oral, written and demonstrative evidence at trials and other proceedings; including relevance; validity; competence, impeachment, hearsay, privilege, expert testimony, authentication, and judicial notice. Coreq: 920 for students electing concentration in advocacy.

813 Professional Responsibility (3) Legal, professional and ethical standards applicable to lawyers. Not open to students who have taken 815.

814 Legal Profession (3) Legal, professional and ethical standards applicable to lawyers and especially lawyers as advocates.

815 Introduction to Advocacy and Professional Responsibility (3) Theory and morality of advocacy in adversarial system, and legal, ethical, and professional standards applicable to lawyers and especially lawyers as advocates.

816 Federal Principles of Income Taxation (3) Introduction to basic statutory analysis, fundamental principles of federal individual income tax, and pervasive elements of taxation. Study of tax credits and exclusion. Study of international aspects. Study of federal concept of gross income; patterns of exclusion, exemptions and deductions from gross income used to arrive at tax base; expected treatment of capital gains and losses; and rate structure.


821 Administrative Law (3) Administrative agency decision-making processes and judicial review of administrative decisions. Fundamental doctrines and standards for informal and formal administrative adjudication and rule-making (attention to federal Administrative Procedure Act); constitutional due process standards in administrative settings; and availability, scope and timing of judicial review of agency actions.

822 Legislation (3) Interpretation and drafting of statutory and regulatory provisions; power comparison of judicial views on legislative process with both realities of legislative process and applicable constitutional principles.

826 Introduction to Business Transactions (2) Non-technical introduction to the law of business and the functional relationships among the various actors in business transactions. Analysis of business transactions viewed toward new clients. Not available for students with business background.

827 Business Associations (4) Legal problems associated with formation, operation, and dissolution of unincorporated and incorporated business firms; legal rights of the firm members: principals and agents; partners and limited partners, members, managers, and governors of limited liability companies, and corporate shareholders, directors, and officers; and others with whom members interact in connection with firm's business.

828 Corporate Finance (3) Legal issues arising in connection with corporate financial transactions; issuance of capital and various securities; distributions to shareholders, mergers and other corporate acquisitions. Legal valuation of corporate securities.

830 Securities Regulation (3) Basic structure of federal securities laws. Legal problems associated with raising of capital by new and growing enterprises; securities transactions by promoters, officers, directors and others involved; regulation of public-held companies: litigation under Rule 10b-5 and other anti-fraud provisions; and provision of legal and other professional services in connection with securities transactions. Recommended prerequisite: 827.

833 Representing Enterprises (3-5) Capstone course for concentration in business transactions. Study of business transactions and completion of major planning and drafting project. Transactions vary: formation of new businesses; acquisitions and disposals of existing business; development and operation of real estate project; various financing transactions and corporate reorganization. Prereq: Completion of 828 for concentration in business transactions.

834 Antitrust (3) Federal antitrust laws; monopolization, price-fixing, group boycotts, and anticompetitive practices generally; government enforcement techniques and private treble damage suits.

840 Commercial Law (4) Basic coverage of most significant provisions of Uniform Commercial Code: security interests in personal property (Art. 9 of U.C.C. and relevant Bankruptcy Code provisions); commercial paper, including checks, promissory notes and other negotiable instruments (Arts. 3 and 4 of U.C.C.); sales of goods, including coverage of portions of Art. 2 of U.C.C. not covered in Contracts.

842 Contract Drafting Seminar (2) Practical fundamentals of drafting contracts of different types.

843 Debtor-Creditor Law (3) Basic elements of federal bankruptcy law; claims, property of estate, automatic stay, trustee's avoidance powers, assumption and rejection of contracts, priority of distributions, and discharge between liquidation and rehabilitation. Enforcing judgments outside of bankruptcy.

847 Advanced Constitutional Law (2-3) Advanced study of issues in American constitutional law. Specifc course offerings vary. Subjects include: constitutional structure and operation, American governmental institutions, federalism, separation of governmental powers; relationship between legislative and executive branches, relationship among states and between states and federal government, and constitutional amendment process; state constitutional law, Tennessee constitution and relationship between state and federal constitutional law. Bill of Rights and 14th Amendment to Constitution: constitutional rights as protected by Bill of Rights and 14th Amendment. Prereq: 812. May be repeated under different topics.

848 Civil Rights Actions (3) Litigation to vindicate constitutional rights in private actions against the government and its officials, as well as rights protected by other civil rights legislation: elements of cause of action under 42 U.S.C. sec. 1983; actions against...
895 Labor Relations Law (3) Political, social and economic influences on development of federal labor relations laws; employer-employee collective bargaining; individual union and employer unfair labor practices; strikes, lockouts, boycotts, and other collective bargaining processes; development of labor-management agreement; individual rights of employees; federal preemption and state regulation.

896 Employment Law (3) Legal regulation of employment relationships: legal, social and economic influences in employment relationships; modern employment discrimination; legally prescribed minimum standards of compensation and safety; restraints on termination of employment; regulation of retirement systems.

898 Arbitration Seminar (2) Arbitration of labor agreements; judicial and legislative developments; nature of process; relationship to collective bargaining; selected arbitration problems on various topics under collective agreements; and role of lawyers and arbitrators. Prereq: 895.

899 Labor Relations Seminar (2) Selected labor relations law problems. Prereq: 895.

905 Advocacy Clinic (6) Supervised fieldwork requiring students to assume substantial responsibility for representing clients within the context of recognized legal processes and problems. Exploration and development of fundamental professional skills involved in practicing law: interviewing and counseling clients; presentation of cases to attorneys, planning for transactions and dispute resolutions, initiating and defending claims, conducting fact investigation, and presenting evidence. Prereq: 920 and third-year standing.

908 Mediation Clinic (3) Mediation as an alternative to litigation; strategy, tactics and skills through readings, simulations, and service as mediators in general sessions court and other settings; mediation ethics, relationship of mediation to other dispute resolution methods, roles of attorneys in mediation, and writing of mediation agreements.

915 Conflict of Laws (3) Jurisdiction, foreign judgments, and conflicts of laws.

916 Federal Courts (3) Jurisdiction of federal courts; conflicts between federal and state judicial systems.

918 Remedies (3) Judicial remedies: damages, restitution, and equitable relief; availability, limitations and measurement of various remedies; comparison of contract, tort and property-related remedies.

920 Trial Practice (3) Litigation through trial and appellate processes and preparation of a trial strategy; professional responsibility; fact investigation and witness preparation; discovery and presentation of evidence; selection and examination of jurors; opening and closing arguments. Written work: pleadings, motions, interrogatories or memoranda. Coreq: 813 for students electing concentration in advocacy. Prereq: 813 for all other students.

921 Pre-Trial Litigation (3) Civil pre-trial process. Drafting of actual pre-trial documents in civil cases: complaint, motions for preliminary injunction, class certification papers, motions to dismiss and for summary judgment, and various discovery papers.

922 Advanced Trial Advocacy (3) Study and development of trial skills: trial preparation, direct and cross-examination, expert witnesses, jury selection, jury instruction, technology in courtroom, and motion practice. Coreq: 821.

925 Appellate Practice Seminar (2) Federal and Tennessee Rules of Appellate Procedure, local rules of federal circuit; review of complete records of several United States Supreme Court cases and preparation of an appellate brief based on an actual case.

927 Interviewing, Counseling and Negotiation (3) Development of conceptual and practical frameworks for understanding interviewing, counseling and negotiation, and the lawyer's role in tasks. Readings of different methods, strategies and perspectives from recent literature involving lawyering skills. Simulations and videotape critiques, drafting of documents. Relevant ethical issues and strategies. Not open to students who have taken 904 or 906.

928 Case Development and Resolution (4) Theory and development of skills for case development and management: interviewing, counseling, and fact investigation. Ways of resolving disputes without litigation. Not open to students who have taken 927.

929 Teaching Clients the Law (3) Communication of law as basis for decision by persons other than lawyers. Development of skills by team-teaching a practical law course through clinics for school or adult clients and by writing research papers that synthesize Tennessee or federal law in plain language.

935 Gratuities Transfers (4) Nature, creation, termination, and revocation of transfers of goods; fiduciary administration; intestate succession and the administration of estates; probate and contest of wills; creation and construction of various types of future interests; construction of leases; application of the rule against perpetuities.


940 Land Finance Law (3) Financing devices: mortgages, deeds of trust and land contracts; problems of priorities, transfer of secured interests, debt assumed or taken subject to security interest; default, exercise of power of redemption and/or statutory right of redemption; mechanics of foreclosure; mechanics of sales; lis pendens; contemporary developments in areas containing leases, cooperatives, housing subdivisions, and shopping centers.


943 Land Use Law (3) Private land use controls: nuisance, easements, real covenants, equitable servitudes and home owner associations; public land use controls: zoning, subdivision controls, eminent domain, and regulatory takings.

950 Computers and Law (3) Impact of computers on law and practice of law: expert systems; legal skills required in building expert systems; common law office uses of computers; and computerized research. Preparation of lawyers to think effectively concerning use of computers. Prior computer experience not necessary.

956 Entertainment Law (3) Role of law and lawyer in entertainment industry. Course content varies. Music industry: music copyright laws; artist/manager relationships; record contracts; talent agreements; industry labor unions; and performing right organizations.

957 Law, Science and Technology (3) Legal implications of advanced technologies; adaptation of law to challenges posed by new kinds of knowledge and new ways of doing things. Biotechnology, regulation of scientific research, space law, legal issues relating to new information technologies, nanotechnologies, and others designated by instructor.

959 Women and the Law (3) Treatment of status of women in American legal system: women as political actors, as family members, as participants in workforce, as targets of violence and as members of legal professions. Introduction to current competing approaches to gender justice.

959 Intellectual Property (3) Intellectual property and related issues under federal and state law: patents; trademarks; trade secrets; copyright; right of publicity; unfair competition.


962 Law and Medicine Seminar (2) Effects of legal rules on delivery and quality of medical care: nature of physician-patient relationships, medical malpractice, administration, and ethics. Medical malpractice liability: standard of care, proof, causation,

973 Wealth Transfer Taxation (3) Taxation of gratuitous transfers of wealth during life (gift tax) and death (estate tax) and of generation skipping transfers. Prereq or coreq: 935.

975 Tax Theory (3) Method and purposes of governmental revenue collection through examination of economic and political theory; comparative analysis of various actual and proposed patterns of taxation: income tax, consumption tax, sales tax, and value-added tax. Required preparation of expository essay on aspect of tax theory chosen by student. Limited enrollment.


980 Insurance (3) Types of insurance: life, property, health, accident and liability insurance; regulation of insurance industry; interpretation of insurance contracts; insurable interest requirement; conditions, warranties and representations; coverage and exclusions; duties of agents; excess liability; subrogation; and bad faith actions against insurers. Liability insurance defense problems: duty to defend, notice and cooperation issues, and conflicts of interest.

983 Products Liability (3) Scope of doctrine and theories of recovery; potential plaintiffs and defendants; statutory and contractual limitations on recovery; damages; causation; and defenses.

985 Social Legislation (3) Systems other than traditional tort remedies for compensating victims of work-related accidents and diseases, and for compensating disabled persons. Workers' compensation: requirements for covered employer-employee relationship; accidental injuries or occupational diseases arising out of and in the course of employment; causation; nature of medical, disability, and death benefits; exclusiveness of compensation remedy against employer and co-employer; and responsibilities of non-employers; administration and procedural aspects of Workers' Compensation practice; and various law reform measures. Emphasis on actual and proposed pattern of cases involving Social Security disability claims.

990 Issues in the Law (3) Selected topics. May be repeated.

991 Issues in the Law Seminar (2) Selected topics. May be repeated.

993 Directed Research (1-2) Independent research and writing under direct supervision of faculty member. Proposals must be approved by supervising faculty member and by the Dean or the Dean's designee. Maximum of once each semester during last two years of study. Prereq: Second-year standing.

994 Independent Study (1-4) Independent study under direct supervision of faculty member. Proposal must be approved by supervising faculty member and by the Dean or the Dean's designee. Maximum of once each semester during last three semesters of study.

996 Law Review (1) Performance of duties as staff member or editor of Tennessee Law Review. Responsibilities vary each semester as specified in Tennessee Law Review Policy Manual: writing of casenote, comment or article, and/or performance of other assigned duties related to operations of Tennessee Law Review. Completion of potentially publishable comment or article for Tennessee Law Review satisfies experiment requirement. May be repeated S/NC only. (Does not count toward total number of elective upper division courses taken S/NC.)

997 Moot Court (1) Participation as member of faculty-supervised interscholastic moot court competition. May be repeated S/NC only. (Will not count toward total number of elective upper division courses taken S/NC.)

998 Planning and Drafting Project (1) Preparation and completion of planning and drafting project under faculty supervision in conjunction with substantive courses when such planning and drafting option is provided by course instructor. May be repeated.

Life Sciences

(College of Arts and Sciences)

MAJOR

DEGREES

Jeffrey Becker, Chair

Life Sciences ......................... M.S., Ph.D.

The program leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate and are designed to augment offerings of individual departments in two concentrations: genome science and technology, and plant physiology and genetics. Students interested in these areas should contact either the Life Sciences chairperson or the director of the area of interest. Each concentration is administered separately and has unique admission requirements.

CONCENTRATIONS

Genome Science and Technology

The University of Tennessee-Oak Ridge National Laboratory Graduate Program in Genome Science and Technology (GST) is a unique and multidisciplinary program for full-time graduate study leading to the M.S. or Ph.D. degree. The program focuses on developments in the biological and computational sciences relating to genome sciences, and the program is designed to take advantage of collaboration of The University of Tennessee and the Oak Ridge National Laboratory. Students will be trained in emerging areas of genome science, with emphasis on mammalian genomics, structural biology, bioinformatics, and bioanalytical and bioanalytical technologies. Scientists from both campuses participate in teaching. Research projects pursued for either the M.S. or Ph.D. degrees are mentorship jointly by a faculty member from each campus. A year-long introductory course in Genome Science and Technology focuses on inquiry conducted on a genome-wide scale. Laboratory rotations during the first year offer students hands-on experience in a variety of focus areas.

Applicants are expected to have a background in the biological, physical or computational sciences. Requirements for admission are one year of general biology or the equivalent; two years of chemistry, including one year of general chemistry and one year of introductory organic chemistry with laboratory; one year of calculus; one year of physics; at least eight semester hours in cognate sciences related to the program; a combined GRE score of 1800 for the verbal, quantitative, and analytical sections is highly desirable; three letters of recommendation; and a minimum grade point average of 3.0 out of 4.0. Coursework in genetics, cell biology and computer sciences is advantageous.

Graduate Research Participation (3-12) Special advanced research project not related to dissertation research. Topics can be chosen with consent of instructor. May be repeated. Maximum 3 hrs.

GRADUATE COURSES

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

502 Registration for Use of Facilities (3-15) Required for the student registered elsewhere during any semester when student uses University facilities and for tuition before degree is completed. May not be used toward degree requirements. May be repeated once.

503 Graduate Research Participation (3-12) Special advanced research project not related to dissertation research. Topics can be chosen with consent of instructor. May be repeated. Maximum 3 hrs.
### Logistics

**See Marketing, Logistics and Transportation**

### Management

(See College of Business Administration)

#### MAJOR

**DEGREES**

- Business Administration ................. MBA, Ph.D.
- Oscar Fowler, Head

Professor:

- Boling, Ronald W. (Emeritus), Ph.D., Stanford
- Dewhirst, H. Dudley (Emeritus), Ph.D., Texas
- Gilbert, Kenneth C., Ph.D. ............... Tennessee

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### Graduate Courses

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<tr>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
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<tr>
<td>500 Thesis (1-15)</td>
<td>P/NP only</td>
<td>E</td>
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<tr>
<td>502 Registration for Use of Facilities (3-15)</td>
<td>Required for student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only.</td>
<td>E</td>
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### Logistics

- See Marketing, Logistics and Transportation

### Management

(See College of Business Administration)

#### MAJOR

**DEGREES**

- Management Science .................... M.S., Ph.D.
Charles E. Noon, Chairperson

Committee:
Bowers, Melissa R., Management
Bozdogan, Hamparsum, Statistics
Edirisinghe, Chanaka P., Management
Fowler, Oscar S., Management
Gilbert, Kenneth C., Management
Lehtnaker, Mary G., Statistics
Noon, Charles E., Management
Raiston, Bruce A., Geography

THE MASTER'S PROGRAM

The M.S. program in Management Science is designed as preparation for a career in the application of quantitative techniques for the solution of complex problems. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science coursework will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area.

Supporting areas are available in other departments of the College of Business Administration as well as in computer science, public administration, geography, health, and other areas, subject to approval by the Management Science Committee.

Admission Requirements

The master's program requires the following:
- An undergraduate degree with coursework in mathematics, statistics and/ or computer science.
- An overall GPA of 3.0 or better in the last 60 semester hours of undergraduate coursework.
- A minimum score of 500 on the GRE or GMAT.
- A resume demonstrating relevant work experience.
- Letters of recommendation from at least two academic or professional references.

Complete applications must be submitted by May 15 for fall admission and December 15 for spring admission.

A thesis option is available to qualified students. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during the student's first semester and must approve all courses on a semester-by-semester basis.

Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. The total course load will remain 40 hours for all students.

THE DOCTORAL PROGRAM

The Ph.D. program in Management Science is designed to prepare students for research related to the application of mathematical tools to complex decision making. Three primary objectives of the program are:

1. To provide, through management science coursework, a thorough knowledge of common Management Science/Operations Research mathematical models and their uses;
2. To provide sufficient advanced study in a supporting area to qualify the graduate for a joint faculty position in the supporting area and management science.
3. To develop in the student, through coursework in mathematics, statistics and computer science, a high degree of mathematical maturity to enhance a potential career in management, research, or teaching.

Admission Requirements

The doctoral program requires the following:
- A strong undergraduate background in mathematics or computer science.
- A minimum score of 500 on the GRE or GMAT.
- A minimum GPA of 3.0 on the last 60 semester hours of undergraduate coursework.
- Two letters of recommendation from academic or professional references.

Complete applications must be submitted by March 1 for fall admission and October 1 for spring admission.

A thesis option is available to qualified students. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during the student's first year of study and must approve all courses on a semester-by-semester basis.

Recognizing the diverse backgrounds and needs of Management Science Ph.D. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. The total course load will remain 72 credit hours for all students.

The Ph.D. program is designed as preparation for a career in the science. The doctoral candidate must demonstrate comprehensive understanding of the field of management science and must produce a significant research contribution to the science. A final oral examination is conducted over the dissertation and such other segments of the program that the faculty committee deems appropriate.

Courses and Research

Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation

The student must complete at least 36 semester hours of coursework at the University of Tennessee, at least 6 of which must be at the 600 level. Although a master's degree is not a prerequisite for the doctoral program, a master's degree normally is completed by the end of the first year of the program.

ACADEMIC STANDARDS

A 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 the GPA rises to 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.

PREREQUISITES FOR MANAGEMENT SCIENCE COURSES

The Management Science Program is interdisciplinary and students in other degree programs are encouraged to enroll in management science courses. Course prerequisites are designed to indicate the level at which courses are taught. Interested students whose prior coursework does not match the prerequisites are encouraged to seek the instructor's guidance and consent to enroll.

GRADUATE COURSES

500 Thesis (1-15) P/IN only, E
502 Registration for Use of Facilities (3-15) Re- quired for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only, E
526 Advanced Applications of Systems Modeling and Simulation (3) (Same as Industrial Engineering 526)
531 Mathematical Programming (3) Linear programming solution procedures, duality, sensitivity, and
Marketing, Logistics and Transportation

(College of Business Administration)

MAJOR DEGREES

Business Administration MBA, Ph.D.

Associate Professors:
Dahbaker, P. A., Ph.D. Georgia State
Fogo, J. H. (Liaison), DBA Indiana
Gardal, S. F., Ph.D. Houston
Holcomb, M. C., Ph.D. Tennessee
Norak, C. D., Ph.D. Ohio State
Reizenstein, R. C., Ph.D. Cornell
Rentz, J. O. (Liaison), Ph.D. Georgia

Assistant Professors:
Kahn, K. B., Ph.D. Virginia Tech
Moon, M. A., Ph.D. North Carolina
Ruzicka, M. E., Ph.D. Arizona State

BUSINESS ADMINISTRATION CONCENTRATIONS

For complete listing of MBA and Ph.D. program requirements, see Business Administration.

MBA CONCENTRATION: Logistics and Transportation, Marketing

Minimum course requirements for logistics and transportation—510 and two courses approved by the logistics faculty. For marketing—520 and two courses approved by the marketing faculty.

Ph.D. CONCENTRATION: Logistics and Transportation, Marketing

Minimum course requirements for logistics and transportation—611, 612, 614, 615. For marketing—611, 612, 613, 614, 615, and 616.

Logistics and Transportation

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

504 Logistics and Supply Chain Operations (3) Organizations' internal functional areas and external interactions with suppliers and customers. Operations, interactions, and issues within context of supply chains.

506 Logistics and Supply Chain Strategy (3) Development of strategy for logistics systems and supply chain processes. Executive-level integration of logistics strategy with production, finance, and other decision areas.

507 Global Logistics and Supply Chain Management (3) Logistics strategy in global firm: materials management, international sourcing and procurement, global production and distribution, import/export activity, design and operation of supply chains in global environment.

508 Executive-In-Residence Seminar in Logistics and Transportation Strategy (3) Executive-level seminar in logistics and transportation strategy participation in Executive-In-Residence program that provides student interaction with top level logistics and transportation executives.

509 Logistics and Supply Chain Analytical Techniques (3) Application of various methods and models for analyzing supply chain processes. Understanding, definition and articulation of problems, potential solutions to the issues, commonly faced by managers, consultants, and project analysts.

540 Logistics and Operations Management (3) (Same as Management 540.)
Materials Science and Engineering

(College of Engineering)

MAJORS DEGREES
Materials Science and Engineering M.S., Ph.D.
Polymer Engineering M.S., Ph.D.

Patrick R. Taylor, Head

Professors:
Benson, R. S., Ph.D. .......... Florida State
Brooks, C. R. (Emeritus), Ph.D. .... Tennessee
Buchanan, Raymond A., Ph.D. .... Vanderbilt
Clark, Edward S. (Emeritus), Ph.D. ....... California
Dahotre, N. B. (UTSI), Ph.D. .... Michigan State
Fellers, J. F., Ph. D. .......... Akron
Hansen, Marion G., Ph. D. .......... Wisconsin
Liaw, P. K. (Racheff Chair of Excellence), Ph.D. .......... Northwestern
Lowndes, Douglas H., Ph.D. .......... Colorado
Lundin, Carl D., Ph.D. .......... Rensselaer
McAuliffe, Carl J., Ph.D. .......... Kentucky
Oliver, Ben F. (Emeritus), Ph.D. .......... Penn State
Pedraza, A. J., Ph.D. .......... La Plata (Argentina)
Pharr, George M., Ph.D. .......... Stanford
Phillips, Paul J., Ph. D. .......... Liverpool (UK)
Spruiell, Joseph E., Ph. D. .......... Tennessee
Stansbury, E. E. (Emeritus), Ph.D. .... Cincinnati
Taylor, Patrick R., (Liaison), Ph.D. .......... Ohio State
Meek, Thomas T., Ph.D. .......... Ohio State

Assistant Professor:
Kilt, Kevin, Ph.D. .......... Delaware

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Materials Science and Engineering or Polymer Engineering. Both the Materials Science and Engineering and Polymer Engineering programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs.

Areas of concentration within the Materials Science and Engineering degree program include metalurgy, polymers, and materials. Specializations include, but are not limited to: ceramics; composites; electronic materials; physical metallurgy; materials processing; welding metallurgy and materials joining; corrosion science and engineering; biomedical materials; and mechanical and physical behaviors of materials.

Areas of concentration within the Polymer Engineering degree program include rheology and polymer processing; polymer morphology; mechanical, physical, and chemical behavior of polymers; and composite materials.

THE MASTER'S PROGRAM

Thesis Option
A total of 30 semester hours is required for the M.S. degree in either Materials Science and Engineering or Polymer Engineering. Additional requirements include:
1. A major consisting of 12 semester hours of graduate courses in materials science and engineering or polymer engineering. The materials science and engineering major must include 511, 512, 515, and 516 for the metallurgy concentration; 511, 512, 540, and 541 for the polymers concentration; and 511, 512, and two graduate specialization courses approved by the student's faculty committee for the materials concentration. The polymer engineering major must include 640, 541, 543, 546, 549, and 550 unless similar material has been covered in prior coursework.
2. Additional courses up to 12 hours total in related areas.
4. Satisfactory performance on a comprehensive oral examination administered by the faculty committee.

All resident students are required to register for and participate in the graduate seminar in materials science and engineering or polymer engineering, as appropriate, during each semester in which it is offered. Three hours of MSE 503 or 504, Seminar, graded Satisfactory/No Credit, may be counted toward degree requirements.

Non-Thesis Option
Any candidate may apply for a non-thesis option. Upon acceptance, a supervisory committee of three will be appointed. At least two members of the committee will be from the faculty in the major area, either materials science and engineering or polymer engineering. The requirements for completion of the non-thesis option are as follows:
1. Completion of a total of 30 hours of graduate coursework. At least 12 of those hours must be in the department, and up to 12 hours may be in related areas. Three hours of MSE 503 or 504, Seminar, graded Satisfactory/No Credit, may be counted toward degree requirements. The materials science and engineering major and the polymer engineering major must include the same courses required for the thesis option. The candidate's degree program must be approved by the faculty committee.
2. Satisfactory completion of a culminating experience such as MSE 590 (Critical Review).
3. Satisfactory performance on a comprehensive examination administered by the faculty committee.

THE DOCTORAL PROGRAM

After one year in residence and with the approval of the faculty, a student may proceed directly to the doctoral program without completion of a master's degree. Departmental requirements for completion of the doctoral degree are:
1. a. For students proceeding directly to the Ph.D. from the baccalaureate degree: 48 graduate course credit hours with at least six hours of 600-level courses. Six hours of MSE 503 or 504, Seminar, graded Satisfactory/No Credit, may be counted toward degree requirements. At least 30 credit hours must be courses taught in the department. The materials science and engineering major and the polymer engineering major must include the same courses required for the master's thesis option.

b. For students having a master's degree in Materials Science and Engineering, Polymer Engineering, or Metallurgical Engineering: 18 additional graduate course credits with at least six hours of 600-level courses. Three hours of MSE 503 or 504, Seminar, graded Satisfactory/No Credit, may be counted toward degree requirements. At least 12 credit hours must be courses in the department.
2. Students must complete at least 24 hours of dissertation credits.
3. Satisfactory performance on a comprehensive examination, usually given in two parts, and covering such topics as materials science and engineering, metallurgical or polymer engineering operations and processes, thermodynamics, technology, mathematics, physics, chemistry, and other related fields.
4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 503 or 504 every semester offered.

GRADUATE COURSES

405 Structural Characterization of Materials (4) X-ray diffraction and fluorescence; scanning and transmission electron microscopy; microanalytical techniques.
421 Mechanical Behavior of Materials II (3) Description of stress and strain; linear elastic constitutive equations; isotropic and anisotropic moduli in various materials; yield criteria; brittle fracture; crazing; plastic strain constitutive equations, forming operations and

429 Introduction to Ceramic Matrix Composites (3) Characteristics of composites: ceramic matrix composites; macrocomposites and materials design; overview of fabrication techniques; microstructural characterization; physical and mechanical property evaluation; current and potential applications. Prereq: Introduction to Materials Science and Engineering and Mechanics of Materials or equivalent and consent of instructor. (Same as Engineering Science 429.)

443 Polymer Processing (3) Rheological measurements: flow through tubes and slits, end effects and extrudate swell; thermal stability; injection molding; synthetic fibers, spinning methods, structure development, properties.

444 Plastics Fabrication and Design (3) Lectures, laboratories and field trips; unit operations of plastics fabrication; plastic classification; design and selection criteria; processing techniques; characterization laboratory. Sp


472 Fundamental Principles of Composite Materials (3) Establishment of physical principles basic to design, manufacture and application of fiber reinforced polymers, metals and ceramics. Prereq: 302 or equivalent. (Same as Engineering Science 428.)

474 Biomaterials (3) Metals, polymers and ceramics used in orthopedic, cardiovascular, and dental surgical implant devices and in the development of new materials; properties of materials. Prereq: Permission of instructor. (Same as Engineering Science 428.)

475 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 423.)

484 Introduction to Maintenance Engineering (3) (Same as Nuclear Engineering 484, Industrial Engineering 484, and Mechanical Engineering 484.)

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 facility is being used and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

503 Graduate Seminar in Polymer Engineering (1) Prereq: Admission to graduate program. May be repeated. S/NC only. E

504 Graduate Seminar in Polymer Engineering (1) Prereq: Admission to graduate program. May be repeated. S/NC only. E

505 Engineering Analysis (3) (Same as Chemical Engineering 505.)

511 Fundamentals of Materials Science and Engineering I (3) Crystal bonding, structures, defects, scattering, thermodynamics, diffusion, phase diagrams, microstructures, and phase transformations.

512 Fundamentals of Materials Science and Engineering II (3) Physical properties: electrical and thermal conduction, elementary quantum physics, band theory, dielectric materials, magnetic and optical properties. Mechanical behavior: stress and strain at a point, elastic constitutive equations, phenomenological bulk behavior, and constitutive mechanical mechanisms.


522 Defects in Crystals (3) Analytical and experimental analysis of defect interactions in solids. Prereq: 421 or consent of instructor.

523 Plastic Deformation of Metals (3) Geometry and thermodynamics of plastic deformation; slip, twinning, and cleavage; work hardening, effect of temperature, loading rate effects, effect of ordering and solute alloying; polycrystalline behavior in terms of single grain boundaries and grain boundary mechanisms: texture formation. Prereq: 301, 320 or consent of instructor.

524 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems: refining, purification, surface treatments, alloy systems. Prereq: 570 or equivalent.

525-28 Welding Metallurgy (3) Welding processes; physical metallurgy of welding; phase transformations; heat flow; residual stresses; theories of hot cracking, cold cracking and porosity formation; applications to process optimization.

528 Ceramic Matrix Composites: Material and Mechanics (3) (Same as Engineering Science 528.)

529 Diffusion in Solids (3) Phenomenology and atomic mechanisms of diffusion in solid state. Solution and applications of diffusion equations; random walk problem and mechanisms of diffusion; diffusion in doped and concentrated alloys; Kirkendall effect; high diffusivity paths.

530 Phase Transformations in Metallic Materials (3) Thermodynamics of phase equilibria, theory of nucleation in solids; kinetics and morphology of diffusion controlled growth; kinetics of interface controlled phase transformations; crystallography and kinetics of martensitic transformation.

531 Advanced Corrosion (3) Analysis of corrosion processes in terms of polarization measurements and Pourbaix diagram. Influence of environmental and mechanical factors contributing to pitting, crevice, fretting, wear, fatigue and stress corrosion. Prereq: 470 or consent of instructor.


541 Fluid Mechanics and Polymer Processing (3) Navier-Stokes equations and illustrative problems; applications in chemical engineering and polymer engineering, packed and fluidized beds, multiphase systems. Basic concepts in rheology; applications in polymer processing: extrusion, fiber spinning, injection molding. (Same as Chemical Engineering 541.)

542 Further Topics in Polymer Processing (3) Dynamic behavior and analysis of selected polymer processing operations. Prereq: 541.


544 Polymer Solution Thermodynamics and Characterization (3) Theories of solutions, statistical thermodynamics. Characterization, treatment of chromatography, viscosity, light scattering and osmotic pressure. Prereq: Undergraduate physical chemistry.

546 Mechanical Properties of Solid Polymers (3) Types of mechanical behavior: Hookean and rubber elasticity; plastic deformation; fracture; linear viscoelasticity; dynamic mechanical behavior and testing; loss tangent; experimental methods. Introduction to mechanical properties of polymeric composites.

549-50 Laboratory Methods in Polymer Engineering (1, 2) Experimental techniques and instrumentation associated with characterization, x-ray and light scattering, calorimetry, rheometry, mechanical properties of solid polymers, polymer polymer processing operations. Coreq: 543 or consent of instructor. 549-5/N-SC only.

561 Inorganic Glass Forming Systems (3) Physical and chemical nature of inorganic glasses; structural theories of glass formation; major glass forming systems: silica, other oxide glasses, nitrate glasses, water glasses, and chalco-aluminogel glasses. Prereq: 540; Chemistry 371.

571 Electron Microscopy (3) Operation of electron microscope; kinematical and dynamical diffraction theories; structure determination and analysis of lattice defects. Prereq: 405 or equivalent.

572 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to diffraction structures, powder and single crystal x-ray techniques; introduction to crystal structure determination; characterization of orientation; application to inorganic, metallic and polymer structures.

576 Special Topics in Materials Science and Engineering (3) Topics of current significance and interest. Prereq: Consent of instructor. May be repeated.


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

621-22 Theoretical Metallurgy (3,3) Topics in solid state physics as applied to metallurgy; introduction to quantum theory, specific heats, electron theory of solids, electrical and thermal conductivity, magnetic properties, theories of alloy formation. Prereq: Consent of instructor.

623 Solidification and Crystal Growth (3) Theories of solidification, crystal growth, flow effects, magneto-hydrodynamics of incompletely filled molds, solidification stability theory, thermodynamic applications, rapid solidification theory, metastability. Prereq: Consent of instructor.

625 Materials Lifetime Science and Engineering I (3) Fundamentals of aqueous and high-temperature corrosion and fatigue; methods of materials lifetime modeling. Prereq: 531 and 532, or consent of instructor.

626 Materials Lifetime Science and Engineering II (3) Interactions between corrosion and fatigue at ambient and high temperatures; lifetime modeling of materials simultaneously subjected to corrosion and fatigue. Prereq: 532.

627 Case Studies in Materials Lifetime Science and Engineering (3) Studies of, and participation in, industrial analyses of lifetimes of structural materials subjected to aqueous-corrosion/fatigue and high-temperature-oxidation/fatigue, performed as part of the student's industrial and/or laboratory internship programs. Prereq: 531 and 532, or consent of instructor.

628 Graduate Seminar in Material Lifetime Science and Engineering (3) Workshops by students, faculty, and visiting scholars on materials science and engineering; processes, mechanisms, and lifetime modeling. Prereq: 531 and 532, or consent of instructor.

641 Advanced Rheology and Viscoelastic Theory (3) Continuum mechanics, formulation of viscoelastic theories for describing deformation and flow of polymeric materials. Application to polymer processing problems. Recommended for MS candidates working in rheological areas. Prereq: 541.
642 Advanced Topics in Polymer Processing (3) Application of theories of morphological behavior and of structure development to analysis of polymer processing operations. Prereq: 541. (Same as Chemical Engineering 642.)

643 Phase Transformations in Polymers (3) Glass transition and gaseous states; annealing of polymeric glasses; crystallization of polymers; nucleation, growth and morphology; secondary nucleation theory; solidification of copolymers; crystallization under stress. Prereq: 543.

671 Quantitative Microscopy (3) Principal acoustic, optical, x-ray, neutron, electron and field-ion techniques for examination of microstructures of materials. Prereq: 405.

676 Advanced Topics in Materials Science and Engineering (3) Latest developments and/or advanced special topics. Prereq: Consent of instructor. May be repeated.

678 Seminar in Recent Advances in Materials Science and Engineering (3) Directed and independent study of advanced topics. Prereq: Consent of instructor. May be repeated.

Mathematics

(College of Arts and Sciences)

MAJOR DEGREES

Mathematics ......................... M.M., M.S., Ph.D.

John B. Conway, Head

Professors:

Alexiades, V., Ph.D. ...................... Delaware
Alikakos, N. (Emeritus), Ph.D.......... Brown
Anderson, D. F., Ph.D. ................... Chicago
Bradley, John S. (Emeritus), Ph.D. ... Iowa
Carruth, J. H. (Emeritus), Ph.D. ...... Louisiana State
Clark, C. E. (Emeritus), Ph.D. ...... Louisiana State
Conway, J. B., Ph.D. ..................... Wisconsin
Davenport, Robert J., Ph.D. .......... Wisconsin
Dobbs, D. E., Ph.D. ....................... Cornell
Dydk, J., Ph.D. .............................. Warsaw
Fandus, Henry (Emeritus), Ph.D. .... Illinois
Gross, L. J., Ph.D. .......................... Cornell
Hinton, D. B., Ph.D. ....................... Tennessee
Husch, L. S., Ph.D. ......................... Florida State
Johannson, K., Ph.D. ..................... Bielefeld
Jordan, G. Samuel, Ph.D. .............. Wisconsin
Karakashian, O., Ph.D. .................... Harvard
Kupersmidt, B. A. (UTSI), Ph.D. .... MIT
Lenhart, S., Ph.D. .......................... Kentucky
McConnel, R. M. (Emeritus), Ph.D. ... Duke
Mathews, H. T. (Emeritus), Ph.D. .. Tulane
Miller, D. D. (Emeritus), Ph.D. ........ Michigan
Mulay, S., Ph.D. ............................ Purdue
Rajput, B. S., Ph.D. ....................... Illinois
Reddy, K. C. (UTSI), Ph.D. ............ Indian IT
Richter, Stefan, Ph.D. .................... Michigan
Rosinski, J., Ph.D. .......................... Wroclaw
Schaefer, P. W., Ph.D. .................... Maryland
Serbin, Steve, Ph.D. ........................
Simpson, H., Ph.D. ........................... Cal Tech
Son, K. (Emeritus), Ph.D. ............... Oregon State
Son, R. P., Ph.D. ............................ Oregon State
Stallman, P. F. (Emeritus), Ph.D. ...... Georgia
Stephenson, K. R., Ph.D. .............. Wisconsin
Sundberg, C. Ph.D. ......................... Wisconsin
Thistlethwaite, M. B., Ph.D. ......... Manchester
Wade, W. R., Ph.D. ....................... California (Riverside)
Wagner, C. G., Ph.D. ..................... Duke

Associate Professors:

Collins, Charles R., Ph.D. .......... Minnesota
Feng, Xiaobing, Ph.D. ................. Purdue
Freire, A., Ph.D. ........................... Princeton
Gavrilets, Sergey, Ph.D. .............. Moscow State
Guan, Bo, Ph.D. ............................. Massachusetts
Kimble, K. R. (UTSI), Ph.D. .......... Ohio State
Kuo, Y., Ph.D. ............................... Cincinnati
Leblond, Ph.D. ............................. Maryland
Smith, J. Ph.D. ............................ California
Xiong, Jie, Ph.D. ............................. North Carolina

Assistant Professors:

Chen, Xia, Ph.D. ............................. Case Western
Davis, Reid, Ph.D. ......................... Tennessee
Dwyer, Jerry, Ph.D. ...................... Ireland
Kachi, Yasuuki, Ph.D. .................... Tokyo
Matthews, Gretchen, Ph.D. .......... Louisiana State
Schulze, Timothy, Ph.D. ............... Northwestern
Tzermias, Pavlos, Ph.D. .............. California

The Mathematics Department has three graduate degrees: (1) the Master of Mathematics degree, intended primarily for teachers, (2) the Master of Science degree, designed to prepare students for industrial employment and for teaching, and (3) the Doctor of Philosophy degree, designed to prepare students for industrial employment and for college and university teaching and research. Contact the department office for additional information.

A student offering mathematics as a minor for the master's degree is required to obtain at least 8 hours of resident graduate credit in courses numbered above 400 and approved by both the major department and the Department of Mathematics.

For additional information, please visit the graduate website on the Department of Mathematics' homepage at www.math.utk.edu.

THE MASTER OF MATHEMATICS PROGRAM

Before admission to the Master of Mathematics program, the applicant must have either (a) certification for teaching secondary mathematics in at least one state, or (b) three years of elementary school, secondary school, or community college teaching experience. Applicants must have successfully completed one year of calculus (141-42 or equivalent) and a course in matrix algebra (251 or equivalent).

The following requirements must be met:
1. Complete 30 hours of coursework of which 21 must be at the 500 level. The coursework must include 504, 505, 506, 507, and 6 hours in 508. At most, 6 hours may be taken out of the Department of Mathematics (selected in consultation with the advisor).
2. Pass a final examination upon completion of all coursework.

In exceptional circumstances, part of admission requirement (b) might be satisfied concurrently with coursework. Normally Master of Mathematics degree students will start the program by taking 504 during the summer.

THE MASTER OF SCIENCE PROGRAM

The department offers two options for the Master of Science degree. The first option requires a thesis for which 6 hours must be earned along with 24 additional hours of work in acceptable courses numbered above 400. Of the additional hours, 6 may be in an area outside the department and 15 must be in courses in mathematics numbered above 500.

After one semester of graduate study, a student whose advisory committee gives its approval may choose the non-thesis option, for which 30 hours in courses numbered above 400 are required. Of these, 21 hours (at least 15 of which must be in mathematics) must be in courses numbered above 500. Of the 30 hours, 9 in courses approved by the advisory committee may be taken in fields other than mathematics. For this option it is also required that a final examination be passed and that credit be received for a reading course (598) in which a term paper or project is required.

Concentration in Applied Mathematics

For this concentration, available under the thesis or the non-thesis option, the student must complete the following:

1. Prerequisite courses:
   d. Matrix Algebra II 453.

2. One hour of Seminar in Applied Mathematics 519 or Seminar in Mathematical Ecology 589.

3. One course from each of the following five areas:

THE DOCTORAL PROGRAM

For the Ph.D. program in Mathematics, the student must meet the following four requirements in addition to those of The Graduate School:

1. Satisfy either the standard program or the interdisciplinary mathematical ecology concentration. A student intending to work in mathematical ecology must either choose a minor or the minor in mathematical ecology and complete this minor, or he is encouraged to complete the interdisciplinary mathematical ecology concentration. A student may elect to switch from one to the other provided the constraints of the latter option have not been violated. A student's status after electing such transfer is determined by the complete history of the
401 Mathematics and Microcomputers (3) Primarily for students seeking certification as mathematics teachers at secondary level. Use of microcomputers to study concepts and problems. Does not satisfy the major requirements for a B.S. or M.S. in mathematics. Prereq: Calculus I.

404 Applied Vector Calculus (3) Topics from multivariable and vector calculus, line and surface integrals, divergence theorem and theorems of Gauss and Stokes. Prereq: Calculus III.

405 Models in Biology (3) Difference and differential equation models of biological systems. May not be counted toward graduate degree. Prereq: Calculus II or Biocalculus II.


412 Combinatorics (3) Introduction to problems of construction and enumeration for discrete structures: sequences, partitions, graphs, finite fields and geometries, or experimental designs. Prereq: Probability and Statistics or consent of instructor.

423 Probability I (3) Axiomatic probability, multivariate distributions, conditional probability and expectations, moments of generating/characteristic functions. Laws of large numbers and central limit theorem. Prereq: 300-level probability or consent of instructor.

424 Probability II (3) Elements of stochastic processes: Random walk, Markov chains and Poisson processes. Other topics as selected by instructor. Prereq: 423.

425 Statistics (3) Derivation of standard statistical distributions: F, t, and χ2; independence of sample mean and variance; basic limit theorems; point and interval estimation; Bayesian estimation; statistical hypothesis testing; Neyman-Pearson theorem; likelihood ratio and other parametric and non-parametric tests; sufficient statistics. Prereq: Probability I or consent of instructor.


443 Complex Variables I (3) Theory of functions of complex variable: residue theory and contour integrals. Prereq: Calculus III. Recommended prereq: 300- or 400-level mathematics course.

445-46 Advanced Calculus II (3,3) Theory of sequences, series, differentiation, and Riemann integration, and one or more variables. Prereq: Calculus III and Introduction to Abstract Mathematics, or consent of instructor.

447-48 Honors: Advanced Calculus II (3,3) Honors version of 445-46. Prereq: Calculus III and Introduction to Abstract Mathematics, or consent of instructor.

453 Matrix Algebra II (3) Matrix theory including Jordan canonical form. Prereq: Matrix Algebra I.

455-56 Abstract Algebra II (3,3) Algebraic structures: groups, rings, fields, vector spaces and linear transformations. Prereq: Matrix Algebra I and Introduction to Abstract Mathematics, or consent of instructor.

457-58 Honors: Abstract Algebra II (3,3) Honors version of 455-56. Prereq: Matrix Algebra I and Introduction to Abstract Mathematics, or consent of instructor.

460 Geometry (3) Axiomatic and historical development of neutral, Euclidean, and hyperbolic geometries stressing proof techniques and critical reasoning. Modern ideas of non-Euclidean geometrics. Prereq: Introduction to Abstract Mathematics, or consent of instructor.

461 Topology (3) Topology of line and plane, separation properties, compactness, connectedness, convergence and continuity of functions, homeomorphisms of curves and topological invariants. Prereq: Calculus III and Intro-
471 Numerical Analysis (3) Computation, instabilities, and rounding. Interpolation and approximation by polynomials and piecewise polynomials. Quadrature and numerical solutions of boundary value problems of ordinary differential equations, stiff systems. Prereq: Numerical Algorithms I or consent of instructor. (Same as Computer Science 471.)


475 Industrial Mathematics (3) Modeling, analysis, and computation applied to scientific/technical/industrial problems. Either Computer Literacy for Mathematics or Numerical Algorithms, or consent of instructor.

490 Readings in Mathematics (1-3) Open to superior students with consent of department head. Independent study with faculty guidance. Prereq: Consent of faculty mentor to supervise independent work. May be repeated. Maximum 9 hrs.

499 Seminar in Mathematics (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

500 Thesis (1-18) P/NP only. E

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

504 Discrete Mathematics for Teachers (3) Mathematical logic and methods of argument, sets, functions and relations, Combinatorics. Normally first required graduate course for students seeking M.S. degree. May be repeated. Students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus or equivalent.

505 Analysis for Teachers (3) Development of differential and integral calculus, proofs of basic theorems. For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus or equivalent.

506 Algebra for Teachers (3) Algebraic structures: integral domains, fields, polynomials, polynomial equations, algebra of integers and polynomials. For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus or equivalent.

509 Seminar for Teachers (3) For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus or equivalent.


515-16 Analytical Applied Mathematics (3,3) Analysis of advanced topics in modern context for applied problems: dimensional analysis and scaling, perturbation theory, variational approaches, transform theory, wave conservation, stability and bifurcation, distributions, integral equations. Prereq: 446 or 448, 453, and either 511-12 or both 431 and 435.

517-18 Mathematical Methods in Physics (3,3) (Same as Physics 571-72.)

519 Seminar in Applied Mathematics (1-3) May be repeated. Maximum 12 hrs.

521-22 Enumerative Combinatorics (3,3) Sieve methods, recursion, generating functions, and permutation groups applied to enumeration of discrete structures. Incidence algebras and combinatorics of partially ordered sets.

523-24 Probability (3,3) Pertinent facts from measure theory, definition of abstract probability spaces; Kolmogorov's existence theorem; series of independent random variables; weak convergence; central limit theorems; probability theory in Euclidean spaces; infinitely divisible distributions and central limit problem; general concept and properties of conditional expectation, martingales, Doob's martingale convergence theorems. Prereq: 445-46. Recommended prereq: 423.

525-26 Statistics (3,3) Pertinent facts from probability theory, formulation of classical statistical models; sufficiency, Fisher-Neyman factorization theorem, exponential families, Bayesian methods. Methods of estimation and optimality; uniform minimum variance unbiased estimation, asymptotic efficiency and optimality; the confidence procedure; hypothesis testing; optimal tests and confidence intervals, the Neyman-Pearson lemma, uniformly most powerful tests; general linear models, estimation and tests in linear models; non-parametric models, rank methods for comparison, linear regression and independence, robust tests; topics from decision theory. Prereq: 445-46. Recommended prereq: 425.

527 Stochastic Modeling (3) Models in probability applied to real world situations; queuing theory; branching processes; Monte Carlo simulation. Prereq: 445-46 or consent of instructor.


534 Calculus of Variations (3) Necessary conditions for extrema, Euler's equation, broken extremals. Weierstrass-Erdmann conditions. Sufficient conditions for extrema-Lebedev's and Jacobi's conditions, conjugate points, Multiple integrals. Prereq: 431 or 445-46.

535-36 Partial Differential Equations (3,3) First order equations, classification of equations and properties of elliptic, hyperbolic, and parabolic equations in several variables. Prereq: 445-46 and 231 or consent of instructor.

537-38 Mathematical Principles of Continuum Mechanics (3,3) Conservation principles, equations of equilibrium and motion for fluids and elastic solids, conservation theorems, convexity properties, bifurcation phenomena, existence theory. Prereq: 431, 435, 446 or 448, or consent of instructor.

539 Seminar in Differential Equations (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

541-42 Real Analysis (3,3) Measure theory, Lebesgue integration and the Lebesgue spaces, L^1 and L^2, continuity properties, bifurcation phenomena, existence theory. Prereq: 431, 435, 446 or 448, or consent of instructor.


549 Seminar In Analysis (1-3) May be repeated. Maximum 12 hrs.

551-52 Modern Algebra (3,3) Groups, rings, modules and linear algebra, fields and Galois theory. Must be taken in sequence. Prereq: 455-56 or consent of instructor.

553 Linear Programming (3) Theory and applications. Prereq: Consent of instructor or 453 and program ability.


555-56 Number Theory (3,3) Introduction to algebraic number theory. Prereq: 455-56 or consent of instructor.

559 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated.


567-68 Differential Geometry (3,3) Classical differential geometry in two and higher dimensions: curves and surfaces in Euclidean space, Gauss map, curvature, Gauss-Bonnet theorem, hyperbolic geometry, Manifolds and Riemannian metrics, connections, geodesics, Jacobi fields, sectional curvature. Differential forms and moving frames. Prereq: 445-46 or consent of instructor.

569 Seminar in Topology (1-3) May be repeated. Maximum 12 hrs.


577 Optimization (3) Major topics in optimization with applications to engineering and economics. Includes constrained and unconstrained optimization with analysis of major algorithms and utilization of commercial software. Prereq: Numerical Algorithms, 445, 446.

559 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

561-62 Modern Topology (3.3) Technical background to current literature in topology. Topics vary. May be repeated with consent of department. Maximum 12 hrs.

663-64 Algebraic Topology (3.3) Homology, cohomology and homotopy theories: duality theorems and Hurewicz isomorphism theorem. Prereq: 561-62 and 1 yr of abstract algebra. 455-56 or 551-52. May be repeated with consent of department. Maximum 12 hrs.

667-68 Advanced Differential Geometry (3.3) Selected topics from Riemannian geometry and analysis on manifolds: Lie groups, metric geometry, spectrum of Laplacian, Hodge Theory, variational problems, curvature and topology of manifolds. Prereq: 567-68 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

669 Seminar in Topology (3) May be repeated with consent of department. Maximum 12 hrs.


679 Seminar in Numerical Mathematics (1-3) May be repeated with consent of department. Maximum 12 hrs.

681-82 Advanced Mathematical Ecology (3,3) Selected topics in theoretical and applied mathematical ecology; population, community, ecosystem ecology, and applied topics such as demography, ecotoxicology, epidemiology, environmental change, and resource management. Prereq: 581-82. May be repeated (Same as Ecology and Evolutionary Biology 681-682).

Mechanical and Aerospace Engineering and Engineering Science

(College of Engineering)

MAJOR

Aerospace Engineering .................. M.S., Ph.D.
Engineering Science ................... M.S., Ph.D.
Mechanical Engineering ................. M.S., Ph.D.

T. E. Shannon, Interim Head

Professors:

Antar, B. (UTSI), Ph.D. ................. Texas
Armillirli, R. V., Ph.D. ................. VPI
Baker, A. J., Ph.D. ...................... New York
Carley, T. G. (Emeritus), Ph.D. ........... Illinois
Carruthers, J. E. (UTSI), Ph.D. ............ Georgia Tech
Collins, F. G. (UTSI), Ph.D., D.D. ............ California
Crawford, R. A. (Emeritus) (UTSI), Ph.D., D.D. 

Hodgson, J. W. (Emeritus), PE, Ph.D. ............. Georgia Tech
Jendrucko, R. J., PE, Ph.D. ............ Virginia
Johnson, W. S., Ph.D. ................. Clemson
Keefe, D. R. (UTSI), Ph.D., D.D. ........... Florida
Keyhani, M., Ph.D. ..................... Ohio State
Kim, K. H. (Emeritus), Ph.D. .............. NC State
Kramer, R. J., Ph.D. ..................... Oklahoma
Landes, J. D., Ph.D. ..................... Lehigh
Lee, C. W. (Emeritus), Ph.D. ............... Illinois
Liston, H., Jr., M.E.A. .................. George Washington
Lo, C. F. (UTSI), Ph.D. .................. Cornell
McKay, M. H. (UTSI), PE, Ph.D. ............. Florida
McKay, T. D. (UTSI), PE, Ph.D. ............. Auburn
Maxwell, R. L. (Emeritus), PE, M.S. ............ Case Western
Merkle, C. L., Ph.D. ..................... Princeton
Milligan, M. W., PE, Ph.D. .............. Tennessee
Parang, M., Ph.D. ....................... Oklahoma
Parsons, J. R., PE, Ph.D. .................. NC State
Peters, C. E. (Emeritus) (UTSI), D.A.S. ........... Brussels
Pitl, H. (Emeritus), PE, Ph.D. ............. Illinois
Pitts, D. R. (Emeritus) (UTSI), Ph.D. .......... Georgia Tech
Remenyik, C. J., (Emeritus) ............... Johns Hopkins
Schultz, R. J. (UTSI), Ph.D. ............... Tennessee
Seth, W. E. (Emeritus), Ph.D. ............. Johns Hopkins
Shahroki, F. U. (UTSI), Ph.D. ............. Oklahoma
Shannon, T. E., PE, Ph.D. ................. Tennessee
Shobe, L. R. (Emeritus), PE, M.S. .......... Kansas State
Smith, G. V., PE, Ph.D. ................. Penn State
Snyder, W. T., Ph.D. ..................... Northwestern
Soliman, O., PE, Ph.D. ................. Tennessee
Speckhart, F. H. (IBM Prof.), PE ............. Georgia Tech
Stair, W. K. (Emeritus), M.S. .............. Tennessee
Steinhoff, J. S. (UTSI), Ph.D. .......... Chicago
Stoneking, J. E., PE, Ph.D. .............. Illinois
Valioli, A. D. (UTSI), Ph.D. .............. Tennessee
Venkataseswaran, S. (UTSI), Ph.D. ........... Penn State
Waterman, J., PE, Ph.D. ............... Cincinnati
Weitsman, Y. J. (Distinguished Prof.), Ph.D. ............ Rensselaer
Wilkinson, H. J. (Emeritus), PE, Ph.D. .......... Tennessee
Wilson, C. C. (Emeritus), Ph.D. ........... Purdue
Wu, J. M. (Emeritus) (UTSI), Ph.D. .......... Cal Tech
Wu, J. Z. (UTSI), Ph.D. ................. Beijing Institute
Wu, Y. C. (Emeritus) (UTSI), PE, Ph.D. .......... Cal Tech
Young, R. L. (Emeritus) (UTSI), PE, Ph.D. ............ Northwestern

Associate Professors:

Boulet, J. A., M., Ph.D. ............. Stanford
Freeman, J. S., Ph.D. ................. Wisconsin
Hamal, W. R., Ph.D. .................... Tennessee
Hopkins, J. A. (UTSI), Ph.D. .......... Pennsylvania
Jennett, G. S., Ph.D. .................... Tennessee
Kasra, M., Ph.D. ....................... Oklahoma
Kees, M. W. (Emeritus), Ph.D. ........ Certificate
Kawasaki, G. H., Ph.D. .................. West Virginia
Lye, J. E., M.D., Ph.D. ............... Pennsylvania
Mathukar, M. S., Ph.D. ................. Drexel
Mouollen, T. H. (UTSI), Ph.D. ........... Tennessee
Nguyen, K. Ph., Ph.D. .............. Colorado
Ponke, C., Ph.D. ...................... Gal Tech
Yu, N., Ph.D. ....................... California (San Diego)

Assistant Professors:

Kress, R. L., PE, Ph.D. ............... Arizona
Zheng, M., Ph.D. ...................... Calgary (Canada)

Derivation, physical meaning, and implementation of schemes. Prereq: 435 or 512 or 515, Fortran or C, or consent of instructor.

579 Seminar in Numerical Mathematics (1-3) May be repeated. Maximum 12 hrs.

581-82 Mathematical Ecology (3,3) Deterministic and stochastic models of populations, communities, and ecosystems. Prereq: 431, 453 or consent of instructor. (Same as Ecology and Evolutionary Biology 581-582.)

583 Mathematical Evolutionary Theory (3) Population genetics and evolutionary ecology. Prereq: 431, 453 or consent of instructor. (Same as Ecology and Evolutionary Biology 585.)

585 Optimal Control Theory (3) Deterministic optimal control. Examples involving calculus of variations, optimal trajectory, and engineering control problems. Introduction to stochastic control. Prereq: 431, 445-46 or consent of instructor.

589 Seminar in Mathematical Ecology (1-3) May be repeated. Maximum 12 hrs.

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

598 Graduate Reading in Mathematics (1-3) Independent study with faculty guidance. Prereq: Graduate standing and consent of instructor. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) Ph.D. only. E.


619 Seminar in Applied Mathematics (1-3) May be repeated. Maximum 12 hrs.

623-24 Advanced Probability (3,3) Selected topics in modern theory of probability and stochastic processes: i.i.d. calculus and stochastic differential equations, integration and martingale theory, ergodic theory, probability on algebraic structures, limit theorems, geometry and probability in Banach spaces, probability methods in analysis. Prereq: 523-24 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

629 Seminar in Combinatorics (1-3) May be repeated with consent of department. Maximum 12 hrs.

631-32 Advanced Ordinary Differential Equations (3,3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature. Subject matter varies according to interests and preparations of students. Prereq: 531-32 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

635-36 Advanced Partial Differential Equations (3,3) Selected topics in modern and theoretical partial differential equations. Prereq: 541-42 or 547-48 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


643-44 Harmonic Analysis (3,3) Fourier series and Fourier transforms in Euclidean spaces or topological groups: convergence, summability, uniqueness, inversion, duality, Plancherel transform, Hilbert transform, Hardy-Littlewood maximal function, interpolation of operators, or Fefferman-Stein duality. Prereq: 541-42 and 543. May be repeated with consent of department. Maximum 12 hrs.

649 Seminar in Analysis (1-3) May be repeated with consent of department. Maximum 12 hrs.

651-52 Advanced Modern Algebra (3,3) Selected topics in modern algebra or number theory. Prereq: 551-52 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.
Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy are available in Mechanical Engineering, Aerospace Engineering, and Engineering Science. Changing from one of these programs to another requires departmental approval. Each applicant is advised as to any prerequisite courses before entering a program. A M.S.-MBA degree program with a concentration in product development and manufacturing is also available with a major in Mechanical Engineering or in Engineering Science.

In Mechanical Engineering, program concentrations include dynamics, control, and robotics; energy conversion and utilization; gas dynamics; heat transfer and fluid mechanics; machine design; power generation; product development and manufacturing (MS only); propulsion; space engineering; stress analysis; and thermodynamics.

In Aerospace Engineering, program concentrations include aeroacoustics; aerodynamics and performance; energy conversion and utilization; flight and aerospace mechanics; gas dynamics; heat transfer and fluid mechanics; propulsion; space engineering; structures and stress analysis; and thermodynamics.

In Engineering Science, program concentrations include applied artificial intelligence, biomedical engineering, computational mechanics, fluid mechanics, mechanics of composite materials, solid mechanics, industrial engineering (Ph.D. only), product development and manufacturing (MS only), optical engineering (UTSI only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. 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 program'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 biomechanics.

In Mechanical Engineering or Aerospace Engineering, entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. A program application is required in addition to the Graduate School application. Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds. The general GRE is required of all international applicants for admission.

In Engineering Science, entrance into the graduate program is available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. A program application is required in addition to the Graduate School application. The names and addresses of four references must be included with the program application. The general GRE is required of all international applicants for admission.

Each student must satisfactorily complete a program of study that has been approved by his/her advisory committee and complies with the requirements of the Graduate School. In Engineering Science, the student's major professor may be selected from a department other than the Department of Mechanical and Aerospace Engineering and Engineering Science; however, at least one member of the student's graduate advisory committee must be on the faculty of the Department of Mechanical and Aerospace Engineering and Engineering Science.

THE MASTER'S PROGRAM

In Mechanical Engineering, Aerospace Engineering, and Engineering Science, two M.S. options are offered. Option I requires a thesis and is the normal program for graduate students. Option II does not require a thesis and provides graduate students, including co-op and other off-campus students, the opportunity to focus their programs in special areas through extended coursework.

Credit requirements for these two options in Mechanical Engineering and Aerospace Engineering are:

<table>
<thead>
<tr>
<th>Course Areas</th>
<th>Hours Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coursework</td>
<td>24-30</td>
</tr>
<tr>
<td>Thesis credit</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>30-30</td>
</tr>
</tbody>
</table>

Credit requirements for these two options in Engineering Science are:

<table>
<thead>
<tr>
<th>Course Areas</th>
<th>Hours Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coursework</td>
<td>24-30</td>
</tr>
<tr>
<td>Engineering courses (Major concentration may include but is not restricted to course offered by the Department.)</td>
<td>12-15</td>
</tr>
<tr>
<td>Mathematics (400 level or above)</td>
<td>6-9</td>
</tr>
<tr>
<td>590 Selected Engineering Problems (max.)</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>30-30</td>
</tr>
</tbody>
</table>

For all program options, other 500 level engineering courses that are approved by the student's major's committee and the graduate programs committee may be substituted for the mathematics courses. All program options require participation in the departmental graduate seminars program, and passing a final examination on all work submitted for the degree. The final examinations in Option II will cover all coursework. The thesis option, Option I, requires submission and defense of a written thesis that demonstrates the ability to conduct and report an independent investigation.

DUAL M.S.-MBA PROGRAM

The College of Business Administration and the College of Engineering offer an integrated program leading to the conferral of the Master of Business Administration degree with a major in Business Administration (concentration in operations management) and the Master of Science degree with a major in Engineering Science or Mechanical Engineering (concentration in product development and manufacturing).

The Engineering Science program is intended to provide other engineering majors an opportunity to participate in this program with a flexible coursework plan based on their undergraduate degree.

The establishment of the dual program addresses the critical need for personnel trained in both engineering and management who can integrate an increasingly complex body of knowledge for rapid introduction of new products to the marketplace. The objective of the dual degree program is to prepare graduates to take a leading management role in companies that must react quickly to a dynamic market where forces of competition require rapid changes in design and manufacturing and a short product development cycle.

Admission Requirements

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

Students will initially apply for the MBA program, indicating on their application the intent to pursue the dual M.S.-MBA program and the appropriate engineering major (refer to the MBA program for specific instructions). Students accepted for both the MBA and the M.S. with a major in Engineering Science or Mechanical Engineering programs will be assigned to Dual Program Committee advisors, who will be responsible for course approval and supervision of the students' progress through the dual program.

Applications by U.S. citizens and permanent residents received after the MBA application deadline (March 1) will be considered as space allows. Additional information is required and different application dates are established by The Graduate School for international students.

Curriculum

All engineering students enrolled in the program must complete common coursework designed to provide them with an integrated, multidisciplinary teamwork experience. The MBA curriculum in product development and manufacturing consists of 33 hours of common coursework in the College of Business Administration and 15 hours of common coursework in the College of Engineering. Engineering common coursework includes a culminating 3-hour Integrated...
project course requiring a comprehensive report, and a final examination as required by the Dual Program Committee, to be taken during the first session of summer following the second year.

During the second year dual degree candidates will take courses in their engineering major. The coursework for each option is designed to provide students with a concentration in their major and advanced skills to accomplish their team work assignments.

Curriculum for Dual M.S.-MBA Degree – Major in Mechanical Engineering

August - First Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA 511 MBA Core I</td>
<td>3</td>
</tr>
<tr>
<td>Fall - First Year</td>
<td></td>
</tr>
<tr>
<td>BA 512 MBA Core II</td>
<td>15</td>
</tr>
<tr>
<td>ME 504 Product Development Process</td>
<td>1</td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>BA 513 MBA Core III</td>
<td>9</td>
</tr>
<tr>
<td>ME 506 Product Selection and Evaluation</td>
<td>2</td>
</tr>
<tr>
<td>ME 508 Integrated Product, Process, and Manufacturing System Design</td>
<td>3</td>
</tr>
<tr>
<td>Summer</td>
<td></td>
</tr>
<tr>
<td>Internship</td>
<td></td>
</tr>
<tr>
<td>BA 514 Integrated Business Simulation</td>
<td>3</td>
</tr>
<tr>
<td>ME 509 Project Management</td>
<td>1</td>
</tr>
<tr>
<td>Fall - Second Year</td>
<td></td>
</tr>
<tr>
<td>IE 511 Business Planning and Commercialization</td>
<td>3</td>
</tr>
<tr>
<td>ME 509 Project Management</td>
<td>1</td>
</tr>
<tr>
<td>– Engineering courses</td>
<td>9</td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>MBA “hub” course elective</td>
<td>3</td>
</tr>
<tr>
<td>ME 509 Project Management</td>
<td>1</td>
</tr>
<tr>
<td>– Engineering courses</td>
<td>9</td>
</tr>
<tr>
<td>Summer (first session)</td>
<td></td>
</tr>
<tr>
<td>ME 594 Culminating Integrated Project Report</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>66</td>
</tr>
</tbody>
</table>

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

Approval Dual Credit
A maximum of 15 semester hours of the common program courses completed in the College of Engineering may be counted toward the MBA degree program.

THE DOCTORAL PROGRAM

All students must complete 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.

In Mechanical Engineering or Aerospace Engineering, the courses must include:
1. A minimum of 12 semester hours of graduate credit in mathematics in courses numbered 400 or above with a minimum of 6 semester hours numbered 500 or above.
2. A minimum of 24 semester hours in the department in courses numbered 500 and above, with at least 12 of these semester hours in the major. A minimum of 9 semester hours of courses is required at the 600 level. These are exclusive of thesis, problems, or dissertation credit. The student’s advisor committee can approve a student’s petition to replace one 600-level course with one or more 500-level courses(s) that are more appropriate.

Aerospace Engineering

A minimum of 12 semester hours in mathematics or computer science in courses numbered 400 and above, exclusive of a first course in ordinary differential equations. Additional requirements for all students include:
1. Registration and participation in the graduate seminar in the major program.
2. Meet all departmental examination requirements, which include passing a written and oral comprehensive examination.
3. Presentation of a dissertation proposal to the student’s advisor committee and approval of that proposal by that 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 UT on an in-state tuition basis.

The M.S. program in Aerospace Engineering is available to residents of the states of Kentucky or South Carolina. The Ph.D. program in Aerospace Engineering is available to residents of the states of Arkansas or Kentucky. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Student Services.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

Students majoring in Mechanical Engineering or Aerospace Engineering may not normally use more than one 400-level engineering course to meet their advanced degree requirements. For students majoring in Engineering Science, 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 minimum required credit hours in a master's degree program must be at or above the 500 level. With the approval of the student’s major department, a student whose major is outside the College of Engineering may or Aerospace Engineering may take senior (400-level) courses in the Department for graduate credit. Such students should consult with instructors regarding prerequisites for undergraduate courses.

GRADUATE COURSES

422 Aerodynamics (3) Theory and design of aerodynamic devices for desired characteristics. Potential flow theory, viscous effects, compressibility effects. Supersonic, transonic, and supersonic flight. Prerequisite: 351 Compressible Flow, 370 Airplane Performance. F

424 Astronautics (3) Orbital mechanics, propulsion, atmospheric reentry of space vehicles, reentry thermal protection materials, human factors in space flight, space environment and current topics. Prerequisite: 351 Compressible Flow, Coreq: Mechanical Engineering 344 Heat Transfer. F

425 Propulsion (3) Principles of propulsion devices; turbo-jet, ram jet and rocket engines. Prerequisite: 351. F