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, electronics, communication theory, electromagnetic theory, plasma engineering, power systems, solid-state electronics, power electronics, and control systems. Applications are required to submit scores on the TOEFL and IELTS, and a letter of recommendation from a faculty member who can attest to the student's potential for graduate study. Specific departmental requirements for the Ph.D. degree 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 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 of study.
   c. A minimum of 6 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 2 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 doctoral degree program. The student who fails the qualifying examination must take and pass the examination the next time it is offered 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.

A comprehensive examination is required by the Graduate Council. 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 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, and access to current technical 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.
5. 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 towards a student's major in Electrical Engineering except when required by the program.


421 Electric Energy Systems (3) Structure and operation of electrical energy grid; load flow; economic loading; planning; control; reliability. Balanced and unbalanced faults; system protection; system stability. Level 1 design projects. Prereq: 316 Signals and Systems II, 325 Electric Energy System Components.


432 Electronic Amplifiers (4) Feedback amplifier principles; wideband linear amplifier design; low-noise preamplifier design; radio power amplifier design; linear regulated power supply design and switching regulator principles. Radio frequency amplifier design; oscillators. Laboratory experiments on design projects. Level 2 design projects which require laboratory work. Prereq: 316 Signals and Systems II, 342 Electronic Circuits.

441 Digital Communication (3) Quantization and pulse code modulation. Binary and M-ary signaling, spectrum of line pulses, budget analysis, error-free communication in presence of noise, matched filtering and equalization, bandpass digital transmission, introduction to multiple access techniques. Level 1 design projects. Prereq: 342 Communications.

442 Communication System Design (4) Application of communication theory to system design. Development of communication system specifications. System simulation utilizing graphical programming language. Hardware and software design and simulation. Construction and performance evaluation of complete analog or digital transmitter and receiver or significant subsystems. Level 2 design projects. Prereq: 441.

443 Antennas and Propagation (3) Introduction to antenna theory: fundamental antenna concepts and parameters (directivity, gain, patterns, etc.) and signal propagation. Theory of diffraction and scatter by wire and loop antennas, and other simple antennas. Level 1 design projects. Prereq: 316 Signals and Systems II, 341 Fields, 342 Communications.

446 Electromagnetic Compatibility (3) Principles and practices to avoid interference among and within electrical devices. Parameters and coupling for dipole, bi-conical, and log-periodic antennas. High frequency effects in circuit elements. Radiated and conducted emissions and susceptibility. Crosstalk, shielding, electrostatic discharge, and EMC regulations. Level 1 design projects that require laboratory work. Prereq: 316 Signals and Systems II, 341 Fields, 342 Communications.

451 Computer Systems Architecture (3) Architecture and design of microcomputer systems with microprocessors or microcontrollers and software to support these architectures. Levels I and II. Level I covers instruction set architecture, software interfaces, processor structures, memory hierarchy, interfacing. Level I design projects that require laboratory work. Prereq: 355 Computing System Fundamentals.

452 Design of Digital Systems and Computers (4) Considerations for design and application of digital systems and computers: embedded systems concepts and design, CPU issues, interrupt structures, and I/O channels. Level 3 projects that require laboratory work. Prereq: 206 Electrical Engineering Computations.

471 Introduction to Pattern Recognition (3) Statistical decision theory, adaptive classifiers, and supervised and unsupervised learning. Application of techniques in areas of current interest: face recognition, speech processing, remote sensing, data mining and bioinformatics. Level 1 design projects. Prereq: 316 Signals and Systems II, non-majors require consent of instructor.

472 Introduction to Digital Image Processing (4) Mathematical foundations and practical techniques for computer enhancement and manipulation, enhancement techniques, image enhancement, treatment, restoration, compression, segmentation, and color image processing. Level 2 design projects. Prereq: 316 Signals and Systems II, non-majors require consent of instructor.

481 Power Electronics (3) Principles and characteristics of power semiconductor devices, single-phase and polyphase phase controlled converters, converter control, solid state circuit design, Level 1 design projects and laboratory work. Prereq: 316 Signals and Systems II, 325 Electric Energy System Components, 332 Electronic Circuits.

482 Power Electronics Circuits (4) voltage-fed inverters, PWM principles, control of inverters, dc-dc converters, dc-machine drives, resonance converters, step motor drives, brushless dc machine principles. Level 2 design projects which require laboratory work. Prereq: 481.

491 Special Topics (3) Basic design and current practice. May not be repeated to satisfy senior requirements for graduation. Prereq: Completion of all junior Electrical and Computer Engineering courses or consent of instructor. Level 1-2 design projects that may require laboratory work.

495 Senior Seminar (1) Current topics. Prereq: Completion of all junior Electrical and Computer Engineering courses or consent of instructor. S/N/C or letter grade.

500 Thesis (1-15) P/NP only.
501 Project in Lieu of Thesis (3) Capstone course taken under supervision of student’s major professor and master’s committee. Individual project involving literature surveys, development of some software or hardware, testing, writing a white paper or journal paper, or other suitable project. Prereq: Consent of graduate committee. May be repeated. Maximum 6 hrs.

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


504 Random Process Theory for Engineers (3) Probability and random variables as approached by set theory. Statistical averages and transformations of random variables. Random processes, stationarity, correlation functions, and temporal analysis. Power spectrum and spectral analysis as applied to response of systems to random signals.

505 Digital Signal Processing I (3) Discrete-time signals and systems, sampling, fast Fourier transform (FFT) and fast convolution, design of FIR filters and IIR filters.

506 Digital Signal Processing II (3) Filter properties in the Z and Fourier transform domains, structures for digital filters, sampling and reconstruction, hardware implementation of digital filters.

507 Application of Linear Algebra in Engineering Systems (3) (Same as Chemical Engineering 507, Materials Science and Engineering 507, and Mechanical Engineering 507.)

511 Linear Systems Theory I (3) State space models of linear dynamic systems, linear algebra, state transition map, matrix exponential, controllability, observability, realization theory, and stability theory. Coreq: 507.

512 Multivariable Linear Control System Design (3) Design of controllers, for multivariable systems, which satisfy constraints on robustness to plant uncertainties, disturbance rejection, command following. Prereq: 511.


519 Control Systems Design II (3) Digital control, variable structure control, state-space design of SISO systems, use of estimators and observers, comparison of classical and state-space methods of control system design, considerations for control system instrumentation. Prereq: 518.

521 Power Systems Analysis I (3) Matrix-vector representations of power networks, sequence modeling of power system components, unbalanced shunt and series faults. Formulating and solving problems in matrix-vector form with application to large scale power systems. Prereq: 421 or equivalent.

522 Power Systems Analysis II (3) Operation and control of interconnected power systems, transient stability and protective relaying, economic dispatch and stochastic problems in matrix-vector form with application to large scale power systems. Prereq: 521.

523 Power Electronics and Drives (3) Forced commutated inverters, advanced PWM techniques, current-fed inverters, motor control, system modeling, vector and scalar control of induction machines, parameter variations, control principles of synchronous machines.


531 Advanced Analog Electronics I (3) Physical operation of modern electronic devices; semiconduc tor devices: diodes, bipolar transistors, J-FETs, and MOS-FETs. Small-signal equivalent circuits and noise models of active devices and feedback amplifier. Laboratory. Prereq: 431, 432, or consent of instructor.


541 Electromagnetic Fields (3) Maxwell’s equations, special relativity, wave reflection and transmission, generalized media, guided waves, radiation from current elements. Prereq: Mathematics 404.


545 Introductory Microwave Networks and Components (3) Scattering and transfer representation for microwave systems; unilateral, bilateral microwave, and millimeter wave devices. Component and system parameter measurement by modern network analyzers. Electronic oscillators and amplifiers, frequency sweep oscillators, transit time devices, parametric devices, mixers, switches.


551 Plasma Diagnostics I (3) Principles of active, passive, perturbing and nonperturbing diagnostic measurement techniques: low and high temperature plasmas, and high temperature plasmas of interest in fusion research. Laboratory safety, data reduction and presentation, microprocessor based data handling and analysis, and reduction of time series data. Prereq: 461, 463, or consent of instructor.

562 Diagnostics II (3) Laboratory instruction in operation of plasma diagnostic instruments in plasma science laboratory, experience with high voltage, vacuum, RF, and digital data handling techniques. Prereq: 561.

566 Industrial Plasma Engineering I (3) Low temperature plasma physics relevant to industrial applications: kinetic theory, particle dynamics in electric and magnetic fields, gaseous discharges, and electron, ion, and plasma sources. Prereq: Graduate standing or consent of instructor.

566 Industrial Plasma Engineering II (3) Continuation of 566. Theoretical and experimental work in applied plasma science, plasma deposition and etching, space propulsion systems, plasma chemistry, plasma lighting devices, insulating theory, particle dynamics in electric and magnetic fields, gaseous discharges, and related topics. Prereq: 565 or consent of instructor.

571 Pattern Recognition (3) Decision-theoretic and structural approaches to pattern recognition. Deterministic and stochastic models for feature extraction and representation, syntactic and semantic methods. Prereq: 471 or consent of instructor.


573 3D Methods in Robot Sensing, Vision and Visualization (3) Tools used in image synthesis and analysis; 3D rendering by nonlinear estimation. Projective geometry, and analytic kinematics; range sensing, lighting models, differential geometry, and 3D rendering.

574 Advanced Computer Vision (3) Principles and methods for analysis of time and space varying images. Imagining physics and color theory, shape-from-X, feature correspondence and tracking, stereo Vision, structure from motion, optical flow, motionbased segmentation, and selected topics from current literature. Prereq: 575 or consent of instructor.


588 Graduate Seminar (1) Topics of interest discussed in weekly seminar. May be repeated. Maximum 6 hrs. S/NC or letter grade.

599 Special Topics (1-3) May be repeated. Maximum 9 hrs.

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

614 Optimal Control (3) Deterministic and stochastic dynamic programming in continuous and discrete time, minimum principle and matrix minimum principle, computational methods in optimal control. Prereq: 611.

617 Special Topics in Systems Theory I (3) Topics of current interest to students and faculty; large scale systems, model order reduction, algebraic and geometric systems, stability, robustness, and advanced methods. Prereq: 503 and consent of instructor.

618 Special Topics in Systems Theory II (3) Topics of current interest to students and faculty; large scale systems, model order reduction, algebraic and geometric system theories, and advanced design methods. Prereq: 617.

623 Advanced Power Electronics and Drives (3) Phase-controlled cycloconverters, cycloconverter-fed ac drives, used in synchronous machines, vector and scalar control of synchronous machines, static Kramer drives, static Scherbius drives, VSCF generation, modern control theory in ac drives.

624 Electrical Insulation (3) Principles, testing, and case studies. Basic principles of aging, losses, charging, conduction, and breakdown in vacuum, gas, liquid, solid, and composite insulation systems. Testing with various instruments and techniques, breakdown and flashover analysis, dielectrics, optics, acoustics, and bridges; associated statistics and distributed parameter effects. Case studies drawn from active research, power systems, electronic circuits, and devices, and static and dynamic grading. Prereq: 503, 504, and consent of instructor.

631 Advanced Topics in Electronic Instrumentation I (3) Based on particular interests of students. Fundamental physical processes in instrumentation technology: thermoelectric, electronic, magnetic, and mechanical and quantum-mechanical devices. Prereq: 531-32 and consent of instructor.

643 Detection and Estimation Theory (3) Detection theory; coding theory; system identification. Signals with unknown parameters; optimal filter synthesis; adaptive systems; sequential detection; suboptimal detection. Prereq: 504 or consent of instructor.

644 Coding and Information Theory (3) Structure of algebraic and probabilistic codes; linear codes, convolutional codes, error-correcting codes, decoding methods; identification schemes: deterministic, stochastic, and hierarchical methods. Prereq: 643.

651 Computer-Aided Design of VLSI Systems I (3) Fabrication of microelectronic devices; computer-architecture design; algorithmic state machines; partitioning; structured design methodology. Prereq: 551-2 or consent of instructor.

652 Computer-Aided Design of VLSI Systems II (3) Computer-aided design tools; design and implementation of fully custom very large scale integrated (VLSI) circuits; design for testability; testing of fabricated chips. Prereq: 651.

663 Advanced Plasma Physics I (3) Basic concepts of high temperature plasma physics. Magnetohydrodynamics and kinetic description of plasma, plasma transport, plasma waves, equilibrium, and stability. Prereq: Physics 541-2, 461-2 or 563-4, or consent of instructor.

671 Image Processing and Robotics I (3) Three-dimensional scene modeling and recognition, multi-sensor systems. Prereq: 572 or 573 or consent of instructor.

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

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

691 Advanced Graduate Seminar (1) May be repeated. Maximum 9 hrs.

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. The Department also offers a creative writing dissertation option in the doctoral program. Detailed information about the master's and doctoral programs, and about individual graduate courses, may be obtained by writing to the department to receive the proper information and forms with which to apply. For additional information, please visit the graduate web site through the College of Arts and Sciences 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 (Only 3 hours of 593 Independent Study may be applied toward the M.A.); and 6 hours for graduate credit at any level, including the 400 level. In this coursework, students must maintain at least a 3.0 GPA.

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

Non-Thesis Option: Six hours of 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 public presentation of a paper at a professional meeting or departmental colloquium. All capstone experiences normally occur after the completion of 24 hours of coursework and must be approved by the Director of Graduate Studies.

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

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

WRITING CONCENTRATION

The master's program with writing concentration is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry.
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 54 semester hours beyond the B.A. (of which at least 24 semester hours beyond the M.A.) to include at least 21 semester hours at the 600 level; at least 15 semester hours at the 500 level or above (only 3 hours of 593 Independent Study may be applied toward the M.A. and 3 after the M.A.); a 3-hour course in teaching methods and 15 additional hours at any level approved for graduate credit (including a maximum of 12 hours at the 400 level if approved by the Director of Graduate Studies).

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

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

Language Requirement: A language requirement 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 language 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 by UT and completion of two courses in the foreign language at the 400 level or above, at least one course to be at the 500 or 600 level. A minimum grade of B must be received in each course.

3. One modern language approved by the Director of Graduate Studies in English and intensive study of the English language. This requirement must be fulfilled by completion of (a), (b), or (c) in option 1, for one foreign language; and completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509 History of the English Language (offered in alternate years; not required). 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 comprehensive examination.

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

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

GRADUATE COURSES

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

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

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

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

405 Shakespeare II: Later Plays (3) Shakespeare’s dramatic achievement between 1601 and 1613. Reading and discussion of selected plays from great tragedies, including Othello; problem plays, including Measure for Measure; and dramatic romances, including The Tempest.

406 Renaissance Drama (3) English theatre between 1589 and 1640 through reading of representative plays by Shakespeare’s contemporaries: Marlowe, Webster, Jonson.

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

410 Milton, Donne and their Contemporaries (3) Principal achievements in poetry and prose of first two-thirds of seventeenth century: poetry of Milton, Donne, Marvell; and prose of Browne, Bacon, Walton.

411 Literature of Restoration and Early Eighteenth Century: Dryden to Pope (3) Survey of English literature and culture from 1660 to 1745.

412 Literature of Later Eighteenth Century: Johnson to Burns (3) Survey of English literature and culture from 1745 to 1800.

413 Restoration and Eighteenth-Century Genres and Modes (3) A major genre or literary mode: drama, novel, poetry, non-fiction prose, satire, romance, or epic, written between 1660 and 1800. May be repeated.

414 Romantic Poetry and Prose I (3) Wordsworth, Coleridge, and Blake; readings from Lamb, De Quincey, and other prose writers.

415 Romantic Poetry and Prose II (3) Keats, Shelley and Byron; readings from Hazlitt, Peacock, and other prose writers.

416 Early Victorian Literature (3) May include poetry by Tennyson and the Browning; prose by Carlyle, Newman, and Mill.

419 Later Victorian Literature (3) May include poetry by the Pre-Raphaelites, Arnold, Hopkins, and Hardy; prose by Arnold, Ruskin, and Carroll; plays by Gilbert and Wilde.

420 The Nineteenth-Century British Novel (3) Scott to Hardy.

421 Modern British Novel (3) Works from authors such as Joyce and Woolf through contemporary British fiction writers.

422 Women Writers in Britain (3) Literary consciousness and works of women writers in Britain. Topics vary: Marie de France, Margery Kempe, Aemilia Lanyer, Elizabeth Cary, Aphae Behn, Frances Burney, Mary Wollstonecraft, Mary Shelley, George Eliot, Virginia Woolf, and Doris Lessing. May be repeated. Maximum 6 hrs. (Same as Women’s Studies 422.)

431 Early American Literature (3) From earliest texts to 1830: exploration and discovery, Native American, colonial, revolutionary, and early national works.

432 American Romanticism and Transcendentalism (3) Prose and poetry of American Renaissance, from c. 1830 to end of the Civil War: Cooper, Poe, Hawthorne, Melville, Emerson, Thoreau, Stowe, Douglass, Whitman, and Dickinson.

433 American Realism and Naturalism (3) Literature from time of the Civil War to World War I: Twain, Howells, James, Jewett, Freeman, Crane, and Norris.

434 Modern American Literature (3) World War I to present.

435 American Novel before 1900 (3) From earliest sustained novels through Brown and Cooper, and major figures to 1900: Hawthorne, Melville, Stowe, Clemens, and James.


441 Southern Literature (3) Southern writing from colonial period into twentieth century: frontier humorists, local color writers, and Southern literary renaissance.

442 American Humor (3) Early nineteenth century into twentieth century: Mark Twain.
443 Topics in Black Literature (3) Contents vary: particular genres, authors, or theories from 1845 to present: Langston Hughes and Harlem Renaissance, Richard Wright and Gwendolyn Brooks, writing by Black women, international Black literature in English, and Black American autobiography. (Same as African and African-American Studies 443.)

451 Modern British and American Poetry (3) From Yeats and Frost to Auden, Stevens, and more recent poets.

452 Modern Drama, 1880-1945 (3) Survey of British, American, and international drama since the advent of modern drama to the end of World War II. (Same as Comparative Literature 452.)

453 Contemporary Drama (3) From modern drama to the end of World War II. (Same as American, and international drama from the advent of English drama to the end of World War II. (Same as American, and international drama from the advent of English drama to the end of World War II. (Same as American Literature 441.)

454 Twentieth-Century International Novel (3) Fiction in English translation from such writers as Kafka and Camus through contemporary authors. (Same as Comparative Literature 454.)

455 Persuasive Writing (3) Writing and analyzing persuasive texts in public, private, and academic contexts. Prereq: Advanced Expository Writing or consent of instructor.

456 Contemporary/Postmodern Literature (3) Studies in literature written after World War II. Content will vary. May be repeated with consent of instructor. Maximum 6 hrs.

460 Technical Editing (3) Editing technical material for publication. Principles of style, format, graphics, layout, and production management. Prereq: Technical and Professional Writing or consent of instructor.

462 Writing for Publication (3) Principles and practices of writing for publication. Dissertation, theses, articles, and reports in science and technology. Prereq: Technical and Professional Writing or consent of instructor.

463 Advanced Poetry Writing (3) Further development of skills acquired in basic writing poetry course. Prereq: 363 or consent of instructor.

464 Advanced Fiction Writing (3) Further development of skills acquired in basic writing fiction course. Prereq: 365 or consent of instructor.

466 Writing, Layout, and Production of Technical Documents (3) Principles of design for desktop publishing. Production of various documents to be incorporated into professional portfolio. Prereq: Technical and Professional Writing or consent of instructor.

470 Special Topics in Rhetoric (3) Topics vary. Prereq: Advanced Expository Writing or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

471 Sociolinguistics (3) Study of language in relation to society. Empirical and theoretical focus. Large-scale units: tribes, nations, social groups. Prereq: 371 or 372 or Linguistics 200 or consent of instructor. (Same as Linguistics 471 and Sociology 471.)

472 American English (3) Phonological, morphological, and syntactic characteristics of major social and regional varieties of American English; origins, functions, and implications for cultural pluralism. Prereq: 371 or 372 or Linguistics 200 or consent of instructor. (Same as Linguistics 471 and Sociology 471.)

474 Teaching English as a Second or Foreign Language I (3) Major issues surrounding teaching ESL/EFL: political implications of teaching ESL/EFL; introduction to second language acquisition: learner variables in language learning; traditional and innovative approaches to ESL/EFL; basic features of American English grammar necessary for teaching ESL. Prereq: 365 or of foreign language or consent of instructor. (Same as Linguistics 474.)

475 Teaching English as a Second or Foreign Language II (3) Issues, principles, and techniques in teaching grammar, speaking, pronunciation, reading, and writing in ESL. Prereq: 371 or 372 or Observations and teaching practice in ESL classes and development of ESL materials and tests. Prereq: 474. (Same as Linguistics 475.)

476 Second Language Acquisition (3) How humans learn second languages. Theoretical models and research: differences between first and second language acquisition; learner variables; socio-cultural factors; and implications for second/foreign language instruction. (Same as Linguistics 476.)

477 Pedagogical Grammar for ESL Teachers (3) Aspects of English syntax and morphology presenting difficulties for non-native learners of English. Basic and complex sentence structures; noun and article system; and verb tense, aspect, modality, and complementation. (Same as Linguistics 477.)

479 Literary Criticism (3) Historical survey of major works of literary criticism.

480 Fairy Tale, Legend, and Myth: Folk Narrative (3) Study of forms of folk narrative; Grimm’s, Andersen’s, Irish, English, Appalachian, African, and Native American tales.

481 Studies in Folklore (3) Topics vary. May be repeated with different topic. Maximum 6 hrs.

482 Major Authors (3) Content varies. Concentrated study of literary works of major authors. May be repeated. Maximum 6 hrs.

484 Special Topics in Writing (3) Topics vary. May be repeated. Maximum 6 hrs.

485 Special Topics in Language (3) May be repeated. Maximum 6 hrs with consent of department. (Same as Linguistics 485.)

486 Special Topics in Criticism (3) Content varies. Theoretical and practical approaches to British and American literature. May be repeated with consent of department. Maximum 6 hrs.

489 Special Topics in Film (3) Content varies. Particular directors, film genres, national cinema movements, or other topics. May be repeated with consent of department. Maximum 6 hrs. (Same as Cinema Studies 489.)

490 Language and Law (3) Language in Anglo-American legal process: focus on differences between spoken and written language; lexical and syntactic ambiguity; pragmatics; speech act analysis; and language rights of linguistic minorities. Prereq: Foundations of the English Language or The Structure of Modern English or consent of instructor. (Same as Legal Studies 490 and Linguistics 490.)

495 Introduction to Rhetoric and Composition (3) Historical, theoretical, and empirical modes of inquiry in rhetoric and composition. Prereq: Advanced Expository Writing or consent of instructor.

496 Rhetoric of Legal Discourse (3) Application of basic principles of persuasive writing to legal materials. Issues identification and argument through written position papers, briefs, and memoranda. Critical reading and discussion. Introductory research techniques. Prereq: Legal knowledge of the most important legal materials. Prereq: Advanced Expository Writing or consent of instructor.

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

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

505 Teaching Freshman Composition (3) Introduction to teaching Freshman English through study of various techniques and philosophies of composition. Required of all first-year teaching associates.

506 Introduction to Literary Research (3) Critical examination of aims of English studies, profession of English teacher, theory of literature, and methods of research: collecting of information, evaluation of materials, and transmitting of results of scholarship.

507 Applied Criticism: The Rhetoric of Literary Forms (3) Study and application of ways in which major critics have analyzed form in poetry and prose fiction. May be repeated. Maximum 6 hrs.

508 History of the English Language I (3) Phonological, morphological, and syntactic development of English language: Old and Middle English.

509 History of the English Language II (3) Phonological, morphological, and syntactic development of the English language with concentration on development after 1500 and especially in American English.

513-14 Readings in Medieval Literature (3.3) Reading and analysis of selected masterpieces of Old and Middle English literature and their Continental sources in Modern English. May be repeated. Maximum 9 hrs. each.

520-21 Readings and Analysis in Selected Areas of Sixteenth- and Seventeenth-Century Prose, Poetry, and Drama (3.3) Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs. each.

530-31 Readings in English Literature of the Restoration and Eighteenth Century (3.3) Topics vary. Genre: poetry, prose, fiction, drama, or period: Restoration, eighteenth century, eighteenth-century special in American English. May be repeated. Maximum 9 hrs. each.

540-41 Readings in English Literature of the Nineteenth Century I and II (3.3) Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs. each.

550-51 Readings in American Literature (3.3) Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs.

552 Readings in Black American Literature (3) Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs.

560-61 Readings in Twentieth-Century Literature (3.3) Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs.

576 Introduction to Contemporary Criticism (3) Introductory survey of twentieth-century literary criticism from New Criticism to present.

580 Fiction Writing (3) Advanced fiction projects under supervision of instructor and time for independent study. Prereq: Extensive background in reading and writing fiction. May be repeated. Maximum 6 hrs.

581 Colloquium in Poetry Writing (3) Major poetic project or continuation 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 6 hrs.

582 Special Topics in Writing (1-3) Topics vary. May be repeated. Maximum 6 hrs. Enrollment by consent of director of graduate studies only.

583 Special Topics in Literature (3) Topics vary: genres, modes, and other literary subjects not in standard period divisions. May be repeated. Maximum 6 hrs.

584 Topics in Feminist Studies (3) Topics vary. May be repeated. Maximum 9 hrs.

585 Issues in Invention, Style, and Audience (3) Theoretical perspectives on contemporary research in rhetoric and composition.

586 History of Rhetoric I (3) Survey of rhetoric from Sophists to Ramus.

587 History of Rhetoric II (3) Survey of rhetoric from Bacon to present.

588 Readings in Applied Rhetoric (3) Content varies: Writing across cultures; writing in American, technical communication, text linguistics. May be repeated. Maximum 6 hrs.

589 Special Topics in Language (3) Topics vary. May be repeated. Maximum 6 hrs.

590 Topics in Critical Theory (3) Topics vary. May be repeated. Maximum 9 hrs.
Entomology and Plant Pathology

(College of Agricultural Sciences and Natural Resources)

MAJOR
Entomology and Plant Pathology ............ M.S.
Plants, Soils, and Insects ....................... Ph.D.

Carl J. Jones, Head

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
Jones, Carl J., Ph.D. ......................... Wyoming
Lambdin, Paris L., Ph.D. ....................... VPI
Newman, Melvin A., Ph.D. ...... Texas A and M
Patrick, Charles R., Ph.D. ..................... Georgia
Trigiano, Robert N., Ph.D. .............. NC State
Windham, Alan S., Ph.D. ............. NC State
Windham, Mark T., Ph.D. ............... NC State

Associate Professors:
Canaday, Craig H., Ph.D. ............... Ohio State
Gawin, Kimberly D., Ph.D. ............. NC State
Hale, Frank A., Ph.D. ....................... Ohio State
Lentz, Gary L., Ph.D. ....................... Iowa State
Owney, Bonnie H., Ph.D. .............. NC State
Skinner, John A., Ph.D. ......... California (Davis)
Stewart, S. D., Ph.D. ................. Auburn
Vail, Karen M., Ph.D. ....................... Florida

Assistant Professors:
Lamour, K. H., Ph.D. .................... Michigan State
Moulton, J. K., Ph.D................ Arizona

The Department of Entomology and Plant Pathology offers a graduate program leading to the Master of Science with a concentration in entomology or plant pathology. Students in entomology may specialize in crop entomology, medical and veterinary entomology, insect biology, insect pest management, or biological control. Students in plant pathology may specialize in foliar and stem fungus diseases, soilborne pathogens, disease physiology, biocontrol, 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 Council and must have completed (1) general botany or biology, 8 hours; (2) advanced biological sciences, 8 hours; (3) advanced invertebrate zoology or animal behavior; (4) organic chemistry, 3 hours. In addition, three completed rating forms and a written statement of career goals and interest in entomology or plant pathology are required.

Degree Requirements

The program requires a written thesis based on original research and the completion of a minimum of 24 hours of coursework for graduate credit, approved by the student’s advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be 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.

THE DOCTORAL PROGRAM

A Ph.D. in Plants, Soils and Insects (PSI), with concentrations in entomology, plant pathology, integrated pest management and bioactive natural products, is offered under a multi-departmental doctoral program. Three departments participate: Plant Sciences, Entomology and Plant Pathology, and the College of Agricultural Sciences and Natural Resources. Other concentrations within the PSI major include horticulture, crop sciences, weed biology, plant improvement, and environmental and soil sciences. Please see the doctoral program links on the homepage of the Department of Entomology and Plant Pathology for additional information, http://eppserver.ag.utk.edu/, or contact a faculty member in the area of interest.

Admission Requirements

Submit application, fee, official transcripts, and scores from the general portion of the Graduate Record Examination to the Graduate Admissions Office. In your application, indicate that you are applying to the Plants, Soils and Insects doctoral program. Submit resume, three letters of reference (or three Graduate Rating Forms), photocopy of GRE scores and a short statement of professional goals and reasons for applying to EPP Ph.D Program Coordinator, Department of Entomology and Plant Pathology, 2431 Center Drive, 205 PSB, University of Tennessee, Knoxville, Tennessee, 37996-4560. In your statement letter and application, please indicate your concentration of interest and intended major professor.

Degree Requirements

To obtain the doctorate, the student must meet the following requirements:

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

2. Submission of an approved program of study by the end of the second semester of graduate study. A candidate for the doctoral degree must complete a minimum of 24 hours of graduate coursework numbered 503 or higher beyond the master’s degree.
Candidates not having a masters degree must complete a minimum of 48 hours of graduate coursework beyond the baccalaureate degree, 24 hours of which must be numbered 500 or higher. A minimum of 12 of the 24 hours, or 30 of the 48 hours, must be graded A.F. At least 9 hours of the student’s coursework must be from outside the PSI major, and a minimum of 6 semester hours must be taken in UT courses numbered 601 or higher. In addition, 24 hours of course 600 Doctoral Research and Dissertation are required.

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

4. Passing both written and oral sections of the comprehensive examination. The candidate will be tested on his/her knowledge of the proposed dissertation and related fields.

5. Presentation of at least two departmental seminars (2 hours of EPP 541), in addition to an exit seminar (no credit).


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

GRADUATE COURSES

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

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

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

510 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.)

512 Soilborne Plant Pathogens (3) Causal agents; host-parasite-soil environment interactions; epidemiology; and biological, cultural, and chemical control. Prereq: Plant Pathology or consent of instructor.

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.

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

520 Plant Parasitic Nematodes (4) Morphology, physiology, 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.

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.

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

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

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

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

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

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.

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

543 DNA Analysis (2) Practical experience in isolating and characterizing DNA from prokaryotic and eukaryotic organisms, amplification of DNA using arbitrary nucleotide primers. DNA profiling techniques (DAF, ASAP, ITS ribosomal DNA and 18S bacterial gene) isolation and purification of amplified products. Data collection and analysis of relationships between organisms. Prereq: 12 hrs biological sciences, 8 hrs chemistry, written consent of instructor. 1 hr and 4 labs weekly for 7 weeks. (Same as Plant Sciences and Landscape Systems 543.)

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

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

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

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

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

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

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

Environmental Engineering

See Civil Engineering

Finance

(College of Business Administration)

MAJOR DEGREES

Business Administration .............. MBA, Ph.D.

James W. Wansley, Head

Professors:

Black, Harold A. (James F. Smith, Jr., Professor), Ph.D. ..................... Ohio State
Boehm, Thomas P. (AmSouth Scholar), Ph.D. ........................ Washington (St. Louis)
DeGennaro, Ramon P., Ph.D. .......................... Ohio State
Erhardt, Michael C. (Castagna Professor), Ph.D. ................................. Georgia Tech
Philippatos, George C. (Distinguished Professor), Ph.D. .......................... New York
Shrives, Ronald E. (Voight Professor), Ph.D. ............................... UCLA
Wachowicz, John M., Jr. (AmSouth Scholar), CPA, Ph.D. ........................... Illinois
Wansley, James W. (Clayton Homes Chair of Excellence) (Liaison), CFA, Ph.D. ......................... South Carolina

Associate Professors:

Auxier, Al L., Ph.D. .............................. Iowa
Collins, M. Cary (Home Federal Fellow), Ph.D. ................................. Georgia
Daves, Phillip R., Ph.D. ........................ North Carolina
Murphy, Deborah L., Ph.D. ........................ Florida

Emeriti Faculty:

Dottenweich, William W., Ph.D. ........................ Pennsylvania

BUSINESS ADMINISTRATION CONCENTRATIONS

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

The curriculum offers courses for those interested in careers in corporate financial management, security analysis and investments, banking and financial institutions, and real estate.

Minimum course requirements are three courses: 511 plus two from the following: 512, 525, 532, 581, and 599 (Torch Fund only).

Ph.D. Concentration: Finance.

Minimum course requirements are finance seminars 641, 651, 652, and 654.

GRADUATE COURSES

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

511 Strategic Management for Creation of Financial Value (3) Strategic issues in corporate finance, investments, and capital markets: how firms can employ financial strategies to create value. Use of derivatives, risk management, real options, fixed income securities, venture capital, initial public offerings and financial restructuring. Prereq: Business Administration 511, 512, and 513, or consent of instructor.

512 Problems in Financial Management (3) Readings and cases that apply finance theory to real-world investment, financing, and asset management problems. Prereq: 511 and Business Administration 511, 512, 513, and 514, or consent of instructor.

525 Investment Analysis and Portfolio Management (3) Investment process, portfolio applications. Asset allocation decision in global setting; organization and functioning of financial markets; equity and bond valuation; asset valuation models; equity and bond portfolio management; options, forwards and futures contracts; evaluation of portfolio performance; and review of alternative economies and emerging markets. Prereq: 511 and Business Administration 511, 512, 513, and 514, or consent of instructor.

532 Commercial and Investment Banking (3) Analysis of management policies of financial institutions and investment banking firms. Legal, economic and regulatory environment and implications for management. Financial institution structure and competition and changing structure of the U.S. financial system. Analysis of raising new funds through underwriting new issues of corporate stocks, bonds and other instruments. Analysis of securities brokerage, market-making, merchant, banking, and mergers and acquisitions. Prereq: 511 and Business Administration 511, 512, 513, and 514, or consent of instructor.

551 Financial Management of a New Enterprise (3) Financial issues associated with formation, control, and long-term planning of new enterprises. Acquisition of venture capital. Prereq: 511 and Business Administration 511, 512, 513, and 514, or consent of instructor.

581 Real Estate Investment and Finance (3) Financial and market analysis used to make real estate investment decisions. Effects of variety of financing options on rate of return on income-producing properties. Effect of various financing options on consumer’s decisions to purchase. Relationship between primary and secondary mortgage markets and impact of those markets on cost and availability of funds for real estate lending. Effects of government intervention (taxation, subsidization, and regulation) in both real estate and mortgage markets. Prereq: 511 and Business Administration 511, 512, 513, and 514, or consent of instructor.

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

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

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/NC or letter grade.


653 Seminar in Financial Institutions (1-3) Theoretical and empirical studies of financial institutions. Topics: modeling banking firm, efficiencies in banking, bank lending arrangements, asymmetric information, international competitiveness, and deposit insurance. Prereq: 641 and consent of instructor. May be repeated. Maximum 6 hrs. S/NC or letter grade.


Food Science and Technology

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREES

Food Science and Technology ..... M.S., Ph.D.

Clark J. Brekke, Head

Professors:

Brekke, Clark J., Ph.D. ................. Wisconsin

Davidson, P. Michael, Ph.D. ............... Wisconsin Sate

Drbaugh, F. Ann, Ph.D. ................. Georgia

Draughn, C. William, Ph.D. .......... Iowa State

Penfield, Marian L. P., Ph.D. .......... Tennessee

Associate Professors:

Golden, David A. (Liaison), Ph.D. ......... Georgia

Lovejoy, D. Wright, Ph.D. .............. Kansas State

Mount, John R., Ph.D. ...................... Ohio State

Assistant Professors:

Weiss, Jochen, Ph.D. ................. Massachusetts

Zivanovic, Svetlana, Ph.D. .......... Arkansas

Emeriti Faculty:

Collins, Jim L., Ph.D. ................. Maryland

Jaynes, Hugh O., Ph.D. ............... Illinois

Melton, Sharon L., Ph.D. .......... Tennessee

Miles, James T., Ph.D. ............... Wisconsin

The Department of Food Science and Technology offers the Master of Science and Doctor of Philosophy degrees. Students in the doctoral program may choose research in the concentration areas of food processing, food chemistry, food microbiology or sensory evaluation of foods. Commodity interests (meats, dairy, fruits, vegetables, bakery products) can be emphasized in any of the areas by careful selection of courses and the research topic. Minors are available in cognate fields. For detailed information, consult the department.

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

THE MASTER’S PROGRAM

Applicants must have a B.S. in food technology, food science or a related scientific field.

Thesis Option

1. Prior to research for the thesis, the student must develop a detailed written 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 503.

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 coursework. In addition, an oral, final examination covering the problem and coursework 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 6 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.

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 committee considers appropriate.

GRADUATE COURSES

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

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


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

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.

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

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

495 Quality Assurance and Sanitation Practices (3) Design and evaluation of food processing operations to produce safe and acceptable quality food products. Prereq: Food Chemistry, Food Microbiology, Food Preservation or consent of instructor.

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

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

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

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

507 Professional Development Seminar (1) Same as Agriculture and Natural Resources 507, Animal Science 507, Biosystems Engineering 507, Biosystems Engineering Technology 507, Environmental and Soil Sciences 507, Plant Sciences and Landscape Systems 507) S/NC only.

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

511 Color of Foods (2) Chemical basis, measurements, and reactions involved in color changes in foods. Manufacture and application of materials used to modify color of foods. Prereq: Food Chemistry or equivalent. 1 hr and 1 lab.

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

515 Food Carbohydrates, Proteins and Lipids (4) Advanced study of chemical and physical properties 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.

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 organisms; traditional and current approaches to microbiological food safety and quality. Prereq: Food Microbiology and Lab or equivalent.

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

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

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.

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

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

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

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.

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.

Forestry, Wildlife and Fisheries

(College of Agricultural Sciences and Natural Resources)

MAJORS DEGREES

Forestry ................................................. M.S.
Natural Resources .................................... M.S.
Wildlife and Fisheries Science ................. Ph.D.

George M. Hopper, Head

Professors:
Dearden, B. L., Ph.D. ................. Colorado State
Hill, T. K., Ph.D. ................. Auburn
Hopper, G. M. (Liaison), Ph.D. .... Virginia Tech
Ostermeier, D. M., Ph.D. .......... Syracuse
Pelton, M. R., Ph.D. ............... Georgia
Rials, Timothy G., Ph.D. .......... Virginia Tech
Scharbaum, S. E., Ph.D. .......... Colorado State
Speer, C. A., Ph.D. .................... Utah State
Strange, R. J., Ph.D. ................. Oregon State
Wilson, J. L., Ph.D. .................... 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. I., Ph.D. ................. Georgia
Van Manen, F. T., Ph.D. .......... Tennessee
Wang, S. Ph.D. ............... Nanjing Forestry (China)
Young, T. M., M.S. ................. Tennessee

Emeriti Faculty:
Buckner, E. R., Ph.D. ............... NC State
Dimmick, R. W., Ph.D. ............. Wyoming
Rennie, J. C., Ph.D. ............... NC State
Schneider, G., Ph.D. ................. Michigan State

Graduate study leading to the Master of Science with majors in Forestry and in Wildlife and Fisheries Science and the Doctor of Philosophy with a major in Natural Resources is offered by the Department of Forestry, Wildlife and Fisheries. The mission of the Department of Forestry, Wildlife and Fisheries is to advance 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 take the general Graduate Record Examination (GRE) with minimum scores required. Graduate Rating Forms or letters of recommendation must be submitted to the Office of Graduate Admissions.

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 500) is required.
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. A minimum grade-point average of 3.0 on a 4.0 scale.

2. A graduate committee of at least 7 members must be selected. At least one member must be from outside the department. The committee will meet and schedule the student’s program during the first semester in 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 20 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 administration and management; wood sciences; and multidisciplinary natural resource 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 1650, with a minimum of 1100 on the verbal and quantitative sections.

3. A statement of professional goals, natural resources 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.

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 5 faculty members will be selected. At least one member shall be from outside the department. The committee will meet and schedule the student’s program during the first semester in residence.

3. Three hours of Forestry 511 are required.

4. Four 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 18 hours of approved study.

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; managerial economics; taxes; forest products marketing. Prereq: Resource Analysis or consent of instructor.

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

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

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

434 Wood Processing and Machining (2) Primary log breakdown and secondary processing into major products. Fundamentals 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.

500 Thesis (1-15 credits) Required of each graduate student in residence. Prereq: Th FCW 500 Thesis (1-15 credits) P/NP only.

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

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

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.

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

520 Advanced Forest Ecology (3) Physiological ecology of trees; relationships between overstory structure, microclimate, and understory response; regeneration ecology; competition and effects of criminal and human disturbance regimes at multiple scales; forest succession and stand dynamics. Prereq: Graduate standing in forestry or biological science, or consent of instructor.
525 Woodlot Management (3) Current technologies and management strategies concerning wise use of forest resources for private, non-industrial forest landowners necessary for decision-making and implementation. 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.

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

540 Genetics in Forestry (3) Genetic improvement of forest trees, selection of superior phenotypes; field testing tools used, prescribed fire, pesticides, in regeneration and management. Prereq: Silvicultural methods and Biology 220 or consent of instructor.

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

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

580 Advanced Silviculture (3) Silvicultural characteristics, silvicultural practices and systems applied to commercially important hardwoods and softwoods. In-depth analyses of silvicultural principles involved and tools used, 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.

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 multivariate plot sampling; list sampling; Poisson sampling. Growth and yield predictors for even-aged and uneven-aged forests. Prereq: Land Measurement and Forest Resource Inventory or consent of instructor.

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

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

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

Forestry, Wildlife and 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. Applicable to majors in Forestry and in Wildlife and Fisheries Science. 2 hrs and 1 lab.

416 Planning and Management of Forest, Wildlife and Fisheries (3) Comprehensive treatment of forest and wildlife resource management through developing land management plans and analyzing case studies that demonstrate the concept of sustainable development. Prereq: Senior standing 1 hr and 2 labs.

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

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

540 Seminar on Integrated Resources Management and Fish Biodiversity Reserves (2) IAB program, UNESCO-sanctioned global conservation initiative. Analysis of integrated resources management practices of wild mammal and wildlife management. Environmental policy and application of science to management practice. Applicable to majors in Forestry and in Wildlife and Fisheries Science.

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

600 Doctoral Research and Dissertation (3-15) Preregistration required. Prereq: Consent of instructor. May be repeated.


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

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.

Wildlife and Fisheries Science

GRADUATE COURSES

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

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

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

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

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

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. S/NC only.

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

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


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

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

530 Wildlife Diseases (2) Necropsy of birds and mammals. Recognition of various diseases and methods of preparing pathological materials in field and lab. Investigative procedures concerning wildlife diseases. Prereq: 1 yr biology, 444 or 445, or consent of instructor. (Same as Comparative and Experimental Medicine - Veterinary Medicine 530.)
535 Floodplain Ecosystems (3) Ecology, restoration and management of floodplain ecosystems; biotic and abiotic processes, social considerations, and wildlife and forest management. Lower Mississippi River Alluvial Valley. Prereq: Consent of instructor.

540 Predator Ecology (2) Dynamics of terrestrial vertebrate predator populations in human-altered and relatively unaltered environments. Use of computers. Prereq: Animal Science 571 or Statistics 536 or consent of instructor.

545 Advanced Population Analysis (2) Detail characteristics, assumptions, goals, methods, and current technologies for fish and wildlife population analysis. Use of computers. Prereq: Animal Science 571 or Statistics 536 or consent of instructor.

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

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

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

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

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

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

Associate Professors:
Orvis, Kenneth H., Ph.D. .................California Shaw, Shih-Lung, Ph.D. .................Ohio State

Assistant Professor:
Grissino-Mayer, 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 one concentration or major technique. An emphasis in geographic information science 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 non-thesis options for the Master of Science. Both options require a minimum of 30 semester hours beyond the completion of a sound undergraduate major program. The M.S. program requires students to have background in quantitative methods equivalent to the course content of Geography 415, and some familiarity with key themes and approaches in both physical and human geography. 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 doctoral 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, 599, 9 hours of 600-level seminars, and (at each offering during residency) 501. A minimum of 9 semester hours must be earned in collateral fields, with courses selected for their relevance to the special fields. Ph.D. students whose Master’s level work was in a field other than geography and for whom the Master’s area remains close to their Ph.D. specialization may substitute geography units in courses outside of their specialty areas for up to 3 of the 9 required outside units. Competency in quantitative methods and basic human and physical geography is required. Additional tools, including languages, will be required as appropriate to the student’s areas of research specialization.

Examinations required for admission to candidacy include a written 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 comprehensive examination should be taken within the same semester.

MINOR IN ENVIRONMENTAL POLICY

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

GRADUATE COURSES

410 Global Positioning Systems and Geographic Data (3) Survey, field and laboratory use of Global Positioning Systems for capturing digital geographic data; management of geographic data: coordinate systems, datum issues, scanning and digitizing, map standards, and uncertainty in Geographic Information Systems. 2 hrs and 1-2 hr lab.

411 Computer Mapping and Geographic Information Systems (3) Concepts, management, and presentation of digital data for spatial analysis: cartographic data structures. Prereq: 310 Introduction to Cartography or consent of instructor. (Same as Information Management 431) 2 hrs and 1-2 hr lab.

412 Advanced Cartography Techniques (3) Cartographic design and data display techniques for reference and thematic maps; Basic principles and methods of map reproduction. Prereq: Introduction to Cartography or consent of instructor. 2 hrs and 2 labs.

413 Remote Sensing: Types and Applications (3) Principles and uses of remote sensing imagery, digital data, and spectral data: geographic interpretation and mapping techniques. Prereq: Introduction to Cartography or consent of instructor.

415 Quantitative Methods in Geography (3) Geographic application of statistical techniques: point pattern analysis, and analysis of areal units. Prereq: Mathematics 115 Statistical Reasoning or Statistics 201 Introduction to Statistics or consent of instructor.

421 Geography of Folk Societies (3) Geographical study of folk culture, material culture and rural settlement, examples from eastern North America and selected foreign areas.

423 Geography of American Popular Culture (3) Geographical study of regional variation in popular cultures, youth cultures in United States. (Same as American Studies 423.)

432 Dendrochronology (4) Principles, techniques, and interpretation in tree-ring science. Applications in geography, climate, ecology, forestry, archaeology, and regional studies. 3 hours lecture and 2 hours lab per week. Prereq: 131-132 Geography of the Natural Environment or consent of instructor.

433 The Land-Surface System (3) Characteristics of surface form, water, vegetation, and surface materials, and their regional interrelationships. People as evaluators and agents of change. Prereq: Geography of the Natural Environment or consent of instructor.

434 Climatology (3) General circulation system leading to world pattern of climates. Climatic change and modification, and interrelationships of climate and human activity. Prereq: Geography of the Natural Environment or Meteorology or consent of instructor.

435 Biogeography (3) Changing distribution patterns of plants and animals on variety of spatial and temporal scales. Effects of continental drift, Pleistocene climatic change, and human activity on world biota. Prereq: Geography of the Natural Environment or consent of instructor.
436 Water Resources (3) Global water resources and hydrologic processes: water availability, flooding, and water quality issues from physical and economic geographical perspectives. Prereq: Geography of the Natural Environment or consent of instructor.

439 Plant Geography of North America (3) Characteristics and distribution of major plant communities of Canada, the U.S., Mexico, and Central America. Relationships to climate, fire, and human disturbance. Long-term history and future prospects. Prereq: Coursework in geography or botany or consent of instructor.

441 Urban Geography of the United States (3) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities in the United States. Writing emphasis course. (Same as Urban Studies 441.)

443 Rural Geography of the United States (3) Geographical appraisal of rural areas of the United States including small towns and urban fringes. Problems and potentials of rural America. Writing emphasis course.

449 Geography of Transportation (3) Examination of transport systems, their effects on economic patterns, land use, location problems, and development.

450 Process Geomorphology (3) (Same as Geology 450.)

466 Teaching and Learning Geography (3) Preparation of prospective teachers in content, skills, strategies, and understandings needed for effective teaching and assessment of geography in K-12 schools. Course organization and content based largely on that of National Geography Standards.

495 Special Topics in Geography (1-4) Topics vary. Prereq: consent of instructor. May be repeated with consent of instructor. Satisfactory/No Credit or letter grade. Maximum 8 hrs.

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

501 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration required of resident graduate students who have completed all graduate courses. May be repeated. Maximum 4 hrs. May be applied toward graduate degree. S/NC only.

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

504 Introduction to Geographical Research (1) Research interests and methods of departmental faculty. Research frontiers in geography. Required of new graduate students. S/NC only.

505 Directed Research (2-6) Research on problems as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC or letter grade.

506 Directed Readings (2-6) Readings on topics of interest as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC or letter grade.

509 Topics in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs. S/NC or letter grade.

510 Geographic Software Design (3) Algorithms for spatial analysis, software design, and program implementation in stand alone and distributed computing environments. Prereq: Consent of instructor. (Same as Information Management 531.)

513 Topics in Remote Sensing (3) Applied research using imagery for interpretation and mapping of geographic data. Prereq: 413 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

515 Topics in Quantitative Geography (3) Multivariate analysis applied to problems in geography; research problems utilizing appropriate computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 415 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

517 Geographic Information Management and Processing (3) Concepts and methods in management of geographic information. Database design, manipulation, sampling and analysis. Prereq: Consent of instructor. (Same as Information Management 552.)

518 GIS Project Management (3) Interactions between management, technical, and application aspects of Geographic Information Systems project through simulated environment of real-world GIS sites. Prereq: Computer Mapping and Geographic Information Systems or consent of instructor.

519 Graduate Practicum in Cartography/Remote Sensing/GIS (2-6) Prereq: Written consent of department before registration. May be repeated with consent of instructor. Maximum 6 hrs.

521 Topics in Cultural Geography (3) Examination of trends, problems, and methods in cultural geography. Prereq: 421 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

532 Topics in Global Change (3) Emerging trends, anticipated problems and methods in global change research and response. Prereq: 434 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

533 Topics in Physical Geography (3) Trends, problems, and methods in geomorphology or other areas of physical geography. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

534 Topics in Climatology (3) Trends, problems and methods in area of climatology. Prereq: 434 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

535 Topics in Biogeography (3) Examination of trends, problems, and methods in biogeography. Prereq: 435 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

536 Topics in Watershed Dynamics (3) Trends, problems and methods in study of watershed processes. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

541 Topics in Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 441 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

549 Topics in the Geography of Transportation (3) Examination of trends, problems, and methods in transportation geography and transportation networks. Prereq: 449 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

591 Foreign Study (1-15) See College of Arts and Sciences. Prereq: Written consent of department prior to registration. S/NC or letter grade.

592 Off-Campus Study (1-15) See College of Arts and Sciences. Prereq: Written consent of department prior to registration. S/NC or letter grade.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Written consent of department prior to registration. S/NC or letter grade.

599 Geographic Concept and Method (3) Traditional and modern geographical thought; readings on sources, scope, and methods of geography. Prereq: Consent of instructor.

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

609 Seminar in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

631 Seminar in Natural Hazards (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

632 Seminar in Dendrochronology (3) Prereq: 432 or consent of instructor. May be repeated. Maximum 6 hrs.

633 Seminar in Physical Geography (3) Prereq: 533 or consent of instructor. May be repeated. Maximum 6 hrs.

634 Seminar in Climatology (3) Prereq: 534, 532 or consent of instructor. May be repeated. Maximum 6 hrs.

635 Seminar in Biogeography (3) Prereq: 535 or consent of instructor. May be repeated. Maximum 6 hrs.

641 Seminar in Urban Geography (3) Prereq: 541 or consent of instructor. May be repeated. Maximum 6 hrs.

643 Seminar in Rural Geography (3) Prereq: 443 or consent of instructor. May be repeated. Maximum 6 hrs.

649 Seminar in Geography of Transportation (3) Prereq: 549 or consent of instructor. May be repeated. Maximum 6 hrs.

663 Seminar in Geography of the American South (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

German

See Modern Foreign Languages and Literatures

Health and Exercise Science (College of Education, Health, and Human Sciences)

MAJORS

DEGREES

Exercise Education ......................... Ph.D.
Health Science ............................................ M.S.
Human Ecology ......................................... Ph.D.
Public Health ............................... M.P.H., M.S.-M.P.H.
Safety ................................................. M.S.

Edward T. Howley, Interim Head

Professors:
Bassett, David R., Jr., Ph.D. ............ Wisconsin
Clarke, Barbara, Ph.D. ............... Virginia Tech
Gorski, June, Dr.P.H ...................... UCLA
Hamilton, Charles B. (Liaison), Dr.P.H. .......... Oklahoma
Howley, Edward T., Ph.D. ............. Wisconsin
Kirk, Robert H., H.S.D. .......... Indiana
Kozer, Andrew J. (University Professor), Ph.D ........................ Michigan
Liemohn, W.P., Ph.D. ...................... Iowa
Rockeyt, Ian R.H., Ph.D. .................. Brown
Wallace, Bill C. (Liaison), Ed.D. ............... Northern Colorado
Welch, Hugh (Emeritus), Ph.D. ............ Florida

Associate Professors:
Carney, Paula (Liaison), Ph.D. .... Wayne State
Keel, Martha, M.S. ...................... Tennessee
Purington, R. Jack, Ph.D. .......... Iowa
Smith, Susan M. (Liaison), Ed.D. .... Tennessee
Thompson, Dixie L., Ph.D. ............ Virginia
Zhang, Songning, Ph.D. ............. Oregon
The Health and Exercise Science Department fosters development of those with career interests in health education/promotion, exercise science, public health, and safety. The Department of Health and Exercise Science offers graduate programs leading to degrees, majors, and concentrations in:

- **Master of Science**
  - **Health Promotion and Health Education**
  - **Exercise Science**
    - **Exercise Physiology**
    - **Biomechanics/Sports Medicine**
  - **Master of Public Health**
  - **Master of Science - Master of Public Health (Dual Degree)**
- **Doctor of Philosophy**
- **Education**
  - **Exercise Science (Exercise Physiology or Biomechanics/Sports Medicine)**
  - **Human Ecology**
  - **Community Health**

### MINOR IN GERONTOLOGY

An intercollegiate/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 Education, Health, and Human Sciences and Arts and Sciences. A cross-listed seminar between contributing programs is designed to integrate experiences from different sources and to demonstrate the multi-faceted nature of working within an aging society.

**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 Education, Health, and Human Sciences” form. Copies of this form are available in the Department of Health and Exercise Science.

**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 may be taken toward satisfaction of this requirement. Courses which are offered on a regular basis include:
2. **Applied practicum.** 2 hours required. Students should register under practicum experiences in the “home” department of the supervising faculty.

### Exercise Science

The Exercise Science concentration is dedicated to promoting and integrating scientific research and education on the health benefits of exercise. Through a program of interdisciplinary graduate study, using both experimental and epidemiological methods, students gain a greater understanding of the role of exercise in the prevention of various cardiovascular, metabolic, and musculoskeletal disorders. The Exercise Science faculty offers graduate degrees (M.S. and Ph.D.) in two specialties: Exercise Physiology and Biomechanics/Sports Medicine.

The Exercise Science faculty offers graduate degrees (M.S. and Ph.D.) in two specialties: Exercise Physiology and Biomechanics/Sports Medicine.

**Exercise Physiology**

- Focuses on the study of the acute and chronic effects of exercise on the human body. At the Master’s level, students may choose from two tracks: (1) adult fitness/cardiac rehabilitation, or (2) applied physiology research. Students may elect to do internships in cardiac rehabilitation at several area hospitals, and are encouraged to take the ACSM Exercise Specialist® exam upon graduation. The Ph.D. Program requires course work in the life sciences, physiological chemistry, statistics, and advanced topics in exercise physiology. Graduate students collaborate with an exercise physiology faculty member to perform research in the areas of physical activity assessment, metabolism, the health benefits of exercise, and body composition.

The Biomechanics/Sports Medicine specialty involves the study of biomechanical implications to exercise and rehabilitation. This program area focuses on the mechanisms, prevention, and rehabilitation of musculoskeletal injuries. The emphasis in courses taught in this area include biomechanical as well as medical considerations related to exercise and/or rehabilitation. The Ph.D. Program requires course work in engineering mechanics, numerical analysis, statistics, and advanced topics in biomechanics. Graduate students work with biomechanics/sports medicine faculty to pursue research in the areas of biomechanics of lower extremity function, footwear biomechanics, core stability, flexibility, and the biomechanics of injury mechanism and prevention.

**Application for Admission**

Applications from persons who have less than a 3.0 GPA will, in general, not be considered.

The following retention policy applies to all graduate students seeking a degree in the department:

1. Graduate students are required to maintain an overall 3.0 GPA.
2. Any student who fails below this standard will be advised in writing by the department head of the need to discuss the matter with his/her advisor.
3. If a student’s overall GPA remains below 3.0 for a second semester, the student will have his/her degree status revoked.

### Master’s Programs

- **Exercise Physiology Concentration**
  - Exercise Science 508 (or Health 590), 533, 565, 567, 635, 601 (1 hr seminar, 2 enrollments). Either ES 501 (project) or ES 500 (thesis—must also take a statistics course approved by advisor). Electives approved by advisor from Exercise Science, Nursing, or Nutrition.

- **Biomechanics/Sports Medicine Concentration**
  - Exercise Science 508 (or Health 590), 513, 516, 531, 581 (1-3 cr), 601 (1 hr seminar, 2 enrollments). Either ES 501 (project) or ES 500 (thesis—must also take a statistics course approved by advisor). Electives approved by advisor from Exercise Science, Sports Studies, or Biomedical Engineering.

- **Ph.D. — EDUCATION**
  - Exercise Science Concentration*
    - 15 hours in Exercise Science.
    - 9 hours in an Exercise Science specialization.

- **Biomechanics/Sports Medicine**
  - Exercise Science 508 (or Health 590), 513, 516, 531, 581 (1-3 cr), 601 (1 hr seminar, 2 enrollments).

  - Either ES 501 (project) or ES 500 (thesis—must also take a statistics course approved by advisor). Electives approved by advisor from Exercise Science, Sports Studies, or Biomedical Engineering.

### Admission Requirements

Applicants are required to complete the departmental application which will be sent to all persons upon their initial inquiry about the program. This is in addition to the Graduate Assistant Professor:

Klein, Diane S., Ph.D. ..................... Arizona State University

*The above are viewed as minimum requirements and are subject to modification by the student’s committee.*
Health

The Health and Exercise Science 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 with career interests in the disciplines of health education/promotion, public health, and safety. The Health, Safety, and Exercise Science academic programs emphasize strategies of health promotion (education and lifestyle behaviors) and health protection (regulatory, environmental, and safety) for improving individual and community health and well-being. The faculty are committed to the educational value of community-based service learning, applied research, and community outreach. For more information, http://hss.he.utk.edu.

Ph. D.—HUMAN ECOLOGY

-Community Health 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 the departmental committee.
4. Minimum 6 hours in a cognate area.

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 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, recommendations are required by the 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 38 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 skills 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): 509, 510, 520, 530, 540, 555.
2. Internship (6 hours): 587, 588.
3. Concentration of Study (16 hours).
4. Concentration of Study (14 hours).
5. Minimum 6 hours in a cognate area.

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

Also offered is a coordinated dual program leading to the conferral 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. 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 for the M.S., Department of Health and Exercise Sciences for the M.P.H., and the Public Health Academic Program 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 Society (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 Exercise Science. The department 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 students who withdraw from the program before completion of the requirements for both degrees will not receive credit towards the M.S. or M.P.H. degree 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) and 1 semester hour of Graduate 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.
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. (Same as Biochemistry and Cellular and Molecular Biology 480.)

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

501 Special Project (3) Culminating experience for non-thesis major. Research study suitable for publication, or practicum requiring special written work. S/NC only.

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

508 Research in Exercise Science (3) Research for writing of thesis and institutional review board proposals; presentation of research through free communications and poster presentations; calculation and interpretation of statistics related to common research designs used in research; and use of computer software.

509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nutrition 509, Nursing 509 and Social Work 509.)

513 Biomechanics of Orthopedic Rehabilitation (3) Effect of physical activity on musculoskeletal tissue: flexibility development and measurement, surgical implications, and rehabilitation related research.

516 Therapeutic Exercise (3) Current research in therapeutic exercise: role of nervous system, soft tissue healing, proprioception, muscle activation patterns, and strength.

521 Analytic Epidemiology (3) Epidemiologic strategies for evaluating research questions concerning causes, prevention and treatment of morbidity and mortality. Prereq: Biostatistics 520. (Same as Public Health 520.)

525 Epidemiology of Injury and Violence (3) Epidemiologic methods to describe magnitude and examine etiology of unintentional injury. Alternative approaches for preventing or controlling occurrence of injury and violence in both general population and high risk sub-populations.

531 Biomechanics (3) Biomechanical principles and applications to analyses of human movements. Prereq: General physics.

533 Exercise Physiology (3) Physiology of human performance: acute and chronic effects of exercise on metabolic, cardiovascular, pulmonary, and skeletal systems. Prereq: Human physiology or general physiology, general chemistry, 2 hrs and 1 lab.

541 Special Topics (1-3) Advanced study in selected areas of exercise science. May be repeated.

563 Laboratory Techniques in Exercise Physiology (3) Laboratory course in experimental methodology and instrumentation: respiratory and metabolic measurements, blood chemistry, and gas analysis. Prereq: 480 or 533.

565 Advanced Physiology of Exercise (3) Systematic study of skeletal muscle and metabolism related to acute exercise and physical training: lectures, discussions of major scientific reviews, and appropriate laboratory experiments. Prereq: 480 or 533.

567 Exercise Testing and Prescription (3) Physiological adaptations to exercise training; measurement and evaluation of cardiorespiratory function, body composition, strength, and flexibility. Prereq: Undergraduate courses in human physiology and physiologic of exercise.

569 Clinical Exercise Physiology (3) Cardiac structure and function, interpretation of 12-lead electrocardiograms, exercise considerations for cardiac and pulmonary patients. Prereq: 480 or 533, and 567. (Same as Public Health 569.)

570 Cardiac Rehabilitation Practicum (1-3) Supervised experience in hospital-based exercise programs for participants with cardiac and/or pulmonary disorders. Use of telemetry monitoring, leading safe exercise regimens counseling patients on safe exercise guidelines. Presenting educational class on topic applicable to participants. Prereq: 533 and 567, or consent of instructor. Coreq: 569. May be repeated. Maximum 6 hrs.

581 Biomechanics Instrumentation (1) Kinematic, kinetic and muscle activity measurement of human movements using digital and computerized videography, force platform, electromyography and other relevant instruments. May be repeated. Maximum 3 hrs. S/NC only.

585 Seminar in Gerontology (1) (Same as Counselor Education 585; Nursing 585; Educational Psychology 585; Health 585; Nursing 585; Public Health 585; Social Work 585; Sociology 585.)
Public Health

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.

493 Directed Independent Study (1-3) Individual in-depth study of selected issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

502 Registration for Use of Facilities (1-15) Required for students 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.

509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health as discipline and its interrelation with many other academic and professional disciplines. 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/N only.


520 Public Health Policy and Administration (3) Administrative considerations of community-based health services and public health practice. Health policy formulation, political environment and governmental involvement in health, legal responsibilities, and managerial concepts/techniques/process.

521 Organization Theory and Health Care Delivery (3) Administrative and Organization theory related to health facilities; operation and management of community hospital. Case discussions and problem-solving exercises; supervisory, administrative, and management responsibilities.

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. Problems for home health services, comprehensive medical rehabilitation, nursing homes, congregate living centers and similar type health programs. Prereq: 521 or consent of instructor.

525 Financial Management of Health Programs (3) Financial management concepts and practices applied to health services programs. Fundamentals of budgeting, costing, financing, rate setting, financial reporting and analysis. Opportunities to apply techniques. Prereq: 520 or consent of instructor.

530 Biostatistics (3) Application of descriptive and inferential statistical methods to health-related problems and programs. Microcomputer applications, use and interpretation of vital statistics and introductory research methodology preparatory for first course in epidemiology. Prereq: Introductory statistics or consent of instructor.

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.


550 Principles and Practices of Community Health Education (3) Theoretical foundations for community health education; opportunities for skill development in variety of educational processes; and introduction to community health analysis.

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: 550 or consent of instructor.


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 problem, plan design, evaluation and implementation. Health problems of institutions, communities and selected population groups, appropriate diagnostic programs for addressing needs.

565 Clinical Exercise Physiology (3) (Same as Exercise Science 565.)

580 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic. Maximum 6 hrs.

585 Seminar in Gerontology (1) (Same as Counselor Education 585, Educational Psychology 585, Exercise Science 585, Nursing 585, Social Work 585, 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 for approved extended placements. S/N only.

590 Research Methods in Health (3) (Same as Health 590.)

593 Directed Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

635 Physical Activity and Positive Health (3) (Same as Exercise Science 635.)

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

655 Seminar in Nation’s Health (3) (Same as Health 655.)

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

Safety

GRADUATE COURSES

443 Sports and Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interrelationship in sports injury and control; risk-taking tendencies and legal implications; and contributions of sports medicine to safety. 3 hrs and 2 labs.

452 Safety Principles and Practices (3) General safety principles, policies, standards in occupational and community safety. History and current safety issues, problems 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.

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 fire analysis techniques. Prereq: Senior standing or consent of instructor.

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

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

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

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

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

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.

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.

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 identification and study of problem/issue in safety. Extensive reading and critical analysis of safety literature. Specific proposal to instructor before registration. 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.)

THE DOCTORAL 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 9 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

Twenty-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 followed within one week by a one-hour oral examination with the single grade of pass/fail given at the conclusion of the oral examination. No examination is given on the secondary field.

M.A. Fields

- United States (colonial to present)
- Premodern Europe
- Modern Europe
- Asia

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 MASTER’S 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. Spend two consecutive semesters in residence.

3. 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.

4. Fulfill the foreign language requirement.

5. 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).

6. Maintain a 3.0 overall grade-point average in graduate work attempted.

7. Complete 24 hours of graduate coursework (21 hours graded A-F) at UT beyond that required for the M.A. Up to 6 hours may be taken outside of the department.

8. 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 may specify any other languages or research tools, such as statistics, 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, he or she may retake the exam one time only and must do so the following semester.

Comprehensive Examination

The comprehensive examination consists of a written exam (Group I) and an oral exam (Group II) and must be taken no later than the semester following the semester in which the student completes the residence, coursework, and language requirements (summer excluded). Failure to take the comprehensive examination within the required time will be counted as a failure on the examination. No student will be permitted to take the comprehensive examination unless he or she has passed the Group III examination (see above) and has an overall grade-point average of at least 3.0. Qualified students will be examined in one field selected from the Group I list.
Methodology, assumptions and methods of historians. Required of 510 Foundations of Graduate Study in History (3) not be used toward degree requirements. May be and/or faculty time before degree is completed. May

GRADUATE COURSES

502 Registration for Use of Facilities (1-15) P/NP only.

GROUP II fields:

United States

American Political

European

Military and Foreign Relations

Social and Cultural

National Fields

Group III (Examined Teaching Field): World History 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

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

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

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

511 Teaching World History (3) Methodology, conceptualization, historiography, text-book selection and syllabus construction to prepare students to teach courses in world 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 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 U.S. social and economic history. Focus varies. May be repeated. Maximum 15 hrs.

556 Topics in European Social and Economic History (3) Reading seminar: secondary sources on social or economic history of European nations. Focus varies. May be repeated. Maximum 15 hrs.

557 Topics in Cultural and Intellectual History (3) Reading seminar: secondary sources on cultural and intellectual history. Focus varies. May be repeated. Maximum 15 hrs.

558 Topics in United States Regional and Local History (3) Reading seminar: secondary sources on regions, states and cities of the South. Focus varies. May be repeated. Maximum 15 hrs.

559 Topics in Jewish History (3) Reading seminar: secondary sources on Jewish history. Focus varies. May be repeated. Maximum 15 hrs.

561 Topics in Latin American History (3) Reading seminar: secondary sources in Latin America. Focus varies. May be repeated. Maximum 15 hrs.

562 Topics in Asian History (3) Reading seminar: secondary sources on Asian history; East Asia and Middle East. Focus varies. May be repeated. Maximum 15 hrs.

560 Topics in History (3) Reading seminar: secondary sources for new topics. Focus varies. May be repeated. Maximum 15 hrs.

585 Topics in World History (3) Reading seminar in transnational themes involving analysis of two or more world cultures. Focus varies. May be repeated. Maximum 9 hrs.

580 Topics in History (3) Reading seminar: secondary sources for new topics. Focus varies. May be repeated. Maximum 15 hrs.

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

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

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

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

621 Directed Readings (3) Directed readings to prepare candidate for doctoral comprehensive examination. May be repeated. Maximum 1 per doctoral field. S/NC only.

632 Seminar in Modern European History (3) Research seminar in primary sources culminating in scholarly paper in modern European history. Focus varies. May be repeated. Maximum 15 hrs.


651 Seminar in Military and Foreign Relations History (3) Research seminar in primary sources culminating in scholarly paper in military or foreign relations history. Focus varies. Not restricted by national grouping. May be repeated. Maximum 15 hrs.

658 Seminar in United States Regional and Local History (3) Seminar research in primary sources culminating in scholarly paper in regional and local history. Focus varies. May be repeated. Maximum 15 hrs.

Human Ecology

(117)

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

The College of Education, Health, and Human Sciences offers the Doctor of Philosophy in Human Ecology with concentrations in the following:

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Child and Family Studies

Community Health

Hospitality and Tourism Management

Nutrition Science

Retail and Consumer Sciences

Further information on the on the above concentrations is available in the Fields of Instruction (i.e., academic departments) section of this catalog.

Application Process

Individuals seeking admission to the Ph.D. in Human Ecology must be first admissible to The University of Tennessee (see Graduate Studies: Admission Requirements section of this catalog) and then admitted to a concentration within the Ph.D. in Human Ecology. Prospective students are encouraged to make application at least 6-months before anticipated matriculation. Applications are reviewed February 1, June 1, and November 1.

Overview of Program

A major challenge of the doctoral program is to draw upon basic research generated by the natural sciences, humanities, and social sciences so as to provide a holistic perspective that contributes to the improvement of
both individuals and families. The Ph.D. is a research degree granted only to individuals who demonstrate proficiency in conducting original research. Course requirements are determined by each student’s faculty committee and are based on the needs and interests of that particular student, as well as department and College requirements. Further information is available in the Fields of Instruction (i.e., academic departments) section of this catalog and online at http://cehs.utk.edu/main.html.

GRADUATE COURSES

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

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

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

520 Directed Study in Human Ecology (1-3) Integrative 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.

Human Resource Development
(Graduate Program)

MAJORS DEGREES

Business Administration ....................... Ph.D.
Human Resource Development .......... M.S.

Michael Lane Morris (Liaison), Director

Associate Professors:
Kupritz, Virginia, Ph.D. ................. Virginia Tech
Morris, Michael Lane,
Ph.D., CFLE .......................... Tennessee
Stout, Vickie J., Ed.D. ............. Tennessee

Assistant Professors:
Bartley, Sharon, Ph.D. ............. Tennessee
Lim, Doo, Ph.D. ..................... Illinois
Pierce, Randal, Ph.D. .......... Ohio State

Lecturer:
Mackey, Debbie L., Ph.D. .......... Tennessee

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.

Admission Requirements

Applications for admission should request information and application forms from both the Office of Graduate and International Admissions (218 Student Services Building) and the Human Resource Development Program (408 Stokely Management Center, The University of Tennessee, Knoxville, Tennessee, 37996).

Applications are to submit an application for admission to Graduate Admissions. Additionally, applicants are to submit an application, three letters of reference from individuals familiar with their potential for success in academic work, and a statement describing personal career objectives directly to the Human Resource Development Program. Applicants must hold a bachelor’s degree from an accredited institution and present evidence of ability to do graduate work, including a GPA of 3.0 or a 4.0 scale for the last two years of undergraduate work. Any student below this level of academic quality must justify admission via other exceptional credentials. If the applicant has prior work experience in human resource development, a reference letter should also be provided by the work supervisor. Applicants without an undergraduate degree in an area related to human resource development, previous HR employment experience, or a statistical background may be required to complete additional course work as part of their program. Recent Graduate Record Examination scores are required of all applicants. Minimum GRE composite scores (quantitative and verbal) of 1000 are required. Deadline: New students are admitted in fall semester only. Applications must be received by March 1.

Degree Requirements

The HRD Master’s degree program is a 39 hour non-thesis program. All students must take the program core of 18 hours consisting of HRD 510 (Foundations of Human Resources), HRD 556 (Organizational Development Strategies), HRD 557 (Design Strategies), HRD 559 (Evaluation Strategies), HRD 561 (Strategic Human Resource Development), and HRD 563 (Organizational Communication Strategies). In addition to the program core, all students must complete Management 521 (Human Resource Management) and 6 hours of 400 and/or 500 level courses in human resource management. For the remaining 12 hours, students will select 4 out of the 5 following courses: HRD 511 (Issues and Trends in Human Resource Development); HRD 517 (Career Development); HRD 518 (Human Performance Improvement Systems and Technologies); HRD 519 (Human Resource Problems); or HRD 520 (Collaborative Strategies in Human Resource Development).

THE PH.D. PROGRAM

Admission Requirements

Applications for admission should request information and application forms from both the Office of Graduate Admissions, 218 Student Services Building, and the Human Resource Development Program, 408 Stokely Management Center, The University of Tennessee, Knoxville, Tennessee, 37996.

Applications are to submit an application for admission to Graduate Admissions. Additionally, applicants are to submit an application, 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 directly to the Human Resource Development Program. Deadline: New students are admitted in fall semester only. Applications must be received by the Graduate Admissions Office and Human Resource Development Program by March 1.

Applicants must hold a master’s degree from an accredited institution and present evidence of ability to do Ph.D. work, including having maintained a graduate GPA of 3.3 on a 4.0 scale or better. Applicants without a graduate degree in an area related to human resource development may be required to complete additional course work as part of their program. If the applicant has prior work experience in human resource development, human resource management, or a related occupational area, a reference letter should be provided by the work supervisor. Graduate Record Examination scores are required of all applicants. Minimum GRE composite scores (quantitative and verbal) of 1100 are required.

Any person whose native language is not English must submit results of the Test of English as a Foreign Language (TOEFL). A minimum score of 600 is required for admission consideration.

Course Requirements:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRD Core</td>
<td>18</td>
</tr>
<tr>
<td>HRD 510 (Foundations of Human Resources)</td>
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<tr>
<td>HRD 556 (Organizational Development Strategies)</td>
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<tr>
<td>HRD 557 (Design Strategies)</td>
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<td>HRD 559 (Evaluation Strategies)</td>
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<td>HRD 561 (Strategic Human Resource Development)</td>
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<td>HRD 563 (Organizational Communication Strategies)</td>
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<tr>
<td>HRM Core</td>
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<tr>
<td>Management 521 (Human Resource Management)</td>
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<tr>
<td>Select two additional 400/500 level courses from human resource management</td>
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<tr>
<td>HRD Electives</td>
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<tr>
<td>Select 4 out of the 5 following courses:</td>
<td></td>
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<tr>
<td>HRD 511 (Issues and Trends in Human Resource Development)</td>
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<tr>
<td>HRD 517 (Career Development)</td>
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</tr>
<tr>
<td>HRD 518 (Human Performance Improvement Systems and Technologies)</td>
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<tr>
<td>HRD 519 (Human Resource Problems)</td>
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</tr>
<tr>
<td>HRD 520 (Collaborative Strategies in Human Resource Development)</td>
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<tr>
<td>Total</td>
<td>39</td>
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</table>
Degree Requirements
The Doctor of Philosophy degree is 60 hours with a major in Business Administration and a concentration in Human Resource Development for graduate students who seek careers in higher education or as managers/administrators of HRD. The curriculum is designed to enable students to achieve professional objectives, develop needed competencies, and gain desirable experiences and understandings of human resource development. Students not possessing a master's degree before acceptance to the program may be required to complete additional course work before enrolling into any courses associated with the doctoral program. 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 HRD Courses.

Research Core, and Business Core; students who did not complete a thesis in their Master's program must complete a pre-doctoral research project prior to beginning dissertation work and must pass a comprehensive examination; and must pass a final oral examination on their dissertation research. Detailed information regarding the Ph.D. concentration program of study may be obtained from the Program Liaison.

Note: For latest update, check the homepage of the Human Resource Development Program through the College of Business Administration's web site.

Course Requirements:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>HRD Core</td>
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<tr>
<td>HRD 602 (Seminar in Human Resource Development-Fall 1st Year)</td>
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<tr>
<td>HRD 603 (Seminar in Human Resource Development-Spring 1st Year)</td>
<td>3</td>
</tr>
<tr>
<td>HRD Seminars</td>
<td>9</td>
</tr>
<tr>
<td>Students consult with doctoral advisor and committee to select 3 courses</td>
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</tr>
<tr>
<td>HRD 605 (Seminar in Organization Theory and Environmental Context)</td>
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</tr>
<tr>
<td>HRD 606 (Research in Human Resource Development)</td>
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<tr>
<td>HRD 607 (Seminar in Communication Processes)</td>
<td>3</td>
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<td>HRD 608 (Seminar in Work/Life Interface Issues)</td>
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<tr>
<td>HRD 609 (Seminar in Technological Frameworks for Human Resource Develop)</td>
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</tr>
<tr>
<td>HRD 613 (Seminar in Selected Topics)</td>
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<tr>
<td>Research Core</td>
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<td>Statistical Principles (Statistics 531-532 or Statistics 537-538 or equivalent)</td>
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<td>Advanced Statistics (Statistics 579) or (I/O Psychology 627)</td>
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<tr>
<td>Seminar in Research Methods (Marketing 612)</td>
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<td>Business Core</td>
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<tr>
<td>Seminar in Theoretical Foundations (Marketing 611)</td>
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<td>International Management (Management 571)</td>
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<td>Proseminar in I/O Psychology (Industrial/Organizational Psychology 568)</td>
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<td>Dissertation</td>
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</tbody>
</table>

GRADUATE COURSES

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

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

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

509 Implementation of HRD Systems (3) The intern provides experiential learning for students who come to HRD without practical real world experience. The internship is an opportunity to apply classroom knowledge, obtain additional human resource experience, and reflect on the knowledge and experience. The corporate experience provides additional human resource knowledge and assists the student in research and career advancement. Prerequisite: HRD 510 (Foundations of Human Resources).

510 Foundations of Human Resources (3) Students develop a working definition and understanding of the foundations that grid the academic discipline and profession of Human Resources. Students develop knowledge of the historical, theoretical, and philosophical foundations as well as the core models of learning, performance, change and management that promote best practices in the field. Students are introduced to the disciplines of training and development, human resource development, and management including HRM goals and activities.

511 Issues and Trends in Human Resource Development (3) Study of current, emerging, and future issues and trends in Human Resource Development (HRD) research and practice. Linking research and practice, importance of theory to inform practice, research needs reflected in practice, cycle of how researchers and practitioners learn, how they design practice, and how they evaluate to inform policy. Prerequisite: HRD 510 (Foundations of Human Resources).

513 Special Topics in Human Resource Development (1-3) Topics vary in research, theory and current issues in Human Resources. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs.

514 Individual Study in Human Resource Development (3) Prerequisite: Consent of supervising instructor. Approval form must be filed in office of the Program Liaison. May be repeated. Maximum 6 hrs.

517 Career Development (3) Examination of processes and practices that facilitate the individual’s leadership development, performance improvement and career goals in relation to the organization’s present and future human resource needs, including identification of personal responsibilities and organizational opportunities through successful career development systems.

518 Performance Improvement Systems and Technologies (3) Provides studies of concepts, strategies, tools, and trends of performance improvement technologies. Major emphasis will be on the planning, facilitating, and implementation of performance technologies that support HR functions and facilitate their value to organizations. Prerequisite: HRD 510 (Foundations of Human Resources).

519 Human Resource Problems (3) Accommodates experiential learning for students who have a background in human resource development (HRD). In an employment context, students identify, analyze, design, develop, implement, and evaluate a practical HRD intervention. Prerequisites: HRD 510 (Foundations of Human Resources) and HRD 511 (Issues and Trends in HRD).

520 Collaborative Strategies in HRD (3) Examines the strategies for collaboration and teambuilding within organizational systems. The course assists HR professionals understand processes associated with teambuilding including defining types of teams, ranking and evaluating team performance, operating principles and communication within teams. The primary focus of this course is to enable students to facilitate organizational and individual performance. Prerequisite: HRD 563 (Organizational Communication Strategies).

555 Organizational Development Strategies (3) Overview of the roles, strategies, and challenges of organizational development with a focus on the dynamics of organizational development and the internal integration of organizational culture in a global context. Co-requisite: HRD 510 (Foundations of Human Resources).

557 Design Strategies (3) Design methodology for business and industry, focus on instructor-based, technology-based, and self-directed training for training and development and consulting. Co-requisite: HRD 510 (Foundations of Human Resources).

559 Evaluation Strategies (3) Evaluation strategies for professional settings. This course examines the importance of evaluation, how to conduct appropriate evaluations, instrumentation and analysis strategies, how to assess the return-on-investment, and guidelines for creating an evaluation report. Prerequisite: HRD 557 (Design Strategies).

561 Strategic Human Resource Development (3) Overview of how human resource development (HRD) increases organizational competitive advantage. Human capital theory, systems theory and systems integration emerge as theoretical frameworks for linking HRD with business strategy and in strategic initiatives. Value creation for HRD stakeholders, management of HRD resources, and continuous improvement in HRD are discussed and illustrated. Students explore the role of HRD in organizational visioning, planning, leadership development, innovating, and performance development. Co-requisite: HRD 510 (Foundations of Human Resources).

563 Organizational Communication Strategies (3) Students investigate organizational communication theory, purposes, channels, practices, styles, approaches, skills, and tools. Process improvement strategies span internal, and external communication and target oral, written, and nonverbal communications that occur in face-to-face, technology-mediated, and blended organizational communication contexts.

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

602 Proseminar I in Human Resource Development (3) Basic thought, concepts, and issues required for advanced graduate study in human resource development. Prerequisite: Consent of instructor for non-HRD students.

603 Proseminar II in Human Resource Development (3) Basic thought, concepts, and issues required for advanced graduate study in human resource development. Must be taken during first year of study in program. Consent of instructor for non-HRD students.

605 Seminar in Organizational Theory and Environmental Context (3) Students study how the elements and approaches, skills, and tools. Process improvement strategies span internal, and external communication and target oral, written, and nonverbal communications that occur in face-to-face, technology-mediated, and blended organizational communication contexts. Prerequisites: HRD 502 and HRD 503 (Proseminars I and II in Human Resource Development).

606 Research in Human Resource Development (3) Theory and application of qualitative approaches to social science and human resource development research. Emphasis is on ethnographic and in-depth interviewing of behaviors and beliefs of people in natural settings. Use of methods: structured interviews using heuristic elicitation methodology, participant observation, and case studies. Prerequisites: HRD 602 and 603 (Proseminars I and II in Human Resource Development).

607 Seminar in Organizational Communication Processes (3) Students study how the elements and approaches, skills, and tools. Process improvement strategies span internal, and external communication and target oral, written, and nonverbal communications that occur in face-to-face, technology-mediated, and blended organizational communication contexts. Prerequisites: HRD 602 and 603 (Proseminars I and II in Human Resource Development).
ADMISSION REQUIREMENTS

Applicants for admission should request information and application forms from both the Office of Graduate Admissions (218 Student Services Building) and the Director, Industrial and Organizational Psychology Program, (408 Stokely Management Center, The University of Tennessee, Knoxville, Tennessee 37996-0545).

Two separate applications must be completed: one Graduate Application for Admission (apply for major in Industrial and Organizational Psychology) and one application for admission to the Industrial and Organizational Psychology program.

Deadline: New students are admitted in fall semester only, and applications must be received by Graduate Admissions by February 1.

The master’s degree in Industrial and Organizational Psychology is generally not required of individuals pursuing a doctoral degree.

General Requirements

At least one year of college mathematics and one course in statistics are required. 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 each section of the general portion (verbal and quantitative) of the Graduate Record Examination (GRE) are required. Customarily, those 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 with 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 applied 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: Hours

I/O Psychology Core 657, 568, and 569
Research Core 12
Statistical Principles (Statistics 537 and 538 or equivalents)
Multivariate Statistics (Statistics 579, 679 or equivalent)
Advanced Research Methods (605 or equivalent)

General Psychology Core 9
One course in each of the following areas: biological bases of behavior, cognitive bases of behavior, history and systems of psychology.
I/O Psychology Seminars 600 level IOPSY courses, from a program committee approved list.
Approved Electives 9
Supervised practicum, internship, or field training (690)
Ethics (635 or equivalent) 3
Dissertation (600) 24
TOTAL 90

GRADUATE COURSES

502 Registration for Use of Facilities (1-15)
Requi-rements 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.

525 Research in Industrial/Organizational Psychology (1-3) Available only to students admitted to program or by prearrangement with program director. May be repeated. Maximum 6 hrs. S/NC or letter grade.

567-68 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.

569 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.

605 Advanced Research Methods in Psychology (3) Critical analysis of new and evolving techniques for psychological research; new statistical and psychometric methods.

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 psychology of 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 difference and social-cognitive biases as basis for measuring personality.

635 Ethical and Professional Issues in Industrial/Organizational Psychology (3) Issues involved with ethical practice 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.
Industrial Engineering
(Chapter of Engineering)

MAJOR DEGREES

Industrial Engineering .......... M.S., M.S.-MBA

Badiru, A.B., Head

Professors
Badiru, A.B. (Head), Ph.D. ..... Central Florida, P.E.
Ding, F., Ph.D. .......... North Carolina State
Garrison, G.W. (UTSI), Ph.D. .. North Carolina State

Associate Professors
Aikens III, C.H., Ph.D. ...... Tennessee, CPEng.
Hailey, M.L. (UTSI), Ph.D. .... Texas Tech, P.E.
Jackson, D.F., Ph.D. ........... Tennessee, P.E.
Liggett, H.R., Ph.D. ...... North Carolina State
Sawhney, R.S., Ph.D. .............. Tennessee

Assistant Professors
Coleman, G.D. (UTSI), Ph.D. .......... Virginia Tech, P.E.
Ford, R.E., Ph.D. ................. Tennessee
Kim, D., Ph.D. .................. Florida
Kong, D., Ph.D. ................. Penn State

Research Faculty and Staff
Halstead, P.D., B.S. .............. State University of New York
Cook, E.M. ...........................................

The Department of Industrial Engineering offers a graduate program leading to the Master of Science degree with a major in Industrial Engineering, concentrations in traditional industrial engineering, engineering management, human factors engineering, manufacturing systems engineering, and product development and manufacturing. The Ph.D. with a major in Engineering Science is available through the Department of Mechanical, Aerospace, and Biomedical Engineering with a concentration in industrial engineering.

ADMISSION REQUIREMENTS

Applicants must first submit a formal Graduate Application for Admission. In addition to the minimum requirements of the Graduate Council, the Department of Industrial Engineering requires the following:
1. Three rating forms or letters of reference;
2. GRE scores; and
3. Essay (two double-spaced pages—contact department for current topic). The graduate committee in the department sets any prerequisite courses or other measures that apply to the particular situation of the applicant. The department and the Office of Graduate Admissions must be notified of any change in the entering date after admission has been granted.

THE MASTER'S PROGRAM

Students who enroll in the Master of Science degree may select a concentration in industrial engineering, engineering management, product development and manufacturing, or manufacturing systems engineering. Each of these concentrations, with the exception of the product development and manufacturing, allows a student to select either a thesis or non-thesis option. Students who select the manufacturing systems engineering concentration of the dual degree program must select the non-thesis option. The thesis option requires 27 hours of coursework and 6 hours of thesis. The non-thesis option requires 30 hours of coursework and a 3-hour design project; the engineering management concentration requires an additional 3 hours.

Industrial Engineering

Depending upon a student's background and career objectives, graduate work in industrial engineering enables the student to select an area of specialization from operations research, human factors engineering, information systems engineering, maintenance and reliability engineering, or general industrial engineering.

Engineering Management

The engineering management concentration has an additional admission requirement of two years relevant experience as a practicing engineer or scientist. This concentration is fully supported off-campus utilizing electronic media for videotaping and interactive distance teaching methods.

Human Factors Engineering

Human factors engineering is concerned with ways of designing jobs, machines, operations, and work environments so they are compatible with human capacities and limitations. The human factors practitioner, operating within an industrial or service environment, is called upon both to apply existing human performance knowledge to the design or modification of work and workplaces and also to generate new experimental data required for system design and evaluation.

Manufacturing Systems Engineering

Under the manufacturing systems engineering concentration, students learn strategies for improving product quality, 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

The 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.

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 Office of Graduate Admissions 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 Graduate Admissions 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 coursework 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 teamwork assignments.

Curriculum for Dual M.S.-MBA Degree

August—First Year

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<tr>
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<th>Course Title</th>
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Fall—First Year

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<td>MBA Core II</td>
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supervising doctoral research and dissertation work. The IE graduate committee administers the program within the department. Admission to the Ph.D. program requires an undergraduate degree and academic background that meets the admission criteria for the master’s program in industrial engineering or a master’s degree in industrial engineering (or a closely related field), and previous academic performance that clearly demonstrates the capacity to do original research and technical investigative work and the potential for a successful scholarly career. If admitted, prerequisites (if required) will be established by the graduate committee based on the student’s academic background. All students are required to take the Graduate Record Examinations (GRE), and submit three letters of reference and a personal statement about their professional goals. International students are also required to take the Test of English as a Foreign Language (TOEFL).

The College of Engineering offers a certificate program in maintenance and reliability engineering. The program is designed primarily for part-time students in that several of the courses are available through distance education. The 12-credit certificate is earned by completing 483 and 484, which are cross-listed among all participating departments in the College of Engineering, plus two elective courses selected from a list of courses provided by the participating departments. Currently, the available elective courses are Industrial Engineering 516 and 591, Mechanical Engineering 534 and 599, and Nuclear Engineering 579 and 585. The selection of elective courses is determined through an advising conference with each individual student, and is based on the student’s personal interests, academic background, and work experience. Applicants must meet the minimum criteria established by the Graduate Council.

CERTIFICATE IN MAINTENANCE AND RELIABILITY ENGINEERING

The doctoral degree candidate must satisfy the curriculum and graduation requirements of the engineering major being pursued and the requirements of the participating departments. 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.

Approved Dual Credit

A maximum of 15 semester hours of the common program courses completed in the College of Engineering may be counted toward the M.B.A degree program.

DOCTORAL DEGREE

The Doctor of Philosophy (Ph.D.) degree with a concentration in industrial engineering (IE) is available through the Department of Mechanical, Aerospace, and Biomedical Engineering (MABE). The faculty of the Department of Industrial Engineering have the responsibility for administering the program including admission of students, course requirements, administering the qualifying and comprehensive examinations, and industrial engineering

GRADUATE COURSES

Note: Any 400-level course required in the Bachelor of Science in Industrial Engineering program at UT may not be used for graduate credit in the M.S. degree program.


403 Production Facilities Design and Material Handling (3) Design of production facilities: plant layout, analysis and planning for overall moving, packaging and storage of materials. Office layout and service areas. Design of facilities for such diverse groups as hospitals, banking, industry. Prereq: 306.

405 Engineering Economic Analysis (3) Engineering economy and application in engineering practice. Time-value of money and discounted cash flow techniques. Decision among engineering alternatives, design options, equipment selection, break-even points, and similar situations. Cost estimating and consideration of taxes and inflation. Analyzing uncertainty in economic estimates using nonprobabilistic techniques. Prereq: Junior standing or consent of instructor.

421 Information Systems Analysis and Design (3) Systems engineering approach to analysis, design, development, and implementation of systems of information. Informational requirements of industrial engineering systems. Utilization of relevant software packages. Prereq: Senior standing or consent of instructor.

Note: Any 400-level course required in the major discipline may not be used for graduate credit in the other degree program.

422 Senior Industrial Engineering Problems Analysis (3) Application of industrial engineering to field assignments in local organizations. Problem definition, analysis and presentation. Prereq: Expected term of graduation or consent of instructor.


440 Process Improvement Through Planned Experimentation (3) Fundamentals of continuous improvement and advanced statistical process control techniques, and strategies for short production runs. Use of experimental design techniques to improve processes: single and multiple-factor designs, blocking and confounding, and fractional designs. Full factorial designs compared to fractional designs to balance experimental efficiency with loss of information. Lab component utilizes statistical and simulation software to provide hands-on experience. Prereq: 300 Engineering Data Analysis and Process Improvement.

483 Introduction to Reliability Engineering (3) (Same as Nuclear Engineering 483, Chemical Engineering 483, and Mechanical Engineering 483.)

484 Introduction to Maintenance Engineering (3) (Same as Nuclear Engineering 484, Chemical Engineering 484, Materials Science and Engineering 484, and Mechanical Engineering 484.)

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

501 Design Project (1-3) Enrollment limited to industrial engineering students in non-thesis project. May be repeated. Maximum 6 hrs. S/NC only.

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

503 Industrial Engineering Methods Review (3) Survey of industrial engineering tools and techniques applied to analysis, design, and improvement of manu-
facturing systems. Required of dual degree students who do not have an undergraduate degree in industrial engineering. May not be counted toward degree requirements. Prereq: Admission to dual MS-MBA program. S/N/C only.

504 Product Development Process (1) (Same as Mechanical Engineering 504).

506 Product Selection and Evaluation (2) (Same as Mechanical Engineering 506).


509 Multidisciplinary Project (1) Venue for multidisciplinary student teams to coordinate design and manufacturing tasks of product to be developed. Project management (budget and schedule), assignment of tasks for team members, and concurrent design and manufacturing. Design concepts and product features reviewed by potential customers/investors. Prereq: Admission to dual MS-MBA program. May be repeated. Maximum 3 hrs. (Same as Mechanical Engineering 509).

511 Business Planning and Commercialization (3) Complex issues of product development and business planning required to deliver new product from concept to market. Risk issues that emerge during product development cycle, beginning with concept to product development to commercialization to eventual product introduction or dismissal. Management practices for successful product development and product management. Prereq: Consent of instructor.

512 Process Development and Market Feasibility (3) Manufacturing process technologies available to cost-effectively produce specific new products that have been identified and designed. Product cost estimating, estimating capital cost requirements and justification, capacity analysis, layout and design of facilities, identification of potential suppliers, and finalization of business plan. Prereqs: 511 and 524.

513 Facilities Planning and Design (3) Modern materials handling techniques, computer-aided layout techniques, software for generation research models, and use of these to design manufacturing facility. Prereq: Production Facilities Design and Material Handling 512.

514 Advanced Information Systems Analysis and Design (3) Systems analysis and systems control concepts applied to systems of information. Role of IE in office and factory of future. Management support systems, decision support systems, and integrated support systems.

515 Advanced Production and Inventory Systems (3) Advanced topics in production planning and inventory systems. Material requirements planning; production planning and master scheduling; just-in-time concepts; distribution requirements planning; and other selected topics. Prereq: 402 or consent of instructor.

516 Statistical Methods in Industrial Engineering (3) Application of classical statistical techniques to industrial engineering problems. Statistics and statistical thinking in managerial context of organizational improvement; descriptive statistics and distribution theory; relationship between statistical process control techniques and classical statistical tools; parameter estimation and hypothesis testing; goodness-of-fit testing; linear regression and correlation analysis; analysis of variance; single and multiple factor experimental design. Prereq: Probability and Statistics for Scientists and Engineers, or equivalent.


518 Advanced Engineering Economic Analysis (3) Application of engineering economic analysis in complex decision situations and product changes; uncertainty evaluation using nonprobabilistic techniques; capital financing and project allocation; evaluation involving equipment replacement, investor-owned utilities, and public works projects; probabilistic risk analysis including computer simulation and decision trees; multi-attribute decision analysis; and other advanced topics. Prereq: 515 and Probability and Statistics for Scientists and Engineers, or equivalent.

519 Human Factors Engineering and Ergonomics (3) Application of human factor and ergonomic concepts to design factory-instituted products and systems. Human as biomechanical system; human information processing; minimization of human error; anthropometry; anatomy and physiology; physical and mental workload; effects of environmental factors; temperature, lighting, weightlessness, and vibration on humans; manual materials handling and system design; human display design and control; human factors in automation; design of displays and controls; human tool design; and cumulative trauma injuries. Prereq: Probability and Statistics for Scientists and Engineers, or consent of instructor.

520 Human Factors and Product Safety Engineering (3) Role of human factors and safety engineering in legal implications in product design, product liability, system safety, and system failure analysis. Product testing, reliability, and system safety analysis techniques. Case histories of accident investigations, reconstruction, cost of liability litigation. Prereq: 519 or consent of instructor.

521 Advanced Human Factors Engineering Methodology (3) Advanced methodologies used in human factors engineering. Observational methods; function task analysis; computerized human factors design methods; human reliability and error prediction; evaluation of human-machine interface; modeling techniques; questionnaire and survey design; experimental design, and other selected topics. Prereq: 519 or consent of instructor.

522 Optimization Methods in Industrial Engineering (3) Classical optimization applied to constrained and unconstrained, non-linear, multi-variable functions; search techniques; decision making under uncertainty; game theory; and dynamic programming. Prereq: Operations Research or Engineering Management 537.

523 Mathematical Programming (3) (Same as Management Science 531.)

524 Advanced Integrated Manufacturing Systems (3) Different types of manufacturing systems. Integrated application of numerical control and automation, design, and management in layouts to be used in manufacturing. Process planning for discrete products, measurement and reverse engineering principle, and other selected topics. Prereq: 401 and 508, or consent of instructor.

525 Systems Modeling and Simulation (3) Modeling of discrete systems using current simulation software and Monte-Carlo simulation. Problem definition, input distribution, output data analysis, model validation and verification, variance reduction techniques, animation of models, and design of simulation experiments. Case studies in various domains of 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 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: Systems Modeling or 525. (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 651.)


607 Advanced Topics in Industrial Engineering (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 competence in major academic area. Prereq: Enrollment in engineering management. May be repeated. Maximum 6 hrs. S/N/C only.

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

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 Management (3) Principles of engineering management, including; leadership, management processes in engineering economy, motivation, and performance management, organizational behavior, and diversity. Systems thinking, learning organizations, and systems dynamics modeling. Principle application to work settings and case studies.

534 Financial Management for Engineering Managers (3) Financial and managerial accounting in engineering; capital budgeting techniques in investment decision making, income and balance sheet analysis, cash flow, and capital budgeting decisions; capital budgeting, financing, and capital structure decisions. Prerequisites: Consent of instructor.

535 Management of Technology (3) Creativity and innovation; incorporation of advanced technology equipment; application of systems thinking; new methodologies in business and manufacturing organizations;
justifying technology; assimilating and managing change; 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; resource and cost estimating; and project planning, organizing, and controlling; network diagrams and other techniques. Role of project manager: team building, conflict resolution, and contract negotiations. 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 systems: 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 mechanical or chemical which enter into successful establishment of manufacturing or service enterprise. Organizational and financial planning and evaluation, Cost and location studies and market 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 Industrial Engineering 518 or consent of instructor.


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

Information Sciences

College of Communication and Information)

MAJOR

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

Elizabeth Aversa, Director

Professors:
Aversa, Elizabeth, Ph.D. ............... Drexel
Tenopir, Carol, Ph.D. ................. Illinois

Associate Professors:
Bilal, Dana, Ph.D. ..................... Florida State
Pemberton, J. Michael, Ph.D. ......... Tennessee
Pollard, Richard, Ph.D. ............... Brunel (UK)
Raber, Douglas, Ph.D. ................. Indiana
Robinson, William C., Ph.D. ........ Illinois
Wang, Peiling, Ph.D. ................... Maryland
Watson, Jinx, Ed.D. .................Vanderbilt

Whitney, Gretchen, Ph.D. .......... Michigan

Assistant Professors:
Abright, Kendra, Ph.D. ............... Tennessee

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 with 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 plan for the future of the School of Information Sciences states that “The School of Information Sciences will be recognized nationally and internationally as an interdisciplinary program of excellence in the information sciences. Graduates of the School’s programs will be knowledgeable, skillful, and ethical users of information and information technology in their educational, professional, and personal endeavors. They will be well prepared for further study and inquiry, for leadership in the information professions, and for enlightened participation in a global information society. The School’s graduates will recognize their responsibilities to contribute new knowledge and to engage in lifelong learning in the field.”

The vision for the future of the School will be realized through
Excellent teaching
Innovative research and
Distinguished service.

To achieve distinction in teaching, research, and service, the School is committed to:
- a forward-looking curriculum that embraces diversity in intellectual approaches to knowledge, skills, and values,
- a highly competent and visible faculty, a highly competent, effective staff, and an academically able and diverse student body,
- extensive partnerships within higher education and professional communities in both private and not-for-profit sectors, service to the State of Tennessee and to the region,
- the exemplary use of state-of-the-art information technologies in both academics and administration,
- exceptional support, and collaborative and inclusive governance.

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 MS 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 Science involves a total of 42 semester hours of graduate courses including 5 hours required 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, web page 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 sections.

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 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 595. 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 a master’s degree in Information Sciences and a Tennessee State Department of Education license as a School Library Information Specialist.

Initial Endorsement for Non-Licensed Teachers with a Master’s Degree in Library or Information Sciences:

For those students who hold an ALA-accredited master’s degree and have approval of the faculty advisor, the requirements are a maximum of 24 hours within the School’s program, including the required 595. In addition, students must complete two corequisite courses from the College of Education (5 credit hours) beyond the required 24 hours. Upon completion of the requirements, students will earn a Tennessee State Department of Education license as a School Library Information Specialist.

Graduate Program Requirements Thesis Option:

Students electing the thesis option must write a master’s thesis under close supervision of a thesis committee. Six hours of Thesis (IS 500) must be taken within the 42 hours required for graduation. (Students may register for 500 for a maximum of 500, but only 6 hours will count toward graduation.) Students must be registered 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.

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 experience is also required which must be completed in one of the student’s last two terms with a grade of B or better (except as noted below). Students may elect the following and approved by the student’s advisor: 590 Problems in Information Sciences, 591 Supervised Readings in Information Sciences, 592 Seminar in Information Sciences, 593 Independent Study, 594 Graduate Research Participation (S/NC only), 595 Student Teaching in School Library Information Center (S/NC only), 596 Student Teaching and Observation in School Library Information Center (S/NC only), 599 Practicum (S/NC only).

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. Similar opportunities exist with some other libraries and information agencies in the Knoxville area.

Work opportunities in a scientific-technical environment are available through subcontracts 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 a stipend and require that recipients work 10 hours per week in the school.

For application forms and information about financial aid and other information about the M.S. in Information Sciences, write to Admissions, School of Information Sciences, University of Tennessee, 451 Communications Building, Knoxville, Tennessee 37996-0341.

GRADUATE COURSES

430 History of the Book (3) History of writing and various methods of bookmaking.
450 Writing About Science, Technology and Medicine (3) (Same as Journalism 450.)
485 Introduction to Electronic Communications and Information Resources on the Internet (3) Exploration of worldwide information and communications resources: email, newsgroups, and world wide web. Discussion of information issues: copyright, censorship, privacy and access.
486 Advanced Electronic Communications and Information Resources on the Internet (3) Exploration of advanced information and communications issues, resources and tools: forms, scripting and search engines. Prereq: 485 or consent of instructor.
490 Information Environment (3) Generation, production, manipulation, and use of information. Roles of information in society, information seeking and user behavior, information industry, economics of information products and services, technological and organizational change, information processes, and issues.
500 Thesis (1-15) P/NP only.
502 Registration and Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.
520 Organization and Representation of Information (3) Principles of organizing, describing, and indexing intellectual works; current approaches: citation systems, descriptive cataloging, non-subject indexes, and hierarchical subject indexing and classification; authority control of index terms; standards.
521 Cataloging and Classification (3) Basic library-oriented cataloging and classification techniques, tools, and supporting operations. Descriptive cataloging, choice and form of non-subject entries, subject heading work, general classification, authority control, bibliographic utilities, online library catalogs.
522 Organization and Representation of Multimedia Information Resources (3) Principles and practices of description and access to information resources in nonprint media and/or nontextual formats: visual, auditory, and electronic (including Internet) resources.
523 Abstracting and Indexing (3) Philosophies, standards, and procedures for manual and automatic document indexing, back-of-the-book indexing, vocabulary control, thesaurus construction, and abstracting.
530 Information Access and Retrieval (3) Media for information storage, logical and physical information structures, query logic and languages, search strategies and heuristics, evaluation of retrieval system performance. Search techniques for various types of databases including multi-media, full-text, numeric, bibliographic.
531 Sources and Services for the Social Sciences (3) Information sources in political science, sociology, psychology, geography, history, anthropology, business, and education.
532 Sources and Services for Science and Engineering (3) Information sources in engineering, physical and life sciences.
533 Sources and Services for the Humanities (3) Information sources in philosophy, religion, fine arts, performing arts, literature and language. Organization and management of regional collections.
534 Government Information Sources (3) Selection, access, and utilization of government information in varieties of formats from legislative, judicial and executive branches of federal, state, local, and international government and intergovernmental agencies.
535 Advanced Information Retrieval (3) Bibliographic, non-bibliographic, full-text databases, e.g., non-bibliographic formula and structure databases, contents-page/full-text databases, patents; document delivery alternatives, evaluation, and testing.
537 Information Industry (3) Issues and trends concerning information industry: products and services. Standards, enabling technologies, choice of distribution media, entrepreneurial opportunities. Legal, ethical, and quality concerns.
538 Economics of Information (3) Costing and pricing of information; value of information and value added services; cost-benefit analysis and tradeoffs; policy issues related to economic aspects of information exchange and transfer.
539 Information Policy (3) Role of government in creation and exchange of information; review of key national and international policy areas relevant to information creation, production, and distribution; development of information policy for organizations.
540 Research Methods (3) Research methods in variety of information environments; primary and secondary research; research project design; research results interpretation; analysis of published research; techniques supporting research process.
550 Management of Information Organizations (3) Supervisory and management concepts, strategies, and techniques applicable to information professionals working in libraries, archives, museums, management, and other information organizations.
551 School Library Media Centers (3) Planning, implementing, and evaluating school library programs. Curriculum involvement, role of technology, site-based management, relationships with district and state services.

552 Academic Libraries (3) Mission, status, and history of academic libraries and academic librarianship in community colleges, colleges and universities; trends in technology, information technology, and government’s impact on public, technical, and administrative services.

553 Corporate Information Services (3) Development and present status, scope and objectives. Information resources essential to organization.

554 Public Library Management and Services (3) Development, roles, political environment, governance, organization, fiscal management, services, marketing, and performance evaluations.

555 Scientific and Technical Communications (3) Evolution of scientific and technical communication; current trends; role of formal and informal communications; major STI organizations and their roles.

557 User Instruction (3) Theory, strategy, design, and practice in providing instructional services and technology for users of information systems. Includes practical experience.

560 Development and Management of Collections (3) Selecting and preserving variety of items (tangible and intangible) to meet needs of particular users; community analysis; policies and procedures; evaluation; purchasing.

561 Contemporary Book Publishing (3) Creation, design, production, marketing, and distribution; various types of publishers.

563 Graphic Design and Media (3) Principles and practice in visual aspects of communications. Graphic design, typographic, production techniques and publication design, as these apply to electronic information delivery systems.

564 Corporate Information Systems (3) Objectives and function elements of records systems, archival programs, management information systems and techniques within various types of organizations. Management of information internal to organizations.


566 Business Intelligence for Information Professionals (3) Principles and practices of gathering and synthesizing business intelligence: competitive intelligence, environmental scanning, and issues management; information evaluation and synthesis; role of strategic information in modern organizations.

567 Information Network Applications (3) Scholarly and community-based electronic communications. National and international standards, tools, resources; identification, analysis, evaluation, and management of tools and resources; construction of local technologies as developed and applicable.

569 Advanced Production of Audiovisual Software (3) (Same as Education in the Sciences, Mathematics, and Business) Design, typing, production techniques, and publication design, as these apply to electronic information delivery systems.


572 Resources for Young Adults (3) Critical survey of books and related materials for young adults; personal, vocational, and recreational needs and interests. Evaluation, selection, and utilization for school and public libraries.

573 Programming for Children and Young Adults (3) Philosophy and objectives of public and school library services for children and young adults. Reading, listening, and viewing guidance for individuals and groups. Program planning, implementation, and evaluation. Prereq: 571 or 572.

574 Adult Materials and Services (3) Popular informational and recreational materials and services to meet adult interests in variety of formats. Development of specialized collections.

580 Foundations of Information Sciences and Technologies (3) Definitions of information, information sciences, and information technology; theories of information, information representation, retrieval, and transfer; standards and technologies for information processing and distribution; research front, bibliometrics and informetrics; relationships with other disciplines.

581 Seminar in Radio and Television (3) (Same as Electronic Media 580.)

582 Library Automation (3) Computer-based applications, related systems for libraries including MARC, bibliographic utilities, retrospective conversion, circulation systems, online catalogs, computer-based reference systems, and serials control, systems planning and implementation.

583 Information Systems (3) Systems concept, defining system, analysis and design of information systems. Selecting and using information systems to support various users. User involvement in the development process.

584 Database Management Systems (3) Defining data needs, data structures, role of operating systems in data management, file organization, database management systems, logical data models; database administration and evaluation. Design and implementation of applications using database management systems.

585 Information Technologies (3) Evolution, trends, capabilities, and limitations of technologies applied to information capture, storage, preservation, access, and distribution.

586 Information Retrieval Systems (3) Historical perspective on information retrieval research; statistical and probabilistic retrieval techniques; cognitive user modeling; expert intermediary systems; associations, relations and hypertext.

588 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.


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.

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.

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.

595 Student Teaching in School Library Information Center (9) Planned professional semester: full day school library work and classroom observation activities. S/NC only.

596 Field-Based Experience in School Library Information Centers (2) Prescribed activities to gain competencies in a school library information center setting. Must be taken twice. May be repeated. Maximum 6 hrs. S/NC 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 practice design. Minimum 3.0 cumulative GPA. Written consent of advisor and approval of practicum coordinator. May be repeated. Maximum 6 hours. S/NC only.

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.

## Instructional Technology and Educational Studies

(Continued...)

### MAJOR DEGREES

#### Instructional Technology and Educational Studies

- M.S., Ed.S., Ed.D.
- M.Ed.

- Michael Waugh, Head

- **Professors:**
  - Counts, Edward L., Ed.D. ............ Texas A&M
  - Dessart, Donald J., Ph.D. .......... Maryland
  - French, Russell, Ph.D. ............. Ohio State
  - Hipple, Theodore W., Ph.D. ....... Illinois
  - Ray, John R., Ed.D. ................. Tennessee
  - Thayer-Bacon, Barbara, Ph.D. .... Indiana
  - Waugh, Michael, Ed.D. ............ Georgia

- **Associate Professors:**
  - Connelly, Mary Jane, Ed.D......... VPI
  - Grant, A. D., Ph.D. ................. Wisconsin
  - O’Bannon, Blanche, Ed.D. ......... Memphis
  - Wright, Handel K., Ph.D. .......... Toronto

- **Assistant Professor:**
  - Moyer, Diana, Ph.D. ............... Ohio State

- **Emeriti Faculty:**
  - Myer, M. E., Ed.D. ................. Florida
  - Roeske, Edward L., Ph.D. ......... Ohio State

- The Department of Instructional Technology and Educational Studies offers graduate programs leading to degrees, majors, and concentrations in:

  - **Master of Science**
    - Instructional Technology and Educational Studies
    - Cultural Studies of Educational Foundations
    - Curriculum Instructional Technology

  - **Educational Specialist**
    - Instructional Technology and Educational Studies
    - Curriculum Instructional Technology

  - **Doctor of Education**
    - Instructional Technology and Educational Studies
    - Curriculum
### THE MASTER'S PROGRAMS

- **Instructional Technology and Educational Studies - Cultural Studies of Educational Foundations Concentration**

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<td>Concentration:</td>
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<td>CSED 590 (2 cr)</td>
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<td>CSED 592</td>
<td>Choose one or two from the following courses:</td>
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<td>CSED 511, 539, 544, 545, 549, 565 (Multicultural Education)</td>
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<td>Cultural Studies: CSED 548, 595, 609, 660, 695</td>
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<td>Sociology of Ed: CSED 545, 549, 648, 652</td>
<td>History of Ed: CSED 511, 539, 546, 609, 625</td>
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<td>Research (6-9 cr):</td>
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<td>CSED 560, 561, 526, 625 (2 course sequence)</td>
<td>CSED 500 or CSED 503</td>
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### THE ED.D. PROGRAMS

- **Instructional Technology and Educational Studies - Curriculum, Research, and Evaluation Concentration**

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<th>Program Component</th>
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<td></td>
<td>One course from Curriculum (advisor approval)</td>
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<td>TECH 521</td>
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<td>Electives:</td>
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<td>Thesis: Two courses (advisor approval)</td>
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<td>TOTAL:</td>
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### THE EDUCATIONAL SPECIALIST

#### Programs

- **Instructional Technology and Educational Studies - Curriculum Concentration (Thesis/Non-Thesis)**

<table>
<thead>
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<th>Program Component</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>Core:</td>
<td>3</td>
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<tr>
<td>TPTE 517</td>
<td>One course from Curriculum or other approved area</td>
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<td>Research:</td>
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<tr>
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<tr>
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<td>Thesis:</td>
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#### THE ED.D. PROGRAMS

- **Instructional Technology and Educational Studies - Instructional Technology Concentration**

<table>
<thead>
<tr>
<th>Program Component</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>Program Pre-Requisites:</td>
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<tr>
<td>Must hold Master's Degree in Education or related field</td>
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<tr>
<td>Core:</td>
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<td>TPTE 517</td>
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<td></td>
<td>&quot;TECH 521&quot;</td>
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<td>&quot;TECH 570&quot;</td>
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<td>&quot;TECH 575&quot;</td>
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<tr>
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<td>6</td>
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<tr>
<td>ITES 503A</td>
<td>ITES 503B (may not be taken concurrently with 503A)</td>
</tr>
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*NOTE: These courses are required for students who do not have a Masters in IT.*

### THE EDUCATIONAL SPECIALIST

#### Programs

- **Instructional Technology and Educational Studies - Instructional Technology Concentration**

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<tr>
<th>Program Component</th>
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<td>Program Pre-Requisites:</td>
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<tr>
<td>Students entering the Ed.D. program with a concentration in IT must hold a master's degree in IT or closely related field OR complete pre-requisites</td>
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<td>Core:</td>
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<tr>
<td>TPTE 517</td>
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<td></td>
<td>One course from Educational Foundations (advisor approval)</td>
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<td>Concentration:</td>
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<td>Five courses approved by advisor</td>
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<td></td>
<td>&quot;TECH 521&quot;</td>
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<tr>
<td></td>
<td>&quot;TECH 570&quot;</td>
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<td>&quot;TECH 573&quot;</td>
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<td>&quot;TECH 575&quot;</td>
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<td>Research:</td>
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<td>ITES 503A</td>
<td>ITES 503B (may not be taken concurrently with 503A)</td>
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<td>TOTAL:</td>
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*NOTE: These totals are minimums and some students may be required to complete additional coursework to overcome background deficiencies.*

### THE ED.D. PROGRAMS

- **Instructional Technology and Educational Studies - Curriculum, Research, and Evaluation Concentration**

<table>
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<th>Program Component</th>
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<td>CREN 535 OR 675</td>
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<td>CREN 588, 671</td>
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<td>(Selected in consultation with advisor approved area)</td>
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</tr>
<tr>
<td>CREN 561</td>
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<tr>
<td>CREN 671</td>
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<tr>
<td>CREN 623</td>
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*NOTE: These totals are minimums and some students may be required to complete additional coursework to overcome background deficiencies.*
work experience.

**THE PH.D. CONCENTRATIONS**

**Education • Cultural Studies of Educational Foundations Concentration**

<table>
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<th>Program Component</th>
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<tr>
<td>Ed Adm Pol Std 605</td>
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<tr>
<td>EduC 601 (2cr)</td>
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<tr>
<td>CSED 590 (4 cr)</td>
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<tr>
<td>CSED 591</td>
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<tr>
<td>CSED 592</td>
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<tr>
<td>CSED 595 (Multicultural Education)</td>
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<tr>
<td>CSED 609</td>
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<td>(from one of the following areas)</td>
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<tr>
<td>Philosophy of Ed: CSED 526, 539, 544, 547, 548, 608</td>
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<tr>
<td>Cultural Studies: CSED 560, 561, 592, 548, 609, 660, 695</td>
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<tr>
<td>Sociology of Ed: CSED 545, 549, 648, 652</td>
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<tr>
<td>History of Ed: CSED 511, 539, 546, 609, 625</td>
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<tr>
<td>CSED 560, 561, 625, 531</td>
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*NOTE: These totals are minimums and some students may be required to complete additional coursework to overcome background deficiencies.*

**Education • Instructional Technology Concentration**

<table>
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<td>CREV 604 (2 cr)</td>
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<tr>
<td>CRED 676</td>
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<td>TECH 575 or TECH 521</td>
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<td>CREV 535 or 675</td>
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<td>Electives:</td>
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<tr>
<td>CREV 558, 560, 588, 671, 674</td>
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<td>CRED 623</td>
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<td>Educational Psychology 520</td>
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<td>Dissertation Hours:</td>
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<td><strong>TOTAL</strong>:</td>
<td>83</td>
</tr>
</tbody>
</table>

*NOTE: These totals are minimums and some students may be required to complete additional coursework to overcome background deficiencies.*

**Cultural Studies in Education**

**GRADUATE COURSES**


**526 Philosophy of Education (3)** Description, interpretation, and critical analysis of philosophical, theoretical, and aesthetic models of multicultural and gender-sensitive constructive thinking; confronting power and addressing educational implications.

**539 Development of Education Thought (3)** Historic and philosophic approach to lives and writing of influential educators: Plato, Quintilian, Comenius, Rousseau, Pestalozzi, Froebel, Dewey. Prereq: Graduate status and consent of instructor.

**544 Survey of Contemporary Philosophies in Education (3)** Current debates within various philosophical fields of study related to education.

**545 Educational Sociology (3)** Sociological analysis of American education system. Controversial social issues that affect educational system and potential solutions offered by various programs. Open to juniors, seniors, and graduate students.

**546 Topics in History of Education (3)** May be repeated.

**547 Topics in Philosophy of Education (3)** May be repeated.

**548 Transforming Critical Thinking: Constructive Thinking and Educational Implications (3)** Critique and transformation of critical thinking to more holistic, relational, and aesthetic models of multicultural and gender-sensitive constructive thinking; confronting power and addressing educational implications.

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

**550 Introduction to Qualitative Research in Education (3)** Fundamentals of qualitative research methods and development of skills needed for qualitative research proposals. Overview of qualitative research methods: ethnography, case study, historiography, biography, oral and life history. Critical reading and evaluation of qualitative research studies.

**551 Qualitative Research in Education Settings (3)** Implementing and writing qualitative studies in educational settings. Qualitative data collection, analysis, and report writing. Prereq: 560 or equivalent.

**590 Cultural Studies Seminar (1)** Two-semester sequence (fall and spring); ongoing discussion about cultural studies; popular culture, interdisciplinary work, social justice issues. Presentations, videos, readings. May be repeated. Maximum 4 hrs. S/NC only.

**591 Issues in Cultural Studies (3)** Combination of theoretical readings in cultural studies and service learning for social justice project. Discussion of interdisciplinary, social justice and activism. Links between theory and practice of cultural studies.

**592 Justice, Schools, and Sports (3)** Social justice issues: education and sport practices. Social justice, moral commitments to others in educational and sport settings, and equal opportunity to acquire social goods and benefits. Prereq: Admission to doctoral program with concentration in cultural studies in education.

**607 Advanced Seminar in the Social Foundations of Education (3)** Interdisciplinary team-taught seminar. Readings selected by faculty and participants from classic studies and current periodical literature in anthropology, sociology, history, and philosophy of
Curriculum Educational Research and Evaluation

GRADUATE COURSES

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

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

534 Program Evaluation in Education (3) Issues and practices 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 Educational Administration and Policy Studies 534.)


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 school. Characteristics of students, curriculum designs, instructional patterns, and 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.

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

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.

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

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

604 Seminar in Curriculum and Instruction (1) Required 2 consecutive semesters. S/NC only.

623 Using Research for Curriculum Improvement (3) Research methodology; application to descriptive/survey curriculum materials. Critical reading of research, methodological development in descriptive and survey areas.

630 Seminar in Assessment and Evaluation (3) Trends and issues in student/client assessment, personnel evaluation, and program evaluation; and examination of current state, national and international assessment and evaluation projects. Prereq: Consent of instructor.

631 Application of Assessment/Evaluation (3) Systems designs, instruments, procedures, reporting formats used in personnel and program evaluation and student assessment; analysis, synthesis and interpretation of data sets. Prereq: 630.

671 Advanced Educational Statistics (3) Applications of parametric and non-parametric statistical inference to educational and instructional problems. Use of microcomputers in educational research. Prereq: 561.

672 Interpretation and Application of Curriculum and Instruction Research (3) Analysis of research in curriculum and instruction, newer methodologies and strategies. Utilization of research to improve curriculum and instruction practice, application of research principles in context of specific professional assignments. Prereq: Consent of instructor.

674 Designing and Implementing Personnel Assessments (3) Models and methods for assessing performance of educators and other professionals. Critique of systems currently in use and design of evaluation system.

675 Curriculum Evaluation: Theory and Application (3) Evaluation trends and issues. Theoretical frameworks to design evaluation studies for various educational programs.


Instructional Technology

GRADUATE COURSES

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.

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

569 Media and Technology Production Techniques (3) Audiovisual production and technology: audio and video production, basic digital video editing, and other media/technology techniques important for improving communication in a variety of presentation styles, 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.

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

573 Introduction to Multimedia in Instruction (3) Selected computer-based multimedia production tools and use to produce instructional materials based on specific learner characteristics and objectives. Prereq: 521 or consent of instructor.

575 The Internet: Implications for Teaching and Learning (3) Investigation of Internet, its origin and historical development. Hands-on use of Internet. Relevant issues regarding legal and ethical issues, evaluation, responsible use, proprietary rights.

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.

578 Web Design (3) Design and development of instructional web sites using basic design principles and visual web editor software. Prereq: 575.

669 Instructional Media Research (3) Identification, location, and collection of developmental and experimental research on instructional media. Application of research.

678 Seminar in Instructional Technology (1) Readings and discussions based on current literature, research, theories and practices in instructional technology. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs.


680 Designing Problem-Based Learning Environments (3) Development and integration of problem-based learning pedagogy into curriculum. Examination of literature to understand theoretical perspective for design of this type of learning environment. Prereq: 521, 570, 573, 575, or consent of instructor.

Instructional Technology and Educational Studies

GRADUATE COURSES

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

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

503 Problems in Lieu of Thesis (2-3) May be repeated. P/NP only.

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

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

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

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

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

689 Internship (1-3) Experiences in application of principles and practices of curriculum development and instructional improvement. Prereq: Program pre-requisites and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

693 Independent Study (1-3) May be repeated. S/NC or letter grade.
694 Supervised Reading (1-3) May be repeated. S/NC or letter grade.
695 Special Topics (1-3) May be repeated. S/NC or letter grade.

**Interdisciplinary Programs**

(College of Arts and Sciences)

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**


443 Topics in Black Literature (3) (Same as English 443.)

450 Issues and Topics in African-American Studies (3) Problems, topics, issues, and individuals. May be repeated. Maximum 6 hrs.

452 Black African Politics (3) (Same as Political Science 452.)

461 Art of Southern and Eastern Africa (3) (Same as Art History 461.)

462 Art and Archaeology of Ancient Africa (3) (Same as Art History 462.)

463 Arts of the African Diaspora (3) (Same as Art History 463.)


483 African-American Women in American Society (3) Historical and contemporary socio-eco-political factors in American society as related to Black women. (Same as Women’s Studies 483.)

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

**American Studies**

**GRADUATE COURSES**

423 Geography of American Popular Culture (3) (Same as Geography 423.)

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

**Asian Studies**

**GRADUATE COURSES**

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

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

**Cinema Studies**

**GRADUATE COURSES**

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

420 French Cinema (3) (Same as French 420.)

421 Topics in Italian Literature and Cinema (3) (Same as Italian 421.)

433 History of Film and Modern Art (3) (Same as Art Media/Photography 433.)

434 Hispanic Culture Through Film (3) (Same as Spanish 434.)

465 Latin American Film and Culture (3) (Same as Spanish 465 and Latin American Studies 465.)

469 Sexuality and Cinema (4) (Same as Women’s Studies 469.)

489 Special Topics in Film (3) (Same as English 489.)

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

**Comparative Literature**

**GRADUATE COURSES**

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

452 Modern Drama, 1880-1945 (3) (Same as English 452.)

454 Twentieth-Century International Novel (3) (Same as English 454.)

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

**Judaic Studies**

**GRADUATE COURSES**

405 Modern Jewish Thought (3) (Same as Religious Studies 405.)

425 Early Christian and Byzantine Art, to 1350 (3) (Same as Art History 425.)

431 Medieval Art of the West, 800-1400 (3) (Same as Art History 431.)

**Latin American Studies**

**GRADUATE COURSES**

456 Latin American Government and Politics (3) (Same as Political Science 456.)

465 Latin American Film and Culture (3) (Same as Spanish 465 and Cinema Studies 465.)

479 Enchanted Texts in Hispanic Literature (3) (Same as Spanish 479.)

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

**Legal Studies**

**GRADUATE COURSES**

400 Mass Communications Law and Ethics (3) (Same as Communication 400.)

430 United States Constitutional Law: Sources of Power and Restraint (3) (Same as Political Science 430.)

431 United States Constitutional Law: Civil Rights and Liberties (3) (Same as Political Science 431.)

435 Criminal Law and Procedure (3) (Same as Political Science 435.)

442 Administrative Law (3) (Same as Political Science 442.)

451 Criminal Justice (3) (Same as Sociology 451.)

455 Society and Law (3) (Same as Sociology 455.)

470 International Law (3) (Same as Political Science 470.)

490 Language and Law (3) (Same as English 490 and Linguistics 490.)

496 The Rhetoric of Legal Discourse (3) (Same as English 496.)

**Linguistics**

**Graduate Certificate in Linguistics**

The Linguistics Program offers a graduate certificate, designed to meet the needs of individuals wishing to apply linguistics in various professional fields. It draws upon the strengths of faculty members in applied linguistics, sociolinguistics, and theoretical linguistics. The requirements focus upon the central aspects of the discipline of Linguistics and aim to develop students’ basic knowledge and skills in the central aspects of the discipline.

Upon successful completion of this program, students should have an understanding of the basic theoretical concepts and approaches of the discipline and have gained experience in the use of analytic and research techniques. It is also designed to meet the specific needs of those students who are preparing to teach foreign language at the high school/junior college level and/or to obtain advanced level proficiency in linguistics and cultural knowledge.

Prospective candidates for the certificate may take up to 6 hours of certificate classes before making application for admission to the Certificate Program. Once admitted to the program they must maintain a GPA of at least 3.0. Application to the Certificate Program must be made to the Chair of the Interdisciplinary Linguistics Program by submitting a letter of application and copies of undergradu ate transcripts (and graduate transcripts, if applicable). A minimum of fifteen credit hours is required; all courses must be selected in consultation with a program advisor, who must approve all courses for individual
students prior to their being taken, except that, as noted above, up to six credit hours may be accepted from candidates upon admission. Students will satisfy the requirements of the Certificate Program by selecting fifteen hours from the following lists, provided that those courses are selected in consultation with a program advisor, who approves their selection. A certificate cannot be earned without program approval by the advisor.

**Certificate Requirements**
1. At least one of the following courses: French 512, German 512, Spanish 512, Linguistics 423, 425.
2. Additional courses from the following list for a total of fifteen credit hours: Audiology and Speech Pathology 506, 579, 601, 652, English 508, 509, 680, French 421, 422, 510, German 510, 541, 631, 632, Linguistics 400, 411, 426, 429, 435, 471, 472, 474, 475, 476, 477, 485, 490, Spanish 531, Psychology 400, 543, 617, Statistics 531. Other courses may, where appropriate, be substituted for the courses listed above with the permission of the Chair of the Linguistics Program.
3. A non-credit capstone project, normally the preparation of a paper for presentation at a professional conference or for publication in a journal, planned and completed in consultation with a program advisor.

**Graduate Courses**

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

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

423 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.

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

426 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.)

431 Topics in Hispanic Linguistics (3) (Same as Spanish 430.)

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

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

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

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

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

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

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**Medieval Studies**

**Graduate Certificate in Medieval Studies**

The Medieval Studies program offers a graduate certificate enabling students with an interest in medieval topics to acquire a broad foundation in the interdisciplinary approaches to medieval research and to begin putting these approaches into practice. For students earning MAs or PhDs in traditional disciplines, the program will augment their training and may make them more attractive candidates for academic positions. Prospective candidates for the certificate may take up to 6 hours of certificate classes before making application for admission to the Certificate Program. Once admitted to the program they must maintain a GPA of at least 3.0. Application to the Certificate Program must be made to the Chair of the Medieval Studies Program by submitting a letter of application and copies of undergraduate transcripts (and graduate transcripts, if applicable). A minimum of fifteen credit hours is required; all courses must be selected in consultation with a program advisor, who must approve all courses for individual students prior to their being taken, except that, as noted above, up to six credit hours may be accepted from candidates upon admission. Students will satisfy the requirements of the Certificate Program by selecting fifteen hours from the following lists, provided that those courses are selected in consultation with a program advisor, who approves their selection. A certificate cannot be earned without program approval by the advisor.

**Certificate Requirements**

1. Medieval Studies 510.
2. Twelve additional hours chosen from at least two disciplines. A minimum of six hours must be taken in one discipline. Students may choose from the following courses: Art History 425, 431, 441, 451, 571, English 401, 402, 508, 513, 514, 610, 611, 620, 621, French 410, 429, 540, German 541, History 531, Italian 401, 402, Spanish 531, 532, Philosophy 520, 620, Political Science 475. Topics and special topics courses, where appropriate, may be substituted for any of the above courses with the permission of the Chair of the Medieval Studies Program.

3. Demonstration of competency in reading medieval Latin, either by earning an "A" or "B" in Classics 435, or by passing the University of Toronto's MA Medieval Latin exam, given on campus in Fall and Spring semesters. Where appropriate, students may substitute competency in reading medieval Greek, Hebrew, or Arabic. The chair of Medieval Studies, in conjunction with the Medieval Studies committee, will establish standards for determining competency in these languages as need arises.

4. A non-credit capstone project, usually a paper. The paper should be interdisciplinary in its approach to its topic and may be an outgrowth of a seminar paper in another course. This capstone paper must be presented to an audience of Medieval Studies committee members and other interested faculty and graduate students before the certificate is granted.

**Graduate Courses**

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

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**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.)

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**Women’s Studies**

**Graduate Certificate in Women’s Studies**

The Women’s Studies program offers a graduate certificate, enabling students to develop critical thinking about the economic, social, and legal factors influencing women’s roles in contemporary and historical societies, and to evaluate those roles in the widest possible perspectives. Students may examine representations of women in the arts and the media, evaluate how science and medicine view women as objects of study, and study how women work as practitioners and researchers in these fields.

The program is designed to provide a supplementary perspective for students already enrolled in graduate programs, to provide an entry into graduate study for those who are exploring a number of disciplinary approaches, to provide enrichment for members of the community who have a BA or an advanced degree, and to develop skills for professionals in various fields.

Prospective candidates for the certificate may take up to 6 hours of certificate classes before making application for admission to the Certificate Program. Once admitted to the program they must maintain a GPA of at least 3.0. Application to the Certificate Program must be made to the Chair of the Women’s Studies Program by submitting a letter of application and copies of undergraduate transcripts (and graduate transcripts, if applicable). A minimum of fifteen credit hours is required; all courses must be selected in consultation with a program advisor, who must approve all courses for individual students prior to their being taken, except that, as noted above, up to six credit hours may be accepted from candidates upon admission. Students will satisfy the requirements of the Certificate Program by selecting fifteen hours from the following lists, provided that those courses are selected in consultation with a program advisor, who approves their selection. A certificate cannot be earned without program approval by the advisor.

**Certificate Requirements**

1. Women’s Studies 510.
2. Twelve additional hours, drawn from at least two different disciplines. For students enrolled in an MA program, no more than two of the certificate courses may be drawn from

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**Interdisciplinary Programs**

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that program or the department in which the MA program is housed. Students are encouraged to select from courses at the 500 level and above. Students may choose from the following list: Anthropology 517, English 584, Health 420, 520, Public Health 585, Law 649, 862, 958, Women's Studies 400, 410, 422, 425, 434, 466, 469, 476, 483, 510, 593. 3. A capstone experience such as presenting research results to a professional group, submitting a work for publication, arranging an exhibit, or presenting a performance to a group approved by the individual advisor and the chair of 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 Educational Psychology and Counseling 410.)

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

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

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

466 Rhetoric of the Woman's Rights Movement to 1930 (3) (Same as Speech Communication 466.)

469 Sexuality and Cinema (4) Exploration of issues surrounding sexuality, gender and cinema from points of view of feminist film criticism. (Same as Cinema Studies 469.)

476 Rhetoric of the Contemporary Feminist Movement (3) (Same as Speech Communication 476.)

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

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

593 Independent Study (1-6) Prereq: Consent of Chair of Women's Studies.

Electronic Media

GRADUATE COURSES

440 Corporate Video (3) Special requirements of business, industrial, educational, and medical uses of video. Management, budgeting, planning, producing, and evaluating projects. Prereq: 430 or consent of instructor.


460 Broadcast News Operations (3) Production of news programs for broadcast on television stations. Electronic news gathering, editing and writing news packages and studio production. Prereq: 410 or consent of instructor.

470 Cable, Broadband, and Interactive Digital Media (3) History and structure of cable television and other broadband delivery systems: DBS, Internet. Development of digital broadcasting, interactive television, and other broadband media systems and digital technology. Regulatory, policy, programming, and management issues arising from new media and digital technologies. Prereq: 275 Introduction to Radio and Television or consent of instructor.


498 Internship (3) Full-time (30 - 40 hrs per week) work experience in news, production, or sales and management with non-university professional organization. Educational experience beyond that available at university. Final term paper. No retroactive credit for previous work experience. Prereq: Senior or graduate standing, completion of at least 15 hrs of communication or consent of instructor.

500 International Electronic Media (3) History and structure of broadcasting systems in other countries. Development of international broadcasting, rise of new international and global media systems (satellite, internet). Role and impact of international broadcasting organizations, policy, and technology. Use of electronic media for intercultural and development communications. Prereq: Consent of instructor.

550 International Electronic Media (3) History and structure of broadcasting systems in other countries. Development of international broadcasting, rise of new international and global media systems (satellite, internet). Role and impact of international broadcasting organizations, policy, and technology. Use of electronic media for intercultural and development communications. Prereq: Consent of instructor.


570 Broadcast and Internet Research (3) Practical and professional application of research methods. Applied audience and market research. Overview of techniques, research design, data collection and analysis, and application to management decision making.

Use of internet for data collection. Prereq: Communications 512 or 612, or consent of instructor.

580 Seminar in Radio and Television (3) Salient issues in broadcasting. Topics vary. International broadcasting, cable television, new technologies, corporate television, educational and public broadcasting, broadcasting and society. Prereq: Consent of instructor or admission to program. May be repeated. Maximum 6 hrs. (Same as Information Sciences 581.)


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

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 practices 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.


433 Advanced Editing (3) Sensitivity to language and editing skills. Headline writing, layout, and production. Prereq: Editing.

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 write 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 wastes. Presentations from and interviews of experts in environmental science and reporting. Exemplary popular literature in
550 Writing and Editing Projects (3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

456 Science Writing as Literature (3) Survey of important science writing for general public across spectrum of science, engineering, and medicine. Works by authors such as Arthur C. Clarke, Stephen J. Gould, and Richard Selzer. Analysis of literary qualities in quest to understand why some science writing succeeds. Prereq: Consent of instructor.


465 Women and Mass Media (3) Media effects on women. Media coverage and portrayal of women. Historical and current status of women in mass communication industries.

490 Advanced Photographic Journalism (3) Advanced principles and methods of black-and-white photography. Introduction to color photography. News and feature photographs and photo essays. Prereq: Photographic Journalism or consent of instructor.

520 Political Communications (3) Relationships among mass media, public relations and government and their roles in democratic society. Governmental public relations, political campaigns, military, executive, legislative and judicial branches of government, special interest groups and public access to government information. (Same as Public Relations 520.)

525 Public Opinion (3) Role of press in developing and influencing public consensus. Social theories of public opinion and analysis of mass media’s response. (Same as Public Relations 525.)

535 Publications Management (3) Problems in management, production, market analysis, and design. Techniques of writing, editing, and presenting comprehensive articles and other material; regional and specialized magazines. Individual editorial projects. Prereq: 420 or consent of instructor.

550 Writing and Editing Projects (3) Specialized writing or editing interests: agriculture, politics, labor, management, production, market analysis, and design. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

560 Publishing on World Wide Web (3) Electronic research and publishing. Social, legal and ethical challenges surrounding new media. Project planning and storyboarding techniques for designing and creating sites on Web. (Same as Public Relations 560.)

580 Seminar in Visual Communication (3) Behavioral aspects of communication with images. Theories of psychological effect in color, shape, texture, and other design elements. Prereq: Writing or Advertising Creative Strategy or Electronic Field Production or equivalent.

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

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

Large Animal Clinical Sciences

See College of Veterinary Medicine and Comparative and Experimental Medicine

Law

(Major 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
Blaze, Douglas A., J.D. .......... Georgetown
Cohen, Neil P., LL.M. .......... Harvard
Cook, Joseph G., LL.M. .......... Yale
Davies, Thomas Y., J.D. .......... Northwestern
Galligan, Jr., Thomas C., LL.M. .... Columbia
Handin, Patrick, J.D. .......... Chicago
Hess, Amy M., J.D. ................. Virginia
King, Joseph E., J.D. .......... Pennsylvania
Lloyd, Robert M., J.D. .......... Michigan
Phillips, Jerry J., J.D. .......... Yale
Picquet, Cheryn, M.S.L.S. .......... Tennessee
Plank, Thomas E., J.D. .......... Maryland
Reynolds, Glenn H., J.D. .......... Yale
Rivkin, Dean H., J.D. .......... Vanderbilt
Sobieski, John L., Jr., J.D. ....... Michigan
Starbuck, Barbara, J.D. .......... New York University
Stein, Gregory M., J.D. .......... Columbia
Stephens, O.H., J.D. .......... Tennessee
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
Bank, Lyman, J.D. .......... Michigan
Beintema, William J., J.D. ....... Miami
Black, Jerry P., Jr., J.D. .......... Vanderbilt
Cornett, Jody M., J.D. .......... Tennessee
Heminway, Joan M., J.D. .......... New York
Jacobs, Becky L., J.D. .......... Georgia
Kennedy, Deserée A., LL.M. ....... Temple
Kuney, George W., J.D. .......... California (Hastings)
Leatherman, Don A., LL.M. ........ New York
Markle, Susanna, J.D., Washington (St. Louis)
Medill, Colleen E., J.D. .......... Kansas
Parker, Carol M., J.D. .......... Illinois
Pierce, Carl A., J.D. .......... Yale
Pulaski Hall, G.R., J.D. ......... California (Boalt Hall)
White, Penny J., LL.M. .......... Georgetown
Williams, Paulette J., J.D. ........ New York University

Assistant Professors:

Cochran, Cathleen R., M.S. ........ Tennessee
Collins, Carol Morgan, M.S. .... Tennessee
Loyola, Price, M.S.L.S. .......... Tennessee

Emeriti Faculty:

Gray, Grayfred B., J.D. .......... Vanderbilt
Le Clercq, Frederic S., LL.B. ........ Duke
Sewell, Toxey H., LL.M. .......... George Washington

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, and a dual degree program with the Department of Political Science, College of Arts and Sciences, leading to the J.D. and Master of Public 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 Avenue, Knoxville, Tennessee 37996-1810 and at the College’s web page www.law.utk.edu.

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
833 Representing Enterprises or
978 Transactional Tax Planning

Students electing a concentration in business transactions may not take any of the above courses on an S/NC basis except 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. Washington 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
815 Introduction to Advocacy and Professional Responsibility
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 establishment of the dual program recognizes the increasingly complex body of knowledge necessary to the creative conduct of business and business-related law practice, the complementary nature of 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 Office of Graduate Admissions 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 studies are 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 specified in the curricula. 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 and the student’s assigned advisor.

Students may begin their studies in either the J.D. or the MBA program, but may not enroll in MBA coursework while completing the first year of the law curriculum and may not enroll in J.D. coursework while completing the first year of the business curriculum. During the first year in the J.D. program, students register through the College of Law. 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 coursework, the student earns a 2.0 GPA grade in all law courses; those courses 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 2.0 or grade and higher and 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 must plan to be enrolled in coursework or an intern-ship for one summer term 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 independently accepted by, the College of Law for the J.D. degree and the Department of Political Science and the Office of Graduate Admissions for the M.P.A. degree. Applicants must also be accepted by the Dual Degree Committee. All applicants must submit a Law School Admission Test (LSAT) score. An applicant’s LSAT score may be substituted for the Graduate Record Examination (GRE) score, which is normally required for admission to the M.P.A. program. Application may be made prior to or after matriculation in either the J.D. or the M.P.A. program, but application to the dual program must be made prior to entry into the last 29 semester hours required for the J.D. degree and prior to entry into the last 15 hours required for the M.P.A. degree.

Curriculum

A dual degree candidate must satisfy the requirements for both the J.D. and the M.P.A. degrees, as well as the requirements for the dual program. The College of Law will award a maximum of 9 semester hours of credit toward the J.D. degree for successful completion of approved graduate level courses (500 or 600 level) offered in the Department of Political Science. The M.P.A. program will award a maximum of 9 semester hours of credit toward the M.P.A degree for successful completion of approved courses offered in the College of Law. All courses for which such cross-credit is awarded must be approved by the J.D.-M.P.A. coordinators in the College of Law and the Department of Political Science. All candidates for the dual degree must successfully complete Administrative Law (Law 821). An internship is strongly recommended for students in the dual degree program, as it is for all M.P.A. candidates, but an internship is not required.

During the first two years in the dual program, students will spend one academic year completing the required first year of the College of Law curriculum and one academic year taking courses solely in the M.P.A. program. During those first two years, students may not take courses in the opposite area without the approval of the J.D.-M.P.A. coordinators in both academic units. In the third and fourth years, students are strongly encouraged to take both law and public policy courses each semester.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not 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.

Awards 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 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 department in which they are enrolled, take up to 6 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.
positivism; natural law theory; legal realism; idealism; historical jurisprudence; utilitarianism; Kantianism; sociological jurisprudence; policy science; and critical studies.

679 Law and Economics (3) An interdisciplinary approach to the application of basic economic concepts to legal problems; economics in legal decisionmaking; scholarly support for and criticism of modern legal theory. Analyzes law as an economic system. Designed for students with no undergraduate background in economics or mathematics.

881 Law and Literature (3) Reading literary works, development of philosophy and reading technique applicable to both law and life.

886 Public International Law (2) Law creating processes and doctrines, principles and rules of law that regulate mutual behavior of states and other entities in international system.

887 International Business Transactions (2-3) Doing business with foreign persons and in foreign countries; acquisition and use of property within foreign country; regulation of international business transactions by international organizations and foreign governments; analysis of international conventions and laws of foreign countries affecting business and comparison of those conventions and laws with United States law.

895 Labor Relations Law (3) Policies and social and economic policies in development of federal labor relations laws; employee rights of self-organization; union and employer unfair labor practices; strikes, lockouts, boycotts, and collective bargaining processes; enforcement of collective agreements; individual rights of employees; federal preemption and state regulation.

896 Employment Law (3) Legal regulation of employment relationship; legal, social and economic influences in employee-employer relationship; employment discrimination; legally prescribed minimum standards and safety standards 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 arbiters. 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 with various civil and criminal legal problems. Exploration and development of fund-amental concepts of basic trial practice: law; interviewing and counseling clients, negotiating with other attorneys, planning for transactions and dispute resolutions, initiating and defending claims, conducting factual investigations, and presenting evidence. Prereq: 920 and third-year standing. May not receive credit for both 905 and 946 or both 905 and 947.

908 Mediation Clinic (3) Mediation process, theory, strategy, tactics and skills through readings, simulations, and service as mediators in general sessions court and other settings: mediation ethics, relationship of mediators to parties, development of mediation methods, roles of attorneys in mediation, and writing of mediation agreements.

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

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

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 simulation, trial problems in basic trial practice: professional responsibility; fact investigation and witness preparation; discovery and presentation of evidence; selection and instruction of juries; 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. Enrollment 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; recording; contract negotiations; 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 computer assisted drafting.

958 Women and the Law (3) Treatment and 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 interests under federal and state law: patents; trademarks; trade secrets; copyright; right of publicity; unfair competition.

960 Employee Benefits Law (2-3) Employee Retirement Income Security Act, federal law governing employee benefit plans sponsored by private employers. Applied problems, method of instruction: questions, issues, and problems involving employee benefit plans likely to arise in general litigation or business transaction practice. For three credit hours, includes Chapter 46 of Internal Revenue Code.

962 Law and Medicine Seminar (2) Effects of legal rules on delivery and quality of medical care: nature of physician-patient relationship; unauthorized practice of medicine; medical education, licensing and specializations; hospital staff privileges; medical malpractice: liability; standard of care, proof, causation, defenses, and damages; protection of patient autonomy: consent; informed consent; informed appointment and selection of treatment, and death and dying; control of communicable diseases; organ transplantation and medical resource allocation.

972 Income Taxation of Business Organizations (2) Comparative study of pass-through entities and corporate forms of taxation; historical and political development of tax law; taxation of partnerships; C corporations, subchapter S corporations, and limited liability companies; introduction to tax planning and business planning. Required written exercises: drafting of portions of partnership agreements, opinion letters, and legal memoranda. Prereq: 818.

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

975 Tax Theory (3) Method and purposes of govern-ment taxation; collection and incidence of eco- nomic and political theory; comparative analysis of various actual and proposed patterns of taxation; income, consumption tax, sales tax, and value-added tax. Required preparation of expository essay on aspect of tax theory chosen by student. Limited enrollment.

978 Transactional Tax Planning (3) Advanced study of distribution of business ownership, establishment of basis business acquisitions, tax planning for financially troubled entities, and review of recent transactions involving cutting-edge tax planning and shaping changes in law. Limited enrollment. Prereq: 818 and 972.

980 Insurance (3) Types of insurance: life, property, health, accident and liability insurance; regulation of insurance industry; interpretation of insurance con-
tracts; insurable interest requirement; conditions, warranties and representations; coverage and exclusions; duties of agents; excess liability; subrogation; and bad faith 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 Workers’ Compensation (3) Workers’ Compensation system for compensating victims of work-related accidents and diseases; requirements for covered employer-employee relationship; accidental injuries or occupational diseases arising out of and in course of employment; causation; nature of medical, disability, and death benefits; exclusiveness of compensation remedy against employer and co-employees; and rights and liabilities of non-employers; administrative and procedural aspects of Workers’ Compensation practice; and various law reform measures.

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 or the Dean’s designee. Maximum of once each semester during last two years of study. Prerequisite: Second-year standing.

994 Independent Study (1-4) Independent study 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 3 semesters of study.

995 Transactions: The Tennessee Journal of Business Law (1-2) Performance of duties of staff member or editor of Transactions: The Tennessee Journal of Business Law. Responsibilities vary each semester: writing of case synopsis, writing of article, and/or performance of other required duties related to operation. Members of Transactions who are not on senior editorial board receive one hour of credit for successfully completing two consecutive semesters of service. Members of senior editorial board receive two hours of credit for each full year of satisfactory service. May be repeated. S/NC only. Does not count toward total number of elective upper division courses taken S/NC.

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 expository writing 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.

The program leading to the M.S. and Ph.D. degrees in Life Sciences is interdepartmental and inter collegiate and are designed to augment offerings of individual departments in two concentrations: genome science and technology and biology. 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**

Jeffrey Becker, Director

The University of Tennessee-Oak Ridge National Laboratory Graduate School of 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 sequences, and is designed to take advantage of collaboration of The University of Tennessee and the Oak Ridge National Laboratory. Students are trained in emerging areas of genome science, with emphasis on mammalian genomics, structural biology, proteomics, computational biology and bioinformatics, and bioanalytical technologies. Scientists from both campuses participate in teaching. Research projects pursued for either the M.S. or Ph.D. degrees are mentored 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 coursework including a year of calculus (differential and integral), one year of chemistry and a year of physics. Specific course deficiencies may be corrected during the first year.

Required courses are Life Sciences 510; Botany 521, 522; Biochemistry and Cellular and Molecular Biology 511, 512; Plant Sciences and Landscape Systems 471 or Ecology and Evolutionary Biology 560; Microbiology 410. The master’s degree requires a minimum of 30 semester hours of study approved by the student’s committee, a thesis, and an oral examination. The minimum requirements for the doctoral degree include at least 8 hours above the 600 level, 24 semester hours of course 600, courses approved by the student’s committee, a comprehensive examination, a doctoral dissertation, and a defense of dissertation.

**GRADUATE COURSES**

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

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during summer session. 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 Graduate Research Participation (3-12) Special advanced research project not related to dissertation research. Topics chosen with consent of instructor. May be repeated. Maximum 3 hrs.

505 Research Rotation (2) Laboratory rotations with faculty member on clearly defined projects. Written proposal and oral report. May be repeated. Maximum 6 hrs.

506 Computational Biology and Genome Informatics (3) Computational basis of nucleotide and protein sequence analysis; pairwise sequence comparison, multiple sequence alignment; and species trees. Genome annotation and feature finding. Computational protein structure analysis; threading homology models, ab initio methods. Prerequisite: Computer Science 140 Data Structures or consent of instructor.

510 Special Topics in Life Sciences (1-3) Specializations in biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethology; plant; physiology and genetics; and psychology. May be repeated. Maximum 9 hrs.
515-16 Introduction to Genome Science and Technology I, II (1,1) 515—Introduction to research in genome science and technology concentration. 516—Science and ethics of practice of science. S/NC only.

520-21 Genome Science and Technology I, II (4,4) 520—Overview of genomics, advanced genetics principles, computational biology and bioinformatics. 521—Computational biology and informatics, analytical technologies and special techniques.

540-41 Colloquium (1,1) Invited speakers. Topics announced in advance. Required every semester in residence after first year. May be repeated. Maximum 6 hrs.

550 Mammalian Genetics and Genomics (3) Genetic variation, inheritance, phylogenetic traits, molecular genetics and genomics, mutagenesis in laboratory rodents and other mammals. Prereq: 520-21.

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.

595-96 Special Topics in Genome Science and Technology (1-3) Tutorials or lectures on variety of special topics to be chosen by instructor. May be repeated. Maximum 4 hrs.

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

610 Advanced Topics in Life Sciences (1-3) Topics vary. May be repeated. Maximum 6 hrs.

695-96 Advanced Topics in Genome Science and Technology (1-3) Topics vary. May be repeated. Maximum 4 hrs.

Logistics
See Marketing, Logistics and Transportation

Management
(College of Business Administration)

MAJOR DEGREES

Business Administration .......... MBA, Ph.D.

Oscar Fowler, Head

Professors:
Gilbert, Kenneth C., Ph.D. .......... Tennessee
James, Lawrence R. (Pilot Chair of Excellence), Ph.D. ......... Utah
Judge, William O., Ph.D. .......... North Carolina
Ladd, Robert T., Ph.D. ............. Georgia
Miller, Alex (W. B. Stokely Professor), Ph.D. ............... Washington
Neel, C. Warren, Ph.D. .......... Alabama
Noon, Charles E., Ph.D. .......... Michigan
Rentsch, J. R., Ph.D. ............. Maryland
Rush, Michael C., Ph.D. .......... Akron
Srinivasan, M. M. (The Ball Corporation Distinguished Professor of Business), Ph.D. ............. Northwestern
Stahl, Michael J. (Distinguished Professor of Management), Ph.D. ......... Rensselaer
Woehr, D. J., Ph.D. .......... Georgia Tech

Associate Professors:
Bowers, Melissa R., Ph.D. .......... Clemson

Edirisinghe, Chanaka P., Ph.D. .......... British Columbia
Elenkov, Detelin S., Ph.D. .......... MIT
Fowler, Oscar S., Ph.D. .......... Georgia
Haley, Usha C. V., Ph.D. .......... New York

ASSISTANT PROFESSORS:
Smith, Anne D., Ph.D. .......... North Carolina

BUSINESS ADMINISTRATION CONCENTRATIONS

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

MBA Concentration:

Operations Management.

Minimum course requirements: 540, 541, and one course from the following: Management Science 526, 551, Statistics 566, Industrial Engineering 522, 526, or an applicable course approved by designated faculty.

Ph.D. Concentration:

Minimum course requirements are: For operations management—541 and 542; two semesters of 640 (may be repeated for credit); one additional semester of approved doctoral seminar work. For strategic management—610, 611, 612, 613.

MINOR IN ENVIRONMENTAL POLICY

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

GRADUATE COURSES

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

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

511 Organizational Theory: Integrated Structure and Behavior (3) Cases, project groups, discussion; organizational theories, organizational effectiveness; contextual factors of organizations: environment, size, technology; organizational structure configurations, organization design; social influences on organization effectiveness; motivation, leadership, group behavior, intergroup relations, organization change and development.

521 Human Resource Management (3) Personnel functions and human resources management. Community relations, recruiting, selection, training, performance evaluation, wage and salary administration, legal framework as it affects personnel.

531 Management of Technology-Based Organizations (3) Role of technology and innovation in formulation and implementation of strategy. Management of research and development function and coordination with other functions. Management of scientists and engineers.

540 Logistics and Operations Management (3) Analysis of methods and models for understanding supply chain flows and processes. Introduction to management strategies and techniques applicable to design of systems in logistics and operations processes. Prereq: Business Administration 511, 512, and 513 or consent of instructor. (Same as Logistics and Transportation 510.)

541 Operations Management (3) Techniques applicable to design of systems in operations planning and control in manufacturing and service industries. Modeling real-world systems through problem definition, supporting data structure design, model design, solution, implementation, and maintenance.

551 Management of New Ventures (3) Integration of various functional disciplines and their application to general management of ventures formed both within larger corporations and independently. Preparation of a venture plan, case analysis.

571 International Management (3) Analysis of environment of international business firms and impact of internal and external factors on managerial decisions.

581 Environmental Management (3) Managerial frameworks for addressing environmental issues. Most pressing environmental challenges; options compatible with sustained business performances. Cases, field projects, research papers.

591 Directed Independent Study (1-3) Topic of mutual interest. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

595 Selected Topics in Current Management Issues (3) In-depth consideration of current issues. Managerial impact of emerging topics. Prereq: Consent of instructor.

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

610 Seminar in Advanced Organization Theory (3) Analysis of functioning of complex organizations. Classical and open systems models, organization growth and change, organizational effectiveness and design of complex organizations.

611 Seminar in Strategic Management I (3) Analysis of concepts and research in strategic management.

612 Seminar in Strategic Management II (3) Analysis of concepts and research in strategic management.

613 Seminar in Strategic Management III (3) Review and analysis of important books and monographs in strategic management. Understanding evolution of thought and emergence of distinct paradigms.

Management Science
(College of Business Administration)

MAJORS DEGREES

Management Science .......... M.S., Ph.D.

Kenneth C. Gilbert, Chairperson

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

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
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. The candidate may choose from the business functional areas (accounting, finance, marketing, management, and transportation and logistics) or other disciplines, (e.g., computer science, forestry, ecology, and public administration);
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 master’s program requires three applicant recommendation forms and the GRE or GMAT. Applications are encouraged from all majors, but a mathematics background equivalent to the completion of at least two years of college calculus and proficiency in a computer language is required. The program is designed to be completed in four semesters by full-time students. However, students may start the program in any semester and may pursue an M.S. degree program in Management Science on a part-time basis.

Admission Requirements

The Ph.D. program requires three applicant recommendation forms and the GRE or GMAT, in addition to the Graduate Council’s requirements.

Coursework

A minimum of 48 semester hours of coursework taken for graduate credit (exclusive of thesis or dissertation) is required. Some of this may be the coursework from a master’s program although a master’s is not a prerequisite for the doctorate. The candidate must complete a minimum of 24 semester hours at The University of Tennessee, at least 6 of which must be at the 600 level. Both of these requirements are also exclusive of thesis or dissertation credits.

Qualifying Examinations

The student must demonstrate mastery of probability theory and statistical inference, Statistics 563, 564, by passing a written qualifying examination. Mastery of 12 to 14 semester hours in mathematics coursework must be demonstrated by passing a written qualifying examination. Topics normally include numerical analysis, either Mathematics 471, 472, 453, and 571, or 571-572, and real analysis, Mathematics 445-446. Other options may be approved. In exceptional circumstances, the faculty will consider waiving the mathematics and/or statistics qualifying examinations.

These requirements generally are completed by the end of the first year of the program.

There is no foreign language requirement.

Comprehensive Examination

Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation

The student must complete 24 semester hours of Management Science 600: Doctoral Research and Dissertation, through which he/she is expected to make a significant 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. This effort, which is beyond the minimum 48 hours of coursework, normally is completed in the third year of the program.

ACADEMIC STANDARDS

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

502 Registration for Use of Facilities (1-15) Required for students 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/NP only.

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 parametric analysis, linear fractional, piecewise-linear, separable and integer programming, transportation linear programs. Prerequisite: Fundamentals of matrix algebra. (Same as Industrial Engineering 523.)

532 Stochastic Models in Management Science (3) Discrete-time Markov chains, Poisson processes, continuous-time Markov chains, renewal theory, and queueing theory. Prerequisite: Statistics 563 and Mathematical Analysis or consent of instructor.

533 Computational Mathematical Programming (3) Computational aspects of mathematical programming models, in particular for large systems. Prerequisite: 531 and proficiency in computer language.

534 Management Science Methods in Business (3) Application of methods from 531, 532, and 533 to real world problems in business/industry.

551 Leveraging Information Through Descriptive and Prescriptive Modeling (3) Concepts and tools...
for emulating business operations (descriptive modeling) and for determining optimal operational or tactical strategies (prescriptive modeling). Visualization, optimization, and simulation concepts reinforced through hands-on experience with technologies: geographic information systems (GIS), spreadsheet-based models, simulation packages, and supply chain optimization software. (Same as Information Management 522.)

593 Management Science Problems (1-6) Directed study on subject of mutual interest.

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

621 Network Flows (3) Treatment of network optimization algorithms, transportation and transhipment models and primal-dual and primal-dual base tree methods. Prereq: 531 or equivalent.

631 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branch and bound, cutting plane, and group theoretical algorithms. Prereq: 531 or equivalent.

651 Nonlinear Optimization (3) Kuhn-Tucker theory in nonlinear programming, solution procedures for constrained and unconstrained nonlinear programs, search techniques, quadratic programming, duality and sensitivity analysis. Prereq: 531 or equivalent, proficiency in computer language. (Same as Industrial Engineering 602.)

681 Special Topics (3) Prereq: 531, 532 and consent of instructor. May be repeated. Maximum 9 hrs.

691-92 Management Science Seminar (1,1) Subjects selected from current literature. S/NC only.

### Marketing, Logistics, and Transportation (College of Business Administration)

#### MAJOR DEGREES

**Business Administration** MBA, Ph.D.

Robert B. Woodruff, Head

Professors:

Barnaby, D. J., Ph.D. Purdue
Cadotte, E. R., Ph.D. Ohio State
Davis, F. W., Jr., Ph.D. Michigan State
Dicer, G. N., DBA Indiana
Mentzer, J. T. (Harry J. Bruce Chair of Excellence), Ph.D. Michigan State
Schumann, D. W. (Taylor Professor), Ph.D. Missouri
Woodruff, R. B. (Liaison) (Poffitt’s Professor), DBA Indiana

Associate Professors:

Dabholkar, P. A., Ph.D. Georgia State
Foggin, J. H., DBA Indiana
Gardial, S. F., Ph.D. Houston
Kahn, K. B., Ph.D. Virgin Tech
Holcomb, M. C., Ph.D. Tennessee
Moon, M. A., Ph.D. North Carolina
Reizenstein, R. C., Ph.D. Cornell
Rentz, J. O., Ph.D. Georgia
Rinehart, L. M., Ph.D. Tennessee

Assistant Professors:

Flint, D. J., Ph.D. Tennessee
Myers, M. B., Ph.D. Michigan State
Ruzicka, M. E., Ph.D. Arizona State

Sahin, Funda, Ph.D. Texas A&M

**Instructor:** Collins, Mark E., MBA Middle Tennessee State

**BUSINESS ADMINISTRATION CONCENTRATIONS**

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

**MBA Concentration:** Logistics and Transportation

Minimum course requirements for logistics and transportation—Logistics and Transportation 510, 546, and 547. For marketing—Marketing 520 and 530.

**Ph.D. Concentration:** Logistics and Transportation, Marketing

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

### Logistics and Transportation

#### GRADUATE COURSES

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

510 Logistics and Operations Management (3) (Same as Management 540.)

546 Logistics and Supply Chain Strategy (3) Development of strategy for logistics systems and supply chain processes. Executive-level integration of logistics strategy with marketing, production, finance, and other decision areas. Prereq: 510 and Business Administration 511, 512, 513, and 514.

547 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 operations of supply chains in a global environment. Prereq: 510 and Business Administration 511, 512, 513, and 514.

593 Independent Study (3-6) Directed research and study. Prereq: Consent of instructor. May be repeated. S/NC only.

599 Special Topics Seminar (3) Topics vary: market forecasting, market segmentation, services marketing, marketing channels, and related issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

611 Theoretical Foundations (3) Theoretical foundations and frameworks common to business research. Historical and philosophy of science perspectives. (Same as Logistics and Transportation 611.)

612 Research Methods I (3) Research process: philosophical foundations, problem formulation, grounded theory, qualitative methods and analysis, measurement, sources of error, experimental design and analysis, and survey design and analysis. (Same as Logistics and Transportation 612.)

613 Supply Chain Management Thought (3) Survey of concepts and research methods of interorganizational systems. Supply chains will be studied from multiple perspectives including the following: institutional design and structure, transaction cost economics, operations and logistics cost economics, exchange behaviors and strategies, supply chain design and operation, and evaluation of supply chain performance.

614 Evolution of Logistics Thought (3) Survey of concepts, frameworks, theory, research issues, and empirical research in content areas related to logistics and supply chain management. Conceptual foundations, issue controversies, and future directions.

615 Logistics and Transportation Models (3) Analysis of contemporary models and methodologies in logistics and transportation research, topical coverage at discretion of instructor.

693 Independent Study (1-6) Directed research on subject of mutual interest to student and faculty. May be repeated. Prereq: Consent of instructor.

### Marketing

#### GRADUATE COURSES

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

510 Principles of Marketing Management for Non-MBA Students (3) For students from other disciplines interested in obtaining knowledge of marketing disciplines at graduate level.

520 Marketing and Customer Value (3) Frameworks, techniques, and processes required for customer relationship management and demand planning in organizations. Twin problems of analyzing markets and customers and translating these analyses into actionable marketing strategies. Prereq: Business Administration 511, 512, and 513 or consent of instructor.

530 MBA Marketing Concentration (6) Product management, consumer behavior, and international marketing. Interdisciplinary nature of product development and product management. Strategic issues during product life cycle, from idea conception to product development to commercialization to eventual product dismissal. Integrated communications Strategies and tactics associated with communicating value to customers. One-to-one marketing approaches, role of personal selling in communication mix, and advertising and promotions management. Global marketing management: Cross-national forces that enable firms to design and maintain competitive marketing and supply chain networks across multiple geographic locations. Prereq: 520 and Business Administration 511, 512, and 513, and 514.

593 Independent Study (3) Directed research and study. Prereq: MBA Core and consent of instructor. May be repeated. Maximum 6 hrs.

599 Special Topics Seminar (3) Topics vary: market forecasting, market segmentation, services marketing, marketing channels, and related issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

611 Theoretical Foundations (3) Theoretical foundations and frameworks common to business research. Historical and philosophy of science perspectives. (Same as Logistics and Transportation 611.)

612 Research Methods I (3) Research process: philosophical foundations, problem formulation, grounded theory, qualitative methods and analysis, measurement, sources of error, experimental design and analysis, and survey design and analysis. (Same as Logistics and Transportation 612.)

613 Research Methods II (3) Examination of qualitative research theoretical foundations and methodologies. Application of qualitative research methods to marketing research. Topics include formulating research questions, designing qualitative research studies, sampling, data generation techniques, data analysis techniques, evaluating qualitative research, and writing qualitative research reports.

614 Contemporary Marketing Thought (3) Representative topics comprising content of marketing knowledge: macromarketing, markets, channels, and competition for behavior; marketing mix tools; and ethical issues in marketing. Examination of research for contributions to advancing knowledge and opportunities for new research.

Marketing
Materials Science and Engineering

(College of Engineering)

MAJORS DEGREES

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

Raymond A. Buchanan, Interim Head

Professors:
Bhat, Gajanan S., Ph.D. ............ Georgia Tech
Benson, Roberto S., Ph.D. ........ Florida State
Breece, Randall R., Ph.D. ........ Florida State
Buchanan, Raymond A. (Liaison),
PE, Ph.D. .................................. Vanderbilt
Collier, Billie J., Ph.D. ............. Tennessee
Dahotre, Narendra B. (UT/ORNL Joint Faculty), Ph.D. ......... Michigan State
Egami, Takeshi (UT/ORNL Distinguished Scientist), Ph.D. ........ Pennsylvania
George, Esso (UT/ORNL Joint Faculty),
Ph.D. .................................. Penn State
Hansen, Marion G., Ph.D. ........ Wisconsin
Liaw, Peter K. (Racheff Chair of Excellence),
Ph.D. .................................. Northwestern
Lowndes, Douglas H., Ph.D. ........ Colorado
Lundin, Carl D., Ph.D. ............... Rensselaer
McHargue, Carl J. (Director, Center for
Materials Processing), Ph.D. ...... Kentucky
Pedraza, Anthony J.,
Ph.D. .................................. La Plata (Argentina)
Pharr, George M. (UT/ORNL Joint Faculty),
PE, Ph.D. .................................. Stanford
Phillips, Paul J., Ph.D. .............. Liverpool (UK)
Simpson, Michael L. (UT/ORNL Joint Faculty), Ph.D. ............... Tennessee
Spruiell, Joseph E., Ph.D. ........ Tennessee
Wadsworth, Larry C.,
Ph.D. .................................. North Carolina State

Associate Professor:
Meek, Thomas T., Ph.D. ........... Ohio State

Assistant Professors:
Choo, Hahn (UT/ORNL Joint Faculty),
Ph.D. .................................. Illinois IT
Hu, Bin,

Ph.D. ........ Chinese Academy of Sciences
Kit, Kevin, Ph.D. ....................... Delaware
Rack, Philip D., Ph.D. .............. Florida
Rawn, Claudia J. (UT/ORNL Joint Faculty),
Ph.D. .................................. Arizona

Emeriti Faculty:
Brooks, Charlie R., Ph.D. .......... Tennessee
Fellers, J. F., Ph.D. ................. Akron
Oliver, Ben F., Ph.D. .............. Penn State

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 metallurgy, 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; biomechanical 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 540, 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.

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 the 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 courses required for the master’s program.

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.

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.

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 18 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 580 (Critical Review).

3. Satisfactory performance on a comprehensive examination administered by the faculty committee.

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 concepts; fracture mechanics; formation of operations and limit criteria. Prereq: Mechanical Behavior of Materials, Mechanics of Materials I, sophomore mathematics.

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

443 Polymer Processing (3) Rheological measurements; flow through tubes and slits, end effects and extrude swell; selected application, screw extrusion, 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.


472 Fundamental Principles of Composite Materials (3) Establishment of fundamental principles basic to design, manufacture and application of fiber reinforced metals, ceramics and plastics. Prereq: 302 or equivalent.

474 Biomaterials (3) Metals, polymers and ceramics used in orthopaedic, cardiovascular, and dental surgical implant devices; corrosion and degradation problems; material properties of primary importance; tissue response to synthetic materials. Prereq: 201. Recommended for engineering science and mechanics majors.

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

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

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

503 Graduate Seminar in Materials Science and Engineering (1) Prereq: Admission to graduate program. May be repeated. S/N/C only.

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

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

507 Application of Linear Algebra in Engineering Systems (3) (Same as Chemical Engineering 507, Electrical and Computer Engineering 507, and Mechanical Engineering 507.)

511 Fundamentals of Materials Science and Engineering I (3) Chemical bonding, structures, defects, scattering, lattice dynamics, diffraction, 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 deformation 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 mechanisms of single crystal plastic deformation; slip, twinning, and cleavage, work hardening, effect of temperature, loading rate effects, effect of ordering and solid solution alloying; polycrystalline behavior in terms of single crystal deformation mechanisms; texture formation. Prereq: 301, 320 or consent of instructor.

524 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems: refining, oxidation, surface treatments, alloy systems. Prereq: 570 or equivalent.

525-26 Welding Metallurgy (3,3) Welding processes; types and effects of welds; phase transformations; heat flow; residual stresses; theories of hot cracking, cold cracking and porosity formation; application of the principle of utilization. Prereq: 524 or consent of instructor.

526 Ceramic Matrix Composites: Material and Mechanical Properties (3) (Same as Engineering Science 526.)

531 Advanced Corrosion (3) Analyses 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.


540 Basic Polymer Chemistry (3) Synthesis, reactions, degradation, polymers. Molecular character- ization: solution methods and spectroscopy. Prereq: Semester of organic chemistry and ther- modynamics or equivalent.

541 Polymer Rheology (3) Deformation and flow of polymeric materials. Development of empirical models, linear viscoelasticity and finite strain constitutive equations; material functions, temperature dependence and rheometry with applications to synthesis and processing. Elementary kinetic theory of elastic dumbbell suspensions. Prereq: Chemical Engineer- ing 240 Fluid Flow and Heat Transfer or equivalent. (Same as Chemical Engineering 541.)

542 Further Topics in Polymer Processing (3) Description and analysis of selected polymer processing operations. Prereq: 541.


546 Mechanical Properties of Solid Polymers (3) Types of mechanical behavior; Hookean and rubber elasticity; plastic deformation; fracture; linear viscoelasticity; dynamic mechanical behavior and test- ing; loss tangent; experimental methods. Introduction to mechanical properties of polymeric composites.

549-50 Laboratory Methods in Polymer Engineering (1,2) Basic experimental techniques and instrumenta- tion associated with characterization, x-ray and light microscopy, calorimetry, rheometry, mechanical prop- erties of solid polymers, polymer processing opera- tions. Coreq: 540 or consent of instructor. 549-S/NC only.

552 Fiber Science (3) Physical properties, mechani- cal properties and microstructure of polymeric fibers, relation to end-use properties. Prereq: Organic Chem- istry and Thermal Physics or equivalent.

553 Nonwovens Science and Technology I (3) Non- woven fabric technology; different web forming process- es and relationships and engineering considerations. Non- woven fabrication processes and characterization techniques. Effect of processing conditions on structure development and properties of different types of webs. Prereq: 552 and 553.

560 Principles of Ceramic Processing (3) Treat- ment of ceramic processing; raw materials prepara- tion and characterization; powder consolidation; dry- ing, firing, sintering techniques, mechanisms and ki- netics. Prereq: 360 or equivalent.

570 Optical Microscopy (4) Basic compound and polarizing microscopy for imaging. Optical property measurements, and structure elucidation. Other meth- ods of optical microscopy. Prereq: Fundamentals of Physics: Wave Motion, Optics and Modern Physics or equivalent. 3 hrs and 2 labs.

572 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to defi- nition of structures; powder and single crystal x-ray techniques; introduction to crystal structure determi- nation; characterization of orientation; application to inorganic, metallic and polymer structures.


576 Special Topics in Materials Science and En- gineering (3) Topics of current significance and inter- est. Prereq: Consent of instructor. May be repeated.


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

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) Topics in solidification, fluid flow effects, magnetorheodynamics of incompressible fluids, growth and solidification theory, thermodynamic applications, rapid solidification theory, metastability. Prereq: Consent of instructor.

625 Materials Lifetime Science and Engineering I (4) Fundamentals of aqueous metal 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: 625.

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. Theories of failure, fatigue, corrosion, and their fatigue environment. Prereq: 531 and 532, or consent of instructor.

628 Graduate Seminar in Materials Lifetime Science and Engineering (1) Seminars by students, faculty, and visiting scholars on materials lifetime science and engineering; processes, mechanisms, and materials lifetime modeling. Prereq: 531 and 532, or consent of instructor. S/NC only.

630 Thin Film Materials Processing (3) Students learn materials issues and thin film processing techniques used to manufacture semiconductor devices. Topics include basic vacuum technology, plasma physics, sputtering, evaporation (resistive, electron beam, laser ablation), chemical vapor deposition, and etching. The mechanisms of each process are explored, and relevant material chemistries are discussed. Thin film growth models are also explained and processing variables related to material properties. Prereq: Permission of instructor.


642 Advanced Topics in Polymer Processing (3) Application of theories of rheological 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 glassy state; annealing of polyming glasses; crystalization of polymers; nucleation, growth and morphology; secondary nucleation theory; solidification of copolymers; crystallization under stress. Prereq: 543.

644 Optoelectronic Processes in Polymeric Materials (3) This course introduces fundamental molecular and microscopic theories and applications of polymer optical, electronic, and optoelectronic properties. Prereq: 543.

672 Introduction to Transmission EM and Electron Diffraction (3) Fundamentals of electron scattering, reciprocal space, the Ewald sphere construction. Basic electron optics, operation of the transmission electron microscope (includes sample preparation and sample environment). The kinematical theory of imaging of perfect and imperfect crystals in the TEM. Problems with the kinematical theory. Introduction to the dynamical theory of TEM imaging. The effect of inelastic scattering in the TEM. Fundamentals of analytical electron microscopy. The Transmission Electron Microscopy (TEM) and its relation to the TEM. Prereq: Either 405, 511, or 572; and permission of instructor.

673 Introduction to Scanned Probe Microscopies (3) A survey of techniques for surface imaging and characterization. Young’s Topogragher, field emission, and the beginning of scanning tunneling microscopy (STM) and atomic force microscopy (AFM). The operation of the STM (includes laboratory sessions). Image resolution and interpretation in the STM, analytical STM imaging. The theory and control of feedback loops in SPM. The generalization Scanning Probe Microscope (SPM) and the Atomic Force Microscope (AFM). The operation of AFM, limits to resolution, and image interpretation (includes laboratory session). Important variants of the SPM including scanning capacitance, scanning near field optical, and scanning thermal microscopes. The design of nanostructured materials. Prereq: Permission of the instructor.

674 Advanced Topics in Materials Science and Engineering (3) Latest developments and/or advanced special topics. Prereq: Consent of instructor. May be repeated.

675 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
Anderson, D. F., Ph.D. .................. Chicago
Conway, J. B., Ph.D. .................. Louisiana State
Daverman, Robert J., Ph.D. ............. Wisconsin
Dobbis, D. E., Ph.D. .................. Cornell
Dydk, J., Ph.D. .................. Warsaw
Gavrielyts, Sergey, Ph.D. ............ Moscow State
Gross, L. J., Ph.D. .................. Cornell
Hinton, D. B., Ph.D. .................. Tennessee
Jordan, G. Samuel, Ph.D. ............. Wisconsin
Karakashian, O., Ph.D. ............. Harvard
Kupershmidt, B. A. (UTSI), Ph.D. ... MIT
Lenhart, S., Ph.D. .................. Kentucky
Mulay, S., Ph.D. .................. Purdue
Plaut, Conrad, Ph.D. ............. Maryland
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
Simonon, H., Ph.D. ............. Cal Tech
Son, R. P., Ph.D. .............. Oregon State
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, Xiaobo, Ph.D. ............... Purdue
Freire, A., Ph.D. .................. Princeton
Guan, Bo, Ph.D. ................ Massachusetts
Kimble, K. R. (UTSI), Ph.D. ......... Ohio State
Kuo, Y. F., Ph.D. ............. Cincinnati
Lensch, Timothy, Ph.D. ............ Northwestern
Xiong, Jie, Ph.D. ................ North Carolina

Assistant Professors:

Chen, Xia, Ph.D. .................. Case Western
Davis, Reid, Ph.D. ............... Tennessee
Denzler, Jochen, Ph.D. ............ ETH Zurich
Dwyer, Jerry, Ph.D. ............ Ireland
Gleason, Jim A., Ph.D. ............ California
Kachi, Yasuyuki, Ph.D. ............ Tokyo

Mathews, Gretchen, Ph.D. .............. Louisiana State
Todorova, Grozdena, Ph.D. .......... Moscow State
Tzermias, Pavlos, Ph.D. .......... California

Emeriti Faculty:

Bradley, John S., Ph.D. ............... Iowa
Carruth, J. H., Ph.D. ............... Louisiana State
Clark, C. E., Ph.D. ............... Louisiana State
Frandsen, Henry, Ph.D. ............. Illinois
Husch, L. S., Ph.D. ............... Florida State
Serbin, Steve, Ph.D. ............... Cornell
Soni, K., Ph.D. ................... Oregon State

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 6 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 web site 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 at least 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 509. At most, 6 hours may be taken outside 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 written 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.
   e. One hour of Seminar in Applied Mathematics 519 or Seminar in Mathematical Ecology 589.
   2. One course from each of the following five areas:
      e. Statistics—Statistics 525, Stochastic Modeling 527, Statistical Methods 571 (Statistics), Biometry 560 (Ecology and Evolutionary Biology).

THE DOCTORAL PROGRAM

For the Ph.D. program in Mathematics, the student must meet the following requirements in addition to those of the Graduate Council:

1. Satisfy either the standard program or the interdisciplinary mathematical ecology concentration. A student intending to work in mathematical ecology may complete either concentration. A student intending to work in mathematical ecology may complete either
   a. The examinations to be taken must be
      1. Prerequisite courses:
         d. Matrix Algebra II 453.
         e. One hour of Seminar in Applied Mathematics 519 or Seminar in Mathematical Ecology 589.
         2. One course from each of the following five areas:
            e. Statistics—Statistics 525, Stochastic Modeling 527, Statistical Methods 571 (Statistics), Biometry 560 (Ecology and Evolutionary Biology).
   b. The examinations to be taken must be
      1. Prerequisite courses:
         d. Matrix Algebra II 453.
         e. One hour of Seminar in Applied Mathematics 519 or Seminar in Mathematical Ecology 589.
         2. One course from each of the following five areas:
            e. Statistics—Statistics 525, Stochastic Modeling 527, Statistical Methods 571 (Statistics), Biometry 560 (Ecology and Evolutionary Biology).

2. Demonstrate proficiency in one foreign language, normally French, German or Russian. This requirement must be met prior to the examination in the area of specialization. A student’s doctoral committee may require the student to pass a second language examination.

3. Pass an examination in the field of specialization. After the requirements in 1. and 2. have been fulfilled, this examination will be given by a committee appointed by the department head. A student may take this examination only twice.

4. Pass a one-year, 600-level sequence in mathematics outside the student’s area of specialization. The sequences selected to fulfill this requirement must be approved by the department head and the student’s doctoral committee. (Such approval may occur after completion of the sequence.) Requirements 1-4 must be completed no later than the start of a student’s seventh year (as a mathematics graduate student at UT).

Standard Program

Demonstrate knowledge in five subjects selected from the groups listed below by passing written examinations in three subjects and by earning grades of B+ or better each semester in the courses associated with two additional subjects. The three subjects selected for written examinations must be from Groups I, II, III. At least two groups must be represented in the three written examinations. At least three groups must be represented in the five subjects.


A student’s five subjects may not include both Real Analysis and Applied Linear Analysis or both Mathematical Principles of Fluid Mechanics and Mathematical Principles of Continuum Mechanics. A student may not count examinations in both Ordinary Differential Equations and Partial Differential Equations, but both may be included in a student’s five subjects. With prior approval of the graduate committee, a student may utilize as a Group IV course a year-long graduate-level sequence from outside the Department of Mathematics. At most one such examination may be made.

A student may take as many written examinations as desired at any time the examinations are given, subject to the following conditions:

a. The examinations to be taken must be approved in advance by the student’s advisory committee.

b. At any one time a student may take at most one examination each semester.

c. A student may take a collection of written examinations a maximum of three times, but no other failing examinations, counting possible repetitions, will be permitted to take another examination. An exception is that a student who does not have a master’s degree in mathematics and who has been enrolled in a UT graduate program in mathematics no longer than one year may take written examinations at one time during that year without having that sitting for the examinations or any incurred failure(s) count toward the limits imposed above.

d. At least two examinations must be taken and at least one must be passed before the start of a student’s fourth year. Three examinations must be passed before the start of a student’s fifth year.

In lieu of earning a grade of B+ or better each semester in a sequence from Group I, II, III, a student may demonstrate proficiency in that subject by passing the associated written examination. For this purpose, only one examination is permitted for each of up to two subjects, and this use of a written examination must be declared before the examination is taken so that the sitting for the examination and any failure are not counted toward the limits in condition c.

Mathematical Ecology Concentration

The student must pass written examinations in three subjects:


2. A subject from Groups I, II, and III of the standard program.

3. A subject represented by a year-long graduate-level sequence from outside the Department of Mathematics. The sequence must be approved in advance by the mathematical ecology faculty and by the departmental Graduate Committee. At least one member of the mathematical ecology faculty must be involved in the grading of the examination. The examination in this subject may be taken only twice.

The student also must earn grades of B+ or better each semester in the courses associated with two additional subjects from the groups listed in the standard program. This requirement may not be satisfied with courses from outside the department. At least one of the subjects used to meet this requirement or the written examination subject in 2. must be from Groups I and II.

Except for the privilege of utilizing as a Group IV course a course from outside the department, this concentration is subject to the constraints and privileges specified in the standard program, including the restrictions on related subjects, the conditions a. through d. placed on the taking of written examinations, and the option to pass a written examination in lieu of earning a grade of B+ or better each semester in a sequence from Group I, II, or III.

GRADUATE COURSES

400 History of Mathematics (3) Development of major ideas in mathematics from ancient to modern times and influence of ideas in science, technology, philosophy, art, and other areas. Writing emphasis course: at least one in-class essay examination and 300 words of out-of-classroom. Prereq: Calculus I.

401 Mathematics and Microcomputers (3) Primarily for students seeking certification as mathematics teachers at secondary levels. Use of microcomputers to study concepts and problems in mathematics. 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 equations, modeling of biological systems. May not be counted toward graduate degree. Prereq: Calculus II or Biocalculus.


421 Combinatorics (3) Introduction to problems of construction and enumeration for discrete structures: sequences, partitions, graphs, finite fields and geometries, order and permutations. Prereq: Probability and Statistics or consent of instructor.

423 Probability I (3) Axiomatic probability, multivariate distributions: t, F and X2; independence of sample processes. Other topics as selected by instructor.

461 Topology (3) Topology of line and plane, separation properties, compactness, connectedness, continuous functions, homeomorphisms, continua and topological invariants. Prereq: Calculus III and Introduction to Abstract Mathematics, or consent of instructor.

471 Numerical Analysis (3) Computation, instabilities, and rounding. Interpolation and approximation by polynomials and splines; quadrature and numerical solution of initial and 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. Prereq: Differential Equations I and 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 instructor. 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. Prereq: Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

500 Thesis (1-5) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when she/he is using University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 12 hrs.

506 Algebra for Teachers (3) Algebraic structures: integral domains and fields and their applications to 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.


519 Seminar in Applied Mathematics (1-3) Topics vary. Requires out-of-class projects and in-class presentations. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

521-22 Enumerative Combinatorics (3,3) Sieve methods, version, generating functions, and perturbation groups applied to enumeration of discrete structures. Incidence algebras and combinatorics of partially ordered sets.

523-24 Probability (3,3) Pertinent facts from probability theory; formulation of statistical models; sufficiency, Fisher-Neyman factorization theorem, exponential families, Bayesian models; methods of estimation and optimality; confidence intervals and properties of conditional expectation, martingales, Doob’s martingale and optional sampling theorems. Prereq: 445-46. Recommended prereq: 423.

525-26 Statistics (3,3) Pertinent facts from probability theory; formulation of statistical models; sufficiency, Fisher-Neyman factorization theorem, exponential families, Bayesian models; methods of estimation and optimality; confidence intervals and properties of conditional expectation, martingales, Doob’s martingale and optional sampling theorems. Prereq: 445-46. Recommended prereq: 423.

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’s sufficient condition for the extremum- Legendre’s and Jacobi’s conditions, conjugate points. Multiple integrals. Prereq: 431.

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, constitutive relations and stress, convexity properties, bifurcation phenomena, existence theory. Prereq: 431, 435, 443 or 453, or consent of instructor.
539 Seminar in Differential Equations (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


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 programming 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. Maximum 12 hrs.


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 and manifolds and Riemannian metrics; connections, geodesics, Jacobi 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.


575 Matrix Theory and Techniques in Numerical Analysis (3,3) Study of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relation to modern computer architectures. Prereq: 453, 471-72, or consent of instructor. May be repeated. Maximum 9 hrs. (Same as Computer Science 575.)

577 Optimization (3) Major topics in optimization with problems developed from real-world applications including constrained and unconstrained optimization with analysis of major algorithms and utilization of appropriate software. Prereq: Numerical Algorithms, 453, 445-46.

578 Numerical Methods for Partial Differential Equations (3) Numerical approximation of solutions of partial differential equations including conservation laws and hyperbolic, parabolic, and elliptic problems. Derivation, physical meaning, and implementation of schemes. Prereq. 439 or 512 or 515, Fornar 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) Populations genetics and evolutionary ecology. Prereq. 431, 453 or consent of instructor. (Same as Ecology and Evolutionary Biology 583.)

585 Optimal Control Theory (3) Deterministic optimal control. Examples involving calculus of variations, optimal trajectories, 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) P/NP only.


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: Ito's calculus and stochastic differential equations, integration prediction 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 prepa- rations 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 classical and modern 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 on Euclidean spaces or topologi- cal groups: convergence, summability, uniqueness, inversion, duality. Plancherel transform, integral transform, Hardy-Littlewood maximal function, interpolation of operators, or Feller-Stein duality. Prereq: 541-42 and 543. May be repeated with consent of depart- ment. 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.

659 Seminar in Algebra (1-3) Prereq: Consent of instructor. 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) Se- lected topics in theoretical and applied mathematical ecology: population, community, ecosystem ecology and applied topics such as demography, ecotoxicology, epidemiology, resource management. Prereq. 581-82. May be repeated. (Same as Ecology and Evolutionary Biology 681-682.)
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 bio-mechanics.

In Mechanical Engineering or Aerospace Engineering, entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical engineering 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 Application for Admission. 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 Application for Admission. 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 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 conferment 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.
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 Office of Graduate Admissions for the Master of Business Administration 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 separate 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 Office of Graduate Admissions 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 teamwork assignments.

Curriculum for Dual M.S.-MBA Degree – Major in Mechanical Engineering

<table>
<thead>
<tr>
<th>August—First Year</th>
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</thead>
<tbody>
<tr>
<td>BA 511 MBA Core I</td>
</tr>
<tr>
<td>Fall—First Year</td>
</tr>
<tr>
<td>BA 512 MBA Core II</td>
</tr>
<tr>
<td>ME 504 Product Development Process</td>
</tr>
<tr>
<td>Spring</td>
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<tr>
<td>BA 513 MBA Core III</td>
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<tr>
<td>ME 505 Mechatronics</td>
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<tr>
<td>ME 506 Product Selection and Evaluation</td>
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<tr>
<td>ME 508 Integrated Product, Process, and Manufacturing System Design</td>
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<tr>
<td>Summer</td>
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<tr>
<td>BA 514 Internship</td>
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<tr>
<td>ME 509 Project Management</td>
</tr>
<tr>
<td>Fall—Second Year</td>
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<tr>
<td>IE 511 Business Planning and Commercialization</td>
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<tr>
<td>ME 509 Multidisciplinary Project</td>
</tr>
<tr>
<td>ME 551 Mechanical Engineering Design</td>
</tr>
<tr>
<td>ME 537 Mechanical Systems Analysis</td>
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<tr>
<td>ME 527 Thermal Systems Analysis</td>
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<tr>
<td>Spring</td>
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<tr>
<td>ME 505 Mechatronics</td>
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<tr>
<td>ME 509 Multidisciplinary Project</td>
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<tr>
<td>ME 510 Prototype Development and Evaluation</td>
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<tr>
<td>— Math/Engineering Elective (select with advisor)</td>
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<tr>
<td>Summer (first session)</td>
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<tr>
<td>ME 594 Culminating Integrated Project Report</td>
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<tr>
<td>TOTAL</td>
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<td>66</td>
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</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 advisory committee can approve a student's petition to replace one 600-level course with one or more 500-level course(s) that are more appropriate.

In Engineering Science, the courses must include:
1. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.
2. 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 advisory committee and approval of that proposal by that committee.