Graduation requires passing a comprehensive examination, taken no later than the end of the second year, completion of all course requirements with a minimum 3.0 GPA, completion of a written or oral dissertation, and successful oral defense of the dissertation.

The comprehensive examination includes both written and oral parts in which the candidate will be tested on his/her knowledge of the area concerning the proposed dissertation and of related fields. The candidate is expected to be conversant in a wide field of geological sciences.

A minimum of 24 hours of graded coursework beyond the master's degree is required in addition to the 24 hours of Dissertation 600. The coursework includes the sum of 9 hours of 600-level geology courses, 9 hours of 500-level or higher geology courses, and 6 hours of additional graduate courses. Extra-departmental coursework is encouraged.

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

### GRADUATE COURSES

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

#### 410 Advanced Mineralogy (3) Crystal chemistry of rock-forming minerals. Interaction of electromagnetic radiation and crystalline solids. Optical properties of minerals, visible and infrared spectroscopy, and x-ray diffraction. Laboratory exercises emphasize the thin section and x-ray diffractometer methods of mineralogy. Prerequisite: 310. 2 hrs and 1 lab.

#### 420 Paleogeology (4) Principles of paleocological analysis as applied to fossils and fossil assemblages: data collection and interpretation; laboratory designed area. Preparation of scientific reports on field and laboratory analysis. Writing emphasis course. 3 hrs and 1 lab.

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

#### 440 Field Geology (6) Summer field course for advanced undergraduate geology majors and first-year graduate students in geology. Taught off-campus and requires full time of student. Synthesis of major aspects of geological sciences in societal context. Field techniques demonstrated, practiced, and applied to solution of geologic problems. Prerequisite: Completion of major core courses and consent of instructor.

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

#### 455 Basic Environmental Geology (3) Applications of geological sciences toward comprehension of effects of geological processes on organisms and effects of human activities on earth's environments. Prerequisite: 12 hrs of geology courses. 2 hrs and 1-3 lab hrs or field period.

#### 460 Principles of Geochemistry (3) Application of chemical principles to geologic problems. Crystal chemistry and the role of atomic structure and distribution and behavior of elements in earth's crust. Prerequisite: Chemistry 120-30. Recommended prerequisite: 330. 2 hrs and 1 lab.

#### 470 Applied Geophysics (3) Basic principles of geophysical exploration: applications to environmental problems, production, and economic and geologic problems. Prerequisite: 6 hours of geology courses numbered above 300. Elements of Physics.

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

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

#### 480 Principles of Economic Geology (4) Ore-forming processes, classification of mineral deposits, survey of different types of mineral deposits with examples, and metallogenesis. Prerequisite: 310 and 330 or equivalents. Recommended prerequisite: 460. 1 hr and 2-3 lab hrs.

#### 485 Principles of Hydrogeology (3) Physical principles of flow, flow equations, geologic controls, aquifer analysis, water well design, and modeling and transport processes. Prerequisite: The Dynamic Earth; Calculus; Fundamentals of Physics or equivalent, or consent of instructor. (Same as Civil Engineering 485).

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

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

#### 505 Structure of the Southern and Central Appalachian Plateau (2) Structural development of Southern and Central Appalachians from extensional Late Proterozoic to the present. Comparison to similar orogens. Prerequisite: Structural Geology.

#### 510 Clay Mineralogy (3) Origin, chemistry, structures, and properties of clay minerals; application of mineralogical principles in clay mineral studies. Prerequisite: 310 and 568 or equivalent. 2 hrs and 1 lab.

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

#### 525 Biostratigraphy (3) Examination of principles of stratigraphy and biostratigraphy through selected case histories. 1 hr and 1-2 hr seminar.

#### 530 Petrogenesis of Crystalline Rocks (4) Origin and properties of igneous and metamorphic rocks, magmatic and subvolcanic processes and physical conditions. Laboratory study of petrographic thin sections. Prerequisite: 410. 3 hrs and 1 lab.

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

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

#### 545 Sandstone Petrology/Physical Sedimentology (4) Field and microscopic analysis of heterogeneous clastic rock types; physical processes of sedimentation, transport, and deposition of sediment, and formation of sedimentary structures. Prerequisite: 540 or equivalent. 3 hrs and 1 lab.

#### 546 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonate sediments and diagenesis of resultant rocks; field and laboratory analysis of sample material and preparation of scientific reports. Prerequisite: 540 or equivalent. 3 hrs and 1 lab.

#### 550 Regional Geomorphology (3) Integrative approach to study of natural geomorphological regions stressing links and similarities across boundaries, unique characteristics of major divisions, provinces, areas, and districts. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Geography 550)
Germanic and Slavic Languages

(College of Arts and Sciences)

MAJORS DEGREES

German ........................................ M.A.
Modern Foreign Languages .......... Ph.D.

David E. Lee, Head

Professors:
Falen, James E. (Emeritus), Ph.D. Pennsylvania
Fiene, Donald M. (Emeritus), Ph.D. Indiana
Hodges, Carolyn R., Ph.D. .......... Chicago
Kratz, Henry (Emeritus), Ph.D. Ohio State
Osborne, J. C. (Emeritus), Ph.D. Northwestern
Ritzenthaler, Ursula C. (Emerita), Ph.D.

Connecticut

Associate Professors:
Lauckner, Nancy A. (Liaison), Ph.D. Wisconsin
Lee, David E., Ph.D. .......... Stanford
Mellor, Charles J., Ph.D. Chicago

Assistant Professors:
Blackwell, Stephen H., Ph.D. Indiana
Hoeying, Peter, Ph.D.............. Wisconsin
Livers, Keith A., Ph.D. Michigan
Moser, Beverly, Ph.D. ............ Georgetown
Ohnesorge, Stefanie, Ph.D. McGill
Pervukhin, Natalia K., Ph.D. Bryn Mawr

The Department of Germanic and Slavic Languages offers two advanced degrees: the Master of Arts in German and the Doctor of Philosophy in Modern Foreign Languages. Inquiries should be addressed to the head of the department.

THE MASTER'S PROGRAM

The department requires a minimum of 30 semester hours including 15 hours of coursework numbered 500 and above and 6 hours of Thesis 500.

THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance and Asian Languages and requires advanced training in a major language and either a second language or applied linguistics. Students whose language of first concentration is French or Spanish should consult the section on Romance and Asian Languages.

Admission Requirements

Applicants must have completed a B.A. in either French, German or Spanish to be accepted into this program. Both graduates of institutions in the United States and those with undergraduate degrees from institutions outside the United States must have a grade point average of at least 3.0. Consideration will also be given to applicants who do not have an undergraduate degree in one of the three foreign languages but do have the equivalent of an undergraduate major in one of them.

Degree Requirements

Candidates with German as a first concentration must complete a minimum of 63 semester hours of coursework beyond the bachelor's degree in addition to 24 hours of doctoral research and dissertation. The coursework must be distributed as follows:

1. First Concentration: German. A minimum of 39 hours of German courses beyond the bachelor's degree, distributed as follows:
   - 400 level: A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.
   - 500 level: A minimum of 21 hours must be taken. These must include German 512, 519, 520, and 560. Thesis hours are excluded. If 512 is used as part of the second concentration in applied linguistics, another course must be substituted in the first concentration.
   - 600 level: A minimum of 12 hours must be taken, exclusive of dissertation hours.

2. Second Concentration. A minimum of 18 hours beyond the bachelor's degree, taken in the field of applied linguistics or in a second language, either French, Italian, Russian or Spanish. Twelve of these hours must be at the 500 level or above.

Students choosing applied linguistics must take German 425, 435, 510, or 512, 3 hours of German linguistics, such as 426, 436, 631, or 632, and 6 hours of linguistics electives in English or German. The student's graduate advisor must approve the electives chosen.

3. Cognate Field. Six hours in graduate courses numbered 400 and above in a field outside the department of the first concentration but related to the student's principal area of research. Students choosing applied linguistics as a second concentration are strongly urged to take their cognate work in a second language.

4. Additional requirements: For any languages taken as a first or second concentration, a student must demonstrate competence by taking a test. The test will include reading, writing, listening, and speaking, and should be completed by the time the student reaches 40
hours of study beyond the bachelor's degree. Standardized examinations that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI).

If a student has not chosen a third language as his or her cognate area, basic competence (determined by a reading examination with translation into English administered by the department concerned) in a third language is required. If the student's first and second languages are Romance languages, the third language should be chosen from another language family.

For students choosing applied linguistics as an area of second concentration, reading competence in a second language is required. Competence will be determined by translation of a text from the foreign language into English, the test to be administered by the department offering the language.

A comprehensive examination on the first and second concentrations must be passed before the student may be admitted to candidacy. The candidate is required to defend his/her dissertation in an oral examination. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

Graduate Teaching Assistants with a second concentration in another language should have the opportunity and will be strongly encouraged to instruct in the languages of both their first and second concentration, subject to staffing needs.

Doctoral students are strongly encouraged to reside and study abroad and will be assisted in identifying potential sources of financial support (e.g., Fulbright, McClure, Rotary fellowships).

For additional courses, see Romance and Asian Languages.

ACADEMIC COMMON MARKET

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

German

GRADUATE COURSES

331-32 Elements of German for Upper-Division and Graduate Students (3,3) Elements of language, elementary and advanced readings, and a final 1,000-word translation project. Open to graduate students preparing for language examinations, and upper-division students desiring reading knowledge of the language. No credit for students having completed 101-02 or 107. 332 may be repeated. Maximum 6 hrs. Undergraduate credit only.

411-12 Advanced Conversation and Composition (3,3) Prereq: 311-12 or equivalent of consent of department.

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

420 Selected Topics in German Literature from 1750 to the Present (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

421 German Lyric Poetry (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

422 German Drama (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

423 German Narrative Prose (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

424 German Literary Movements (3) Survey of major periods in development of German literature since 1750: problems and periods of periodization.

425 Introduction to Descriptive Linguistics (3) (Same as French 425, Spanish 425, Linguistics 426, and Russian 425.)

426 Methods of Historical Linguistics (3) Phonetics, distinctive features, sound type, word order, and phonological change. Survey of non-phonological linguistic change, language families, Proto-Indo-European, and other proto languages. Prereq: 6 hrs of upper division foreign language courses (excluding courses in translation or graduate reading courses). (Same as Russian 426, French 425, Spanish 426, and Linguistics 426.)

435 Structure of the German Language (3) Conventional English-German-supertag and suprasegmental phonemes, contrastive English-German linguistic structures, selected topics in advanced German grammar and syntax. Prereq: 6 hrs of upper division German language courses (excluding courses in translation and graduate reading courses). (Same as Linguistics 435.)

436 History of the German Language (3) Development of German language from Indo-European through Proto-Germanic, Old High German, Middle High German to New High German. Internal and external linguistic history of German speech. Prereq: 6 hrs of upper division German language courses (excluding courses in translation and graduate reading courses). (Same as Linguistics 436.)

445 Business German (3) Survey of German used in fields of business, government, administration, and economics. Prereq: 6 hrs of upper-division German excluding courses in translation and graduate reading courses.

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

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

510 German Phonetics and Advanced Grammar (3) Advanced work in phonetics, pronunciation, and selected topics in German grammar. For teachers and prospective teachers. Prereq: Consent of instructor. E

512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic language skills and foreign language skills, and cultural knowledge through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding GTA's, except those whose previous training or experience warrants excuse by department.

519 Bibliographical Methods (1) Bibliographical methods, major reference works and bibliographical problems in language and literature.

520 Proseminar (2) Advanced training in use of bibliographical and reference tools; illustrative problems; paper preparation.

541-42 Medieval German Language and Literature (3,3) 541--Introduction to Middle High German; 542--Readings in Medieval German Literature.

550 Studies in German Literature (3) Content varies. May be repeated. Maximum 6 hrs.

551 German Humanism, Reformation and Baroque (3) Content varies. May be repeated. Maximum 6 hrs.

552 German Enlightenment, Rococo, and Sturm und Drang (3) Content varies. May be repeated. Maximum 6 hrs.

553 German Classicism and Romanticism (3) Content varies. May be repeated. Maximum 6 hrs.

554 German Realism and Naturalism (3) Content varies. May be repeated. Maximum 6 hrs.

555 Modern German Literature 1890-1945 (3) Content varies. May be repeated. Maximum 6 hrs.

556 Modern German Literature 1945-Present (3) Content varies. May be repeated. Maximum 6 hrs.

560 German Literary Theory and Criticism (3)

561-62 Directed Readings in German Language and Literature (3,3)

571 Old Norse Language and Literature (3)

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. Letter grade or S/NC.

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

610 Gothic (3) Phonology, morphology, and syntax of Gothic language. Relationship to Indo-European languages and other Germanic languages. Readings from Gothic Bible.

611 Old High German (3) Phonology, morphology, and syntax of Old High German. Representative readings.

621-22 Seminar in German Literature (3,3) May be repeated. Maximum 18 hrs.

631-32 Seminar in German and Germanic Philology (3,3)

Russian

GRADUATE COURSES

401-02 Advanced Grammar, Conversation, and Composition (3,3) Prereq: Russian Composition and conversation or equivalent. (Same as Russian and East European Studies 401-02.)

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

426 Methods of Historical Linguistics (3) (Same as French 425, German 425, Spanish 425, and Linguistics 426.)

451-52 Senior Seminar (3,3) For majors in Russian; seniors admitted at discretion of instructor. Intensive study of language, literary style, and literary criticism based on selected major novels. (Same as Russian and East European Studies 451.)

510 Russian Phonetics and Advanced Grammar (3) Phonetics, pronunciation, stylistics, and selected topics in Russian grammar. For teachers and prospective teachers. Prereq: Consent of instructor.

550 Studies in Russian Literature (3) Content varies. May be repeated. Maximum 9 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.
Health, Leisure, and Safety Sciences

(College of Human Ecology)

MAJORS

Human Ecology ................................................................. Ph.D.
Health Education ............................................................... Ed.D.
Health Promotion and Health Education ......................... M.S.
Public Health .............................................................................. M.P.H.
Recreation and Leisure Studies ........................................ M.S.
Safety Education and Service ............................................. M.S.

Charles B. Hamilton, Head

Professors:
Gorski, June, Dr.P.H. .................................................... UCLA
Hampton, Charles B. (Liaison), Dr.P.H. ....................... Oklahoma
Hayes, Gene A. (Liaison), Ph.D. ............................. North Texas State
Kirk, Robert H., H.S.D. .................................................... Indiana
Wallace, Bill C. (Liaison), Ed.D. ............................... Northern Colorado

Associate Professors:
Blanton, Mary Dale, Re.D. .......................................... Indiana
Krick, Ken L., Re.D. .......................................................... Indiana
Pursley, R. Jack, Ph.D. ......................................................... Iowa

Assistant Professors:
Ellison, Jack S. (Liaison), Ed.D...................... Tennessee
Fitzhugh, Eugene C., Ph.D. ................................................. Kentucky
Hendrick, Francis T. (Liaison), Ph.D. ...................... Oregon
Smith, Susan M., Ed.D. ......................................................... Tennessee

The Health, Leisure, and Safety Sciences Department offers graduate programs leading to the Master of Science with majors in Health Promotion and Health Education, Recreation and Leisure Studies, and Safety Education and Service, and to the Master of Public Health degree in Public Health. The department provides doctoral preparation in Health Education (Ed.D., and Ph.D. 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 a natural uniting of disciplines that contribute to a holistic approach to healthy living and the enjoyment of life for all citizens. The academic disciplines focus on assisting students, clients, and faculty to (1) develop a healthful and safe lifestyle that considers the dimensions of disease and injury prevention, and the role of leisure as it contributes to mental, social, and physical health; and (2) prepare persons for competent practice of their respective disciplines, including scholarly, creative and management endeavors. The department is committed to the educational value of community-based experiential learning.

Health

Graduate programs are available leading to the Master of Science with a major in Health Promotion and Health Education (thesis and non-thesis options) and to the Doctor of Education with a major in Health Education.

The Master of Science, with thesis and non-thesis options, requires completion of 30 semester hours.

The Doctor of Philosophy with a major in Human Ecology offers a concentration in community health.

THE PH.D. CONCENTRATION

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

Requirements include:
3. Minimum 12 hours in supporting specialization in a focused area: public health, safety, gerontology or a program approved by doctoral committee.
4. Minimum 6 hours in a cognate area.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

400 Consumer Health (3) Survey of major consumer health care providers and health care services; selecting, purchasing, evaluating and financing medical and health care services/products. (Same as Public Health 400.) Sp

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

406 Death, Dying and Bereavement (4) Aspects of dying, death and handling trauma of loss. Medical, financial, physical, legal, and social implications of death. F, Sp

420 Sex Education As It Relates to Human Sexuality (3) Exploration of science of human sexuality. Trends, issues, and content of sex education. E

425 Women's Health (3) Factors influencing women's health and women consumers in nation's health service delivery systems. Health problems/concerns of women and techniques for prevention, maintenance and/or correction. (Same as Women's Studies 425.) E

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

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

465 Aging and Health (3) Aging process in health perspective as related to health promotion and wellness of aged. F, Sp

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

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

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

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

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

570 Special Topics (1-3) For graduate students, in-service teachers and other health professionals. Health/wellness or health promotion issues. May be repeated. Maximum 12 hrs. E

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

601 Internship/Research in Safety and Health (3-6) (Same as Safety 601.)

610 Critical Analysis of Writing and Research (3) Analysis of writing and research in health related areas. F

620 Advanced Research Techniques in Health (3) Advanced theory and techniques of research design and methodologies in health discipline. Prereq: 590, 610. Sp

650 Health Aspects of Gerontology (3) Knowledge and understanding of biological, psychological and sociological aspects of aging as related to health and wellness of individual. (Same as Public Health 650.) Sp

655 Seminar in Nation’s Health (3) Comprehensive study of major public health issues. Prereq: 590. (Same as Public Health 655.) F

660 International Health (3) Study of quality of health, health promotion and health services in countries throughout the world. (Same as Public Health 660.) Sp


Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Two professional preparation concentrations are available: Community Health Education and Health Planning/Administration. 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. Preferential consideration for...
admission to degree status shall be given to those with a minimum undergraduate grade-point average of 2.0 and with at least one year of professional experience in a health-related occupation. As a restricted program, non-degree admission requires department recommendation. Deadlines for completed applications are 1 February for Summer term and 1 April for Fall semester.

THE MASTER'S PROGRAM

The M.P.H. is a non-thesis program requiring completion of 36 semester hours of coursework including 9 weeks of field practice. Field practice 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. An essay may 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.

MINOR IN GERONTOLOGY

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

ACADEMIC COMMON MARKET

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

COURSE REGISTRATION

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

GRADUATE COURSES

400 Consumer Health (3) (Same as Health 400.)

410 Health in the Work Environment (3) Fundamental activities in field of industrial health aimed at reducing health problems for employees. Workplace health hazards and problems of concern to nurses, medical staff, management, engineers and others in industrial health and safety fields. Prereq: Consent of instructor. May not be taken for credit by occupational health concentration majors. F

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

502 Registration for Use of Facilities (3-19) Required for the student not otherwise registered during any semester when student uses University facilities and/or 100 or 200 level courses. May not be used toward degree requirements. May be repeated. S/N only. E

509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health discipline and its interaction with many other academic and professional disciplines. Topics 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. F,Sp

510 Environmental and Occupational Health (2) Complexes of personal and ambient environment recognizing health as individual's response to diverse and dynamic world. Principles of occupational safety and health, Survey of contemporary issues and their implications for healthful living today and in the future. F,Sp


513 Industrial Hygiene Instrumentation and Sampling (3) Instrumentation and methods for evaluating industrial environment for personal exposure to chemical and physical stressors affecting worker's health. Lectures, demonstration, and lab. Prereq: 511, MPH (OEHS) major, and consent of instructor. F,Sp

514 Industrial Toxicology and Occupational Exposure (3) Principles of industrial toxicology: basic toxic mechanisms, major systems of entry, physiologic and biochemical responses. Occupational exposure assessment, physical hazards and environmental conditions that influence exposure characterization, statistical aspects of sampling, and transport of contaminants into general environment. Prereq: 1 yr. of general chemistry and 1 semester of human biology.

520 Public Health Policy and Administration (3) Administrative considerations of community-based health care programs and public health practice. Health policy formulation, political and administrative aspects, law and government, and its involvement in health, legal responsibilities, and management of health programs. Speakers both academic and professional. Prereq: Consent of instructor. S,Sp

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; managerial functions and skills. F

523 Management in Extended Care Settings (3) Management and theoretical foundations essential to supervision and administration of health services programs. Management and operation of health services programs for patients and clients in settings which provide acute, subacute, and chronic care, and for people of varying social, economic, and cultural levels and environments. Programs for home health services, comprehensive medical rehabilitation, nursing homes, congregative living centers and similar type health programs. Prereq: 521 or consent of instructor. Sp

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

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

540 Principles of Epidemiology (3) Distribution and determinants of health-related outcomes in specified populations, with application to control of health problems. Historical and modern principles of disease formulation, research design, data and error sources, measures of frequency and association, etiologic reasoning, disease screening, and control. Prereq or coreq: 530. F,Sp

542 Advanced Epidemiologic Methods (3) Nature, collection, analysis and interpretation of data pertaining to cohort and case-control studies. Surveillance and surveys. Analytic methods: multiple logistic regression and survival analysis. Experience in critiquing professional literature. Prereq: 540 or consent of instructor. Fn

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

552 Community Health Problem Solving (4) Dynamics of community organization, community needs assessment, educational interventions, and application of program planning and evaluation techniques. Opportunity to practice skills in realistic setting. Prereq: 550 or consent of instructor. Sp


560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodologies, systems-oriented planning process. Major elements of planning: formulation and conceptualization of problem, planning, evaluation and implementation. Health problems of institutions, communities and selected population groups, appropriate diagnoses, and programs for addressing needs. Sp

568 Physical Activity and Positive Health (3) (Same as Exercise Science 568.)

569 Fitness Testing, Programming, and Leadership for Diverse Populations (2) (Same as Exercise Science 569.)

580 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic. Maximum 8 hrs. F

585 Seminar in Gerontology (1) (Same as Health Sciences 585, Counseling and Social Work 585, Psychology 585, Exercise Science 568, Social Work 665, Sociology 585.)

587-88 Internship (3) Internship (community health education or health planning/administration) in either approved organization or research setting under supervision of designated preceptor. Prereq: MPH major, one semester advance notice and consent of major advisor. May be repeated. S,Sp

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

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

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.)

Recreation and Leisure Studies

Graduate study with a major in Recreation and Leisure Studies leads to the Master of Science. Professional preparation concentrations are available in therapeutic recreation and in recreation administration. In the recreation
administration concentration, the student may emphasize professional preparation for such areas as park and recreation, private and commercial recreation, sports management and entrepreneurial recreation.

The M.S. with thesis option requires a minimum of 33 hours. The M.S. with non-thesis option requires a minimum of 36 hours.

GRADUATE COURSES

410 Maintenance and Management of Recreation and Sports Related Facilities (3) Principles for operations and management of modern facility maintenance systems and management strategies. Cost tracking, inventory systems, specialized maintenance techniques, safety guidelines, management maintenance systems and security. Prerequisites: 110, 310 or consent of instructor. F

415 Managing Leisure/Sport and Related Facilities (3) Principles of planning, designing, outfitting and operating leisure/sport related facilities such as aquatic centers, tennis complexes, activity centers. Prerequisites: Program Development and Evaluation, or consent of instructor. (Same as Sport Management 415.) F

430 Organization and Administration of Leisure Services (3) Principles of administration applied to provision of leisure services offered by public, private and/or commercial enterprises. Organizational structures, personnel management, evaluation, legal authority, introduction to budgeting and fiscal procedures. Prerequisite: 310 or consent of instructor. F

440 Dimensions of Private and Commercial Recreation Businesses (3) Nature and function of recreation in private, commercial, and industrial settings. Survey of development and management of commercial goods and services offered in leisure market. Factors influencing participation, management considerations, and research in commercial recreation and tourism. Prerequisites: 110, junior standing, or consent of instructor. F

450 Specialized Study in Leisure Education (1-6) Specialized intensive activities; developing positive attitudes toward leisure. Demonstrates how leisure contributes to one's mental and physical health. May be repeated. Maximum 6 hrs. E

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

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/N only. E

510 Perspectives and Trends in Leisure Services (3) Basic role of leisure delivery systems in today's society, scope of leisure services, determinants of leisure behavior, developmental features of leisure and recreation. Current trends in recreation, and issues affected by and/or affecting delivery of leisure services. Sp

515 Philosophical and Conceptual Foundations of Leisure (3) Philosophy of leisure and recreation; nature of philosophy, concepts of leisure, play, work, and other factors, history of field, and relationship of ideas to contemporary society and professional practice.

520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of therapeutic recreation. Basic overview of aspects of leisure delivery systems. Prerequisites: Consent of instructor. F

521 Facilitation Techniques in Therapeutic Recreation (3) Role of therapeutic recreation in clinical and non-clinical settings; application of lifestyle planning, self-awareness, values clarification and assertiveness training in therapeutic recreation, relationship of leisure education to therapeutic recreation. Prerequisites: 520 or consent of instructor. Su

522 Clinical Aspects in Therapeutic Recreation (3) Concepts and techniques utilized by experienced and advanced therapeutic recreationists. Basic clinical issues, comprehensive program concerns, administrative funding and trends in practice of therapeutic recreation services. Prerequisites: 520. Sp

540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Finance, revenue generating strategies, cash and inventory control, commercial ventures and microcomputer applications. Prerequisites: 450 or consent of instructor. Sp

541 Management and Operation of Recreation and Sport Related Facilities (3) Research for making program and management decision, process of cost analysis, and basic design and management of recreation and sport related facilities. Prerequisites: Consent of instructor. (Same as Sport Management 541.) Sp

590 Internship in Recreation and Leisure Studies (3-6) Required of all graduate students. Minimum 50 hours work each hour credit. Work experience, evaluation by agency and written paper required. E

591 Directed Study in Leisure & Recreation (1-6) Detailed study of theme, issue, or concern. Designed to meet needs of individual students. May be repeated. Maximum 6 hrs. E

592 Special Topics in Recreation & Leisure Studies (1-6) May be repeated. Maximum 6 hrs. E

Safet

Graduate study with a major in Safety Education and Service (thesis and non-thesis options) leads to the Master of Science degree. The M.S. requires completion of 30 semester hours. Curricular experiences will assist graduate in preparation for certified safety professional examination.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

441 Driver and Traffic Safety Education (4) Preparation of traffic safety instructors for schools, colleges, industries and governmental agencies; training people to teach at least two non-drivers to drive. Valid driver's license required. 3 hrs and 2 labs. F

442 Advanced Driver & Traffic Safety Education (3) Development of competence in teaching of driver education through use of simulation, multimedia, and multiple car driving range. Teaching skills and supervision. 2 hrs and 2 labs. F

443 Sports & Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety, human environment factors and relationship in sports injury control; risk-taking and decision-making strategies; contributions of sports medicine to safety. 3 hrs and 2 labs. F

452 General Safety (3) Principles, practices, and procedures in general safety. Safety problems in industry, transportation, recreation, and sports. Prerequisites: Consent of instructor. F

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

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

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

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

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

535 Emergency Management (3) Civil and defense preparedness, flooding, fires, mass civil disasters, and nuclear personnel attack by alien countries. Sp

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

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

593 Directed Independent Study (1-3) Individual identification and study of problem/issue in safety. Extensive reading and critical analysis of literature. Specific proposal to instructor before registration. May be repeated. Maximum 12 hrs. E

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

History

(Graduate of Arts and Sciences)

MAJOR DEGREES

History

Russell Buhite, Head

Professors:
Bergeron, Paul H., Ph.D., Vanderbilt
Buhite, Russell D., Ph.D., Michigan State
Brummett, Palmira R., Ph.D., Chicago
Chmielewski, Edward V., Ph.D., Harvard
Cobb, James C., (Bernadette E. Schmitt Chair of Excellence), Ph.D., Georgia
Cutler, Everett W., Ph.D., Texas
Farris, W. Wayne, Ph.D., Harvard
Finger, John R., Ph.D., Washington
Haas, Arthur G., Ph.D., Chicago
Hao, Yen-Ping, Ph.D., Harvard
Haskins, Ralph W. (Emeritus), Ph.D., California
Jackson, Charles O., Ph.D., Emory
Klein, Milton M. (Emeritus) (Distinguished Prof.), Ph.D., Columbia
Moser, Harold, Ph.D., Wisconsin
Ratner, Lorman A., Ph.D., Cornell
Utley, Jonathan G. (Emeritus), Illinois
Wheeler, W. Bruce, Ph.D., Virginia

Associate Professors:
Becker, Susan D., Ph.D., Case Western
Bing, John Daniel, Ph.D., Indiana
Bohstadt, John, Ph.D., Harvard
Brummett, Palmira R. (Liaison), Ph.D., Chicago
Diacon, Todd A., Ph.D., Wisconsin
Fleming, Cynthia G., Ph.D., Duke
Johnson, Charles W., Ph.D., Michigan
Muldowy, John, Ph.D., Yale
Pinckney, Paul J., Ph.D., Vanderbilt

Wheeler, W. Bruce, Ph.D., Emory
Moser, Harold, Ph.D., Wisconsin
Ratner, Lorman A., Ph.D., Cornell
Utley, Jonathan G. (Emeritus), Illinois
Wheeler, W. Bruce, Ph.D., Virginia

Wheeler, W. Bruce, Ph.D., Emory
Moser, Harold, Ph.D., Wisconsin
Ratner, Lorman A., Ph.D., Cornell
Utley, Jonathan G. (Emeritus), Illinois
Wheeler, W. Bruce, Ph.D., Virginia
A student who fails the M.A. examination must take the M.A. examination no later than the semester following the completion of 30 hours. A student who fails the M.A. examination must repeat the examination no later than the following semester. A student who fails the examination a second time or does not take the examination when required will be dropped from the graduate program.

THE DOCTORAL PROGRAM

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

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 long 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 will stand for a two-hour oral examination on both the thesis and the field.

Non-Thesis Option
A total of 30 hours of coursework is required. At least 6 hours must be completed in each of two M.A. fields. The primary field is examined by a two-hour written examination following the completion of the semester following the completion of 30 hours. The student who fails the M.A. examination must repeat the examination no later than the following semester. A student who fails the examination a second time or does not take the examination when required will be dropped from the graduate program.

THE DOCTORAL PROGRAM

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

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

Language Requirements
Students must demonstrate competence in one foreign language through coursework or examination. The student’s doctoral committee 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.

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

Doctoral Fields
Group I:
- Premodern Europe
- Modern Europe

United States (colonial to present)
- East Asia
- World History

Group II:
To be defined by the student’s doctoral committee from within one of the following fields:
- United States
- Colonial and Early Republic
- 19th century
- 20th century
- Regional
- Military and Foreign Relations
- Social and Cultural
- American Political
- European
- Medieval
- Early Modern
- Modern
- Political and Diplomatic
- Intellectual and Cultural
- Social and Economic
- National Fields

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 a historical context. The program must be completed within eight years from admission as a potential candidate.

GRADUATE COURSES

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

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

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

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

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. E.

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, French. Focus varies. May be repeated. Maximum 15 hrs.

541 Topics in Early American History (3) Reading seminar: secondary sources on early North American
### Holistic Teaching/Learning

#### (College of Education)

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**Professors:**

- Alexander J. Estill, Ed.D., Kentucky
- Davis, A. R., Ph.D. ------------------------ Ohio State
- Hargis, Charles H. (Liaison), Ed.D.         Colorado State
- Hipple, Theodore W., Ph.D. ------------------- Illinois
- Huff, P., Ph.D. ----------------------------- Ohio State
- Jost, Karl J., Ed.D. -------------------------- Oklahoma
- Knight, Lesa W., Ph.D. ------------------------- Texas
- Rowell, C. Glennon, Ed.D. --------------------- Georgia
- Peabody, W. Jean, Ph.D. ------------------------ Kent State
- Turner, T. N., Ed.D. --------------------------- Penn State

**Associate Professors:**

- Chance, Charles A., Ph.D. --------------------- Ohio State
- Hannum, Michael C., Ed.D. ---------------------- Northern Colorado

**Assistant Professors:**

- Gillmore, Collene P., Ph.D. ------------------- Illinois
- Hendricks, D. A., Ph.D. ------------------------ Alabama

**Instructor:**

- Butterworth, Jennifer R., Ph.D. --------------- Vanderbilt

The Holistic Teaching/Learning unit offers graduate programs leading to the Master of Science degree with a major in Curriculum and Instruction, concentrations in elementary education, reading and education, social science education; elementary teaching and in secondary teaching, and with a major in Special Education, concentration in general special education; the Specialist in Education and the Doctor of Education with a major in Curriculum and Instruction; and the Doctor of Philosophy with a major in Education. The unit also houses programs for students in secondary licensure in early childhood, primary, and middle childhood education (grades K-6 and 1-8), reading endorsement, special education licensure, and secondary social studies. See Education Under Fields of Instruction for full description of all degree requirements.

The unit's central emphasis is on holistic, integrative, and interdisciplinary teaching and learning as opposed to teaching disciplinary subject content (e.g., science, mathematics, language arts) as separate entities. The focus on integration is more in line with how children learn and how language is central to the teaching/learning process. The role of the teacher in holistic teaching and learning becomes more that of a facilitator of learning as opposed to a traditional role of teacher as the dispenser of content in the classroom. Central to the philosophy of holistic teaching and learning is knowing each individual child's learning style, abilities, and interests.

For further information, write the Holistic Teaching/Learning unit.

### GRADUATE COURSES

419 Psychology and Education of Students with Mild Disabilities (6) Nature and characteristics of persons with mild handicaps and educational strategies appropriate for these persons. Prereq: Special Education Principles, Special Education Strategies, 422, and Admission to Teacher Education Program. Coreq: 420. F

420 Field Experience in Modified Programs (3) Practical experience in modified programs; planning, developing, implementing and evaluating instruction. Prereq: Special Education Principles and Special Education Strategies, Admission to Teacher Education and Curriculum and Instruction 422, Coreq: 420. S/NC only. F

421 Elementary and Middle School Science and Social Studies Instruction (3) Methods and materials for teaching science and social studies. Development of functional relationships and entities of two fields. Not open to students with recent course or background in teaching science and/or social studies. Prereq: Admission to teacher education. F, Sp

422 Elementary and Middle School Teaching Methods I (6) Methods and materials (knowledge base) for teaching reading, language arts, mathematics, science and social studies, content and curriculum overview, Unit planning, daily planning, evaluation, etc., and language and concept development.

429 Language Arts/Reading Instruction in Elementary and Middle Schools (3) Language and language development as applied to teaching of oracy (listening, speaking, reading) and aspects of literacy (reading process, readiness and writing). Not open to students with recent course in language arts methods. Prereq: Admission to teacher education. F, Sp

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

431 Field Experience in Comprehensive Programs (3) Prereq: Special Education Principles and Special Education Strategies, Admission to Teacher Education and Curriculum and Instruction 422. Coreq: 430. S/NC only.

432 Psychology and Education of Students with Moderate/Severe Disabilities (6) Nature and characteristics of persons with moderate/severe disabilities and educational strategies appropriate for these persons. Prereq: Special Education Principles and Special Education Strategies, Admission to Teacher Education and Curriculum and Instruction 422.

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

444 Teaching Strategies and Issues in Social Studies Education (1) Goals, objectives, techniques, materials, and evaluation; directed observation in public schools, preparation of teaching plans and materials; simulation teaching experiences. Prereq: Admission to Teacher Education Program.

456 Speech and Language Basis of Learning Disabilities in the Classroom (3) Normal communication development; understanding of speech and language impairments in school-age students; integration of oral and written communication skills into existing curriculum, especially for high incidence special education students.
500 Thesis (1-15) P/NP only. E

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


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

505 Elementary and Middle School Teaching Methods II (6) Content area teaching and development of skills for students to apply methods. Prereq: 422. Coreq: 575. E

506 Internships in Teaching in Special Education and Rehabilitation (3-15) Placement in professional settings in primary or secondary programs under supervision of master practitioners. Enrollment limited to those in fifth-year program. S/NC only.

515 Seminar in Teaching and Learning (3-6) Focus on specific issues which affect elementary teachers. Coreq: Courses in educational psychology, language arts, special education. E

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

521 Teaching Social Studies in Elementary and Middle Schools (3) Planning and techniques. Trends in curriculum, development of concepts and generalizations, integration of social studies, creative problem solving, and teaching of social studies or consent of instructor. Prereq: 522 or equivalent. S

523 Diagnosis and Correction of Children's Difficulties in Learning Mathematics (3) Children's difficulties in learning mathematics and procedures for helping classroom teachers deal with these difficulties. Prereq: Coreq: 522 or equivalent. S


525 Strategies, Programs, and Materials for Teaching Elementary Social Studies (3) Analysis of new and innovative social studies programs and materials. Exploration of current trends in social studies education. Prereq: Previous course in teaching of social studies or consent of instructor. S

527 Elementary School Curriculum (3) Examination, evaluation, and application of curriculum designs in elementary school. Trend in the development of curricula which affect elementary education. Prereq: Consent of instructor. F,S

528 Teaching Language Arts Elementary and Middle School (3) Recent trends and current materials and methods in teaching elementary language arts (except reading). Prereq: Course in language arts or consent of instructor. Prereq: 523 or consent of instructor. S

529 Practicum in Diagnosis and Remediation of Difficulties in Learning Mathematics (3) Assessment and practice experience with children having difficulties in learning elementary school mathematics. Prereq: 523 or consent of instructor. S

530 Teaching Reading in Elementary and Middle Schools (3) Trends in methods, materials, basic approaches, and assessment techniques in elementary reading. Prereq: Course in teaching of reading or consent of instructor. F,S

534 Seminar in Reading Education (1-4) May be repeated. Maximum 6 hrs. E

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

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

538 Practicum in Diagnosis of Reading Problems (3) Theoretical and practical applications of specific reading diagnostic instruments, testing of elementary and secondary school students, preparing case study reports, and conducting parent conferences. Prereq: Course in diagnosis and correction of classroom reading problems or consent of instructor. Sp

539 Practicum in Remediation of Reading Problems (3) Application of learning and teaching methodology in working with elementary and/or secondary school students in one-to-one or small group basis. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. Sp

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

553 Assessment of Exceptional Students (3) Current issues related to assessment; advanced study of evaluation models for exceptional children; dynamic and innovative assessment approaches; advanced study of application to educational programming; basic statistics and application in assessment.

554 Developmental Reading Practicum (2) Diagnosing and remediation for children having developmental and reading difficulties.

555 Characteristics of Affective/Motivational Functioning in Children with Disabilities (3) Definition of methods, identification and symptoms of children with affective/motivational problems or consent of instructor. Sp

556 Instructional Systems for Affective/Motivational Education for Children with Disabilities (3) Educational strategies and models of instruction; simulation, demonstration, and media, teaching techniques, materials, and teacher/pupil/family interactions. Therapeutic forms of education through art, music, role play, puppetworkshop, and group interactions. Prereq or coreq: 555 or consent of instructor.

579 Special Topics (1-3) Prereq: Graduation program. May be repeated. Maximum 9 hrs. S/N or letter grade.

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

586 Seminar in Research Techniques in Special Education (3) Evaluation of appropriate research methodology with handicapped populations.


590 Application of Microcomputer Technology in Special Education and Vocational Rehabilitation (3) Application of microcomputer technology in special education, vocational rehabilitation, and instruction.

591 Clinical Studies (4) Relationship between educational theory and application during internship; research project, development of portfolio, and capstone experience.

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

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

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

599 Seminar in Social Studies Education (3) Research, trends, and issues in secondary social studies. S

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

602 Seminar in Reading Education (1-6) May be repeated. Maximum 6 hrs. E

603 Advanced Studies and Theoretical Models of Reading (3) Research on reading processes and current theoretical models relating to how learners process print. Prereq: 500-level courses in reading education or consent of instructor. Sp,S

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

606 Research in Elementary Education (3) Analysis of research in elementary education with application to classroom teaching. Prereq: Research course. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/N only.

611 Trends and Issues in Curriculum and Instruction - An Interdisciplinary Perspective (3) Current trends and issues in field of curriculum and instruction. Prereq: Admission to Ed.S. program. E

620 Internship in Research in Special Education and Rehabilitation (3-9) Placements with professional engaged in the field of education. Prereq: Recent course in special education or consent of instructor. May be repeated. Maximum 9 hrs. S/N only.

621 Seminar in Social Studies Research and Theory (3) Status of research and theory. Needed research, related research from other fields, and application of research. Prereq: Recent course in teaching of social studies or consent of instructor. May be repeated. Maximum 4 hrs. E

630 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level supervision for the student who has not previously had institutional leadership experience. Prereq: Recent experience in special education or consent of instructor. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/N only.

651 Advanced Studies in Elementary School Language Arts (3) Selected issues in elementary school language arts. Prereq: Graduate course in elementary school language arts or consent of instructor. Sp

679 Special Topics (1-3) Prereq: Admission to doctoral program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/N only.

689 Internship (1-3) Experiences in application of principles and practices of curriculum development and instruction. Prereq: Program prerequisites and consent of instructor. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/N only. E

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

694 Supervised Reading (1-3) May be repeated. S/N or letter grade.

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

Home Economics Education

See Human Ecology
Human Ecology
(College of Human Ecology)

MAJOR DEGREE
Human Ecology M.S., Ph.D.

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

ADMISSION REQUIREMENTS
A completed file for review includes the Graduate School application file, College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section (for the M.S. program in Human Ecology, the Miller's Analogy Test (MAT) score is acceptable), and three Graduate School Rating Forms completed by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology.

THE MASTER'S PROGRAM

The Master of Science with a major in Human Ecology is a college-wide, multidisciplinary program. This degree provides a flexible graduate program for students wishing to pursue in-depth study across subject areas of human ecology. Teachers, extension personnel, family life educators and other professionals interested in broad-based areas will find that a diversity of subject matter combinations can be tailored to meet individual needs.

The M.S. with a major in Human Ecology offers two tracks. Track 1 is designed to meet the needs of professionals who work in programs encompassing all areas of human ecology. Track 2 is designed for students seeking initial teacher licensure in home economics education. Thesis and non-thesis options are available for both tracks.

Track 1 - The thesis option (33 hours) includes 8 hours of statistics and/or research methodology, 9 hours in program planning, implementation, and evaluation (may be selected from agricultural extension, human ecology, or other courses approved by the committee), 3 hours of Human Ecology 510, and 9 hours in courses in the college (must be selected from three departments within the college). The thesis option requires 6 hours of Thesis 500 and an oral defense.

The non-thesis option (36 hours) includes 3 hours of statistics and/or research methodology, 9 hours in program planning, implementation, and evaluation (may be selected from agricultural extension, human ecology, or other courses approved by the committee) 3 hours of Human Ecology 510, 12 hours in courses in the college (must be selected from three departments within the college) and 6 hours of approved electives. The non-thesis option requires a creative project (3 hours) and a written and oral comprehensive examination.

Track 2 - The thesis option (45 hours) includes 6 hours of statistics and/or research methodology, Human Ecology 540, 545, 574, 591, 9 hours in courses in the college (must be selected from three departments within the college) and 575 (12 hours). The thesis option requires six hours of Thesis 500 and an oral defense.

The non-thesis option (48 hours) includes 3 hours of statistics and/or research methodology, Human Ecology 540, 545, 574, 591, 12 hours in courses in the college (must be selected from three departments within the college), 575 (12 hours) and 6 hours of approved electives. The non-thesis option requires a creative project (3 hours) and a written and oral comprehensive examination.

THE DOCTORAL PROGRAM

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

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

1. Selection of a concentration and fulfillment of the requirements as directed by the major professor and approved committee;
2. Minimum of 78 semester hours in courses beyond the baccalaureate degree (exclusive of master's thesis), including College Professional Seminar in Human Ecology 610, minimum of 9 semester hours of 600-level coursework (not including dissertation), and 24 semester hours of dissertation;
3. Successful completion of written/oral comprehensive examinations as provided by each department's procedures and the student's doctoral committee;
4. Original research project, which culminates in a dissertation;

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

CONCENTRATION IN CONSUMER ENVIRONMENTS

The consumer environments concentration is designed to be most appropriate for students with interests in retail and consumer sciences, foodservice, and lodging administration or interior design.

Requirements are a minimum of 34 hours including:

1. HE 530.
2. HE 610.
3. HRA 532, ID 510, and RCS 550 or 641.
4. HRA 537 or RCS 590 or ID 590 (2 hours).
5. Minimum 9 hours of statistics and research methods.
6. Six hours from RCS 511, 550 or 641, ID 575, 625, HRA 555, 610, 620.
7. Twenty-four hours of dissertation.
8. Electives for 34 hours approved by the committee, including a minimum of 9 hours required at the 600 level. (Students must take at least 18 hours in one of three specialty areas: foodservice and lodging administration, retail and consumer sciences, or interior design.)

MINOR IN GERONTOLOGY

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

Core courses and a practicum are offered by the College of Social Work and selected departments within the colleges of Human Ecology, Education, and Arts and Sciences. A cross-listed seminar between contributing programs is designed to integrate experiences from different sources and to present 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 Human Ecology" form. Copies of this form are available in the Dean's Office, Room 110, Jessie Harris Building.

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

1. Coursework: 9 hours required. A variety of coursework may be taken toward satisfaction of this requirement. Courses which are offered on a regular basis include: Health 406, 465, Health/Public Health 650, Interior Design 575, Nutrition 518, Public Health 523, Social Work 666, Sociology 415, Adult Education 522, 513.
2. Applied practicum: 2 hours required. Students should register under practicum experiences in the "home" department of the supervising faculty.
3. Human Ecology 585, 1 hour required. Cross-listed with participating departments.
4. Successful completion of a written comprehensive examination covering subject matter of the minor.

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

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal
residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Human Ecology is available to residents of Alabama, Kentucky, Mississippi, Virginia (concentration in health education only), or West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES

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

501 Microcomputer Research Applications in Human Ecology (3) Advanced microcomputer concepts and applications for research. Overview of statistical analysis software, computer graphics, computer-assisted design and national data base searches.

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

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

520 Directed Study in Human Ecology (1-3) Integrative study and analysis of course work in graduate study in home economics only. May be repeated. Max 6 hrs. E

525 Practicum in Home Economics (1-6) Field based experiences. Prereq: Consent of instructor. E

530 College Teaching in Human Ecology (3) Instructional effectiveness, techniques, organization, and evaluation. Prereq: Consent of instructor. Sp

540 Curriculum in Home Economics (3) Program planning, design of instruction and development of teaching materials for home economics classroom. Prereq: Coreq: 325. Coreq: 575. F

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

563 Family Life Education Programs (3) (Same as Child and Family Studies 563.)

574 Analysis of Teaching for Professional Development (2) Strategy to document and analyze effectiveness of teaching and of professional development. Study and application of various approaches. Coreq: 575. F

575 Professional Internship in Teaching (1-8) Intensive teaching and teacher-related experiences in professional settings in public schools. Enrollment limited to postbaccalaureate students in professional year program. Prereq: Admission to Teacher Education program. May be repeated. Maximum 12 hours. S/N only. F,Sp,A

580 Special Topics in Home Economics Education (1-3) Current issues and trends in home economics. Prereq: Consent of instructor. May be repeated. Su,A

581 Directed Study in Home Economics Education (1-3) Prereq: Consent of instructor. May be repeated. E

585 Seminar in Gerontology (1) Scope of gerontology as discipline and as related to other academic and professional disciplines. Speakers both internal and external to UT-K. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. (Same as Counselor Education and Counseling Psychology 585, Exercise Science 585, Nursing 585, Public Health 585, Psychology 585, Social Work 585, and Sociology 585) S/N only.

591 Clinical Studies (4) Group and individual seminar activities during at least 8 hrs. of Application and evaluation of professional core competencies. Completion and presentation of portfolio and analysis of teaching project. Coreq: 575.

610 Professional Seminar in Human Ecology (3) Review of various approaches taken by different disciplines to study of ecology; ecological applications in human ecology; temporal/spatial properties of human ecosystems; model building/systems thinking and future thinking in human ecology. Sp

Human Resource Development

(College of Human Ecology)

MAJORS

Human Ecology Ph.D.
Human Resource Development M.S., Ed.D.
Vocational-Technical Education Ed.S.

Peter Dean, Head

Professors:
Campbell, C. P., Ed.D. ..................... Maryland
Cheek, Gerald D., Ph.D. ..................... Kansa State
Coakley, Carroll B. (Liaison), Ph.D., Wisconsin
Craig, D. G., Ed.D. ......................... Cornell
Hanson, R., Ph.D. ............................ Purdue
Haswell, R. W., Ph.D. ....................... Purdue
Matthews, John I. (Emeritus), Ph.D. ..... Arizona State
Reed, J. L. (Emeritus), M.S. .............. Oklahoma State
Wagener, G. A. (Emeritus), M.S. .......... Indiana

Associate Professors:
Dean, Peter J., II, Ph.D. .................... Iowa
Ledford, B. J., Ed.D. ....................... Tennessee
Mann, E. C., Ed.D. .......................... Penn State
McGinnis, Jackie H., Ph.D. ............... Florida State
Perry, G. C., Ph.D. .......................... Missouri
Stout, Vickie J., Ed.D. ...................... Tennessee

Assistant Professors:
Mims, Cheryl M. ............................ Virginia Tech
Pierce, R., Ph.D. .............................. Ohio State
Powell, Terrence L., M.S. ................. Oklahoma

THE MASTER'S PROGRAM

The Department of Human Resource Development offers graduate programs leading to the Master of Science with a major in Human Resource Development. Two tracks are available. Track 1 is for students who are already certified to teach or those who are seeking a master's degree without certification. Track 2 is for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

Track 1 - Concentrations are available in business and marketing education, industrial education, technical training, and vocational-technical education. The thesis option requires the completion of 33 semester hours including 6 hours of thesis. The non-thesis option requires the completion of 36 hours of coursework.

Track 2 - Concentrations are available in business and marketing education, and technology education. The non-thesis requirements are Human Ecology 574 and 591, 6 hours; for business and marketing education, 531 and 532, 6 hours; for technology education, 553 and 555, 6 hours; internship, 12 hours; and 12 hours of specialty courses as approved by the student's committee for a total of 48 hours. The thesis option requires 6 additional hours of thesis 500 for a total of 48 hours.

THE SPECIALIST PROGRAM

The Ed.S. program is a cooperative undertaking involving all vocational service areas. Concentrations are available in agricultural, business, marketing and distributive, home economics, industrial, and technical education, and in general vocational education. The degree requires a minimum of 60 hours of graduate study. Credits earned for the master's degree may meet program requirements in the courses which contribute to the program objectives of the candidate. A major core of studies offers advanced concepts in human resource development.

THE DOCTORAL PROGRAM

The comprehensive Ed.D. program in the department is designed to provide opportunities for graduate students to achieve professional objectives, develop Vined principles, and gain experiences and understanding of human resource development. The minimum requirements in the doctoral program consist of the following: department specialization, 12 hours; core and electives, 21 hours; comprehensive field, 9 hours; professional education core, 9 hours; research techniques, 12 hours; and dissertation, 24 hours. A minimum of 90 hours above the baccalaureate is required.

The Doctor of Philosophy with a major in Human Ecology offers a concentration in human resource development.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

401 Utilization of Community Resources (3) Strategies of developing linkages between vocational education and private sector through advisory committees, councils, and working partnerships. Development and management of public relations programs. Prereq: 3 yrs teaching experience. Sp

415 Coordination Techniques (3) Necessary procedures, duties and responsibilities to implement, maintain, and evaluate successful cooperative education program. Prereq: Senior standing and consent of instructor. Sp

430 Principles and Organization of Business and Marketing Education (3) Historical background and development needs. Principles of vocational education in business and marketing, curriculum implications; establishing, evaluating, and improving programs.

432 Methods and Materials in Business and Marketing Education (3) Teaching techniques, aids and evaluation in subject matter fields. Prereq: Consent of instructor. F,Su

436 Supervised Occupational Experience (3-9) Practical work experience in business and marketing settings under supervision of practitioner and departmental representative. May be repeated. Maximum 9 hrs.

439 Areas of Marketing (3) Marketing, personnel development, operations, and management as affects instructional leadership program in marketing education. Prereq: 432. F,Su
addition to the licensure program, master’s degree programs may be completed in the College of Education or the College of Education.

For further information, write the unit leader.

GRADUATE COURSES

445 Early Childhood Education: Program Development and Teaching in Kindergarten (3) Curriculum planning, classroom organization and management practices for teaching young children; relationship of kindergarten to total elementary school. Prerequisite: Admission to teacher education. E

454 Education of the Gifted and Talented Children (3) Orientation to psychometric and behavioral studies of giftedness. Analysis of past and present school practices in reference to curriculum and program implementation. Sp

471 Early Childhood Special Education (6) Assessment, curriculum planning and development and teaching approaches used in early childhood special education. Prerequisite: Admission to teacher education. F

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

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


504 Clinical Experience in Teaching and Supervision of Exceptional Children (3-9) Placement in educational settings. May be repeated. Maximum 9 hrs. S/NC or letter grade. Prerequisite: Admission to teacher education. E

515 Seminar (1-3) Curricular, instructional technology, elementary education, secondary education, or social foundations as related to goals and student programs. May be repeated. Maximum 6 hrs. S/NC only. E

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

554 Assessment in Early Childhood Special Education (3) Development of knowledge and skills in appropriate formal and informal assessment of handicapped infants and young children: screening, identification, diagnosis, placement and programming assessment issues. Prerequisite: Consent of instructor. E

558 Neuromuscular and Health Disorders: Educational Implications (3) Neurological impairments, physical disabilities and special health conditions, autism, and treatment methods. Prerequisite: Consent of instructor. E

564 Psychosocial Development of Gifted and Talented Children (3) Phenomenon of talent development in context of home, school, and society. Implications of talent development. Prerequisite: Consent of instructor. E

565 Instructional Systems for the Gifted and Talented (3) Instructional methods and systems evaluated in terms of effectiveness in various educational environments. Prerequisite: Consent of instructor. E

566 Curriculum for Early Childhood Education (K-3) (3) Theoretical foundations and current research in content and skill areas of curriculum for kindergarten-grade 3; application to local school setting. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

575 Creative Problem-Solving Strategies for Special Educators (3) Techniques for solving problems encountered by special educators in any setting. Prerequisite: Consent of instructor. E

584 Seminar in Early Childhood Education (3) Analysis of research and theory in early childhood education; educative process of young children. Prerequisite: Course in Early Childhood Education. May be repeated. Maximum 6 hrs. S/NC only. E

591 Clinical Studies (4) Relationship between educational theory and application during internship; research project, development of portfolio, and capstone experience on a micro level. Prerequisite: Consent of instructor. E

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

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

610 Internship in College Teaching and Supervision (3-6) Supervised practice in college teaching and supervision. Prerequisite: Admission to doctoral program or consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

620 Internship in Research in Special Education and Rehabilitation (3-9) Placement with professional engaged in research in educational settings. May be repeated. S/NC only. E

630 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Internship in special education and rehabilitation with professional engaged in research in educational settings. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

650 Advanced Studies in Early Childhood Education (3) Prerequisite: Graduate course in early childhood education and consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

679 Special Topics (1-3) Prerequisite: Admission to doctoral program. Must be taken in consultation with instructor. May be repeated. Maximum 6 hrs. S/NC only. E

689 Internship (1-3) Experiences in applications of principles and practices of curriculum development and instructional improvement. Prerequisite: Program prerequisites and consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

693 Independent Study (1-3) Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

694 Supervised Reading (1-3) Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

695 Special Topics (1-3) Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

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Industrial and Organizational Psychology

(Industrial and Organizational Psychology)

MAJOR DEGREES

Industrial and Organizational Psychology ........................................ M.S., Ph.D.

Robert T. Ladd (Liaison), Director

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Committee:
Fowler, Oscar S., Management
James, Lawrence R., Management
Jones, Warren H., Psychology
Larsen, John M., Jr. (Emeritus), Management
Luskin, Michael C., Management
Schuman, David W., Marketing, Logistics & Transportation

For further information, see Departments of Management and Psychology.

The master’s and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research; for university teaching; and for consulting relationships with industry. The programs emphasize a scientific/practitioner model in applying and conducting research based on accepted theory, organizational behavior, psychology, management, and statistics. The programs are administered by a joint committee of the two departments, appointed by the Associate Vice Chancellor and Dean of The Graduate School.

It is intended that students entering the I/O Program will represent widely different undergraduate and graduate backgrounds including psychology, business administration, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses that will assist the students in attaining a reasonable level of sophistication in areas of deficiency.

ADMISSION REQUIREMENTS

Applicants for admission should request information and application forms from both The Graduate School and the Director. industrial and Organizational Psychology Program, 488 Stokely Management Center, The University of Tennessee, Knoxville, TN 37996-0545.

Two separate applications must be completed: one application for admission to The Graduate School (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 the Graduate Admissions and Records Office by February 1.

General Requirements

At least one year of college mathematics and one course in statistics is required. Ordinarily, an undergraduate grade point average of 3.0 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 MASTER’S PROGRAM

A thesis is required with 6 semester hours of Management or Psychology 500.

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Industrial and Organizational Psychology

(College of Business Administration and College of Arts and Sciences)

MAJOR DEGREES

Industrial and Organizational Psychology ........................................ M.S., Ph.D.

Robert T. Ladd (Liaison), Director

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Industrial and Organizational Psychology

(College of Business Administration and College of Arts and Sciences)
The master's degree can be completed with a minimum of 33 semester hours in the major as follows:

Management 567, 568 or Psychology 517-18; Psychology 557; Statistics 537-58.

Twelve hours of additional coursework to be selected primarily from the following with the approval of the student's advisor: Management 511, 522, 610; Management/Psychology 625, 626, 627, 638; Psychology 505, 550, 610, 620, 624.

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their thesis may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 680.

An internship, practicum, or field experience is recommended. A student is expected to be in residence full time one year (two years recommended).

A master's candidate must pass a final oral examination.

In addition to course requirements, a master's student must complete a comprehensive examination in general psychology within no more than two years by attaining a score of 630 (or 85th percentile) on the Subject GRE (Psychology-81). An overall "B" average is required in the course sequence Management 567-68 or Psychology 517-18 to continue in the program beyond the first year.

THE DOCTORAL PROGRAM

Any student in the doctoral program may be required to prepare a master's thesis by the Industrial and Organizational Psychology Committee. This policy will be implemented by the committee at such time as a review of the student's record suggests that additional data on the qualifications for pursuing a Ph.D. are required.

A dissertation is required with a minimum of 24 semester hours of Management or Psychology 600.

The doctoral degree can be completed with a minimum of 54 semester hours in the major as follows:

Management 567-68 or Psychology 517-18, Psychology 557, Statistics 537-58.

A minimum of five doctoral seminars (15 hours) selected from: Management 610; Management/Psychology 625, 626, 627, 638; Psychology 620, 624. (Five doctoral seminars are viewed as the absolute minimum; more are recommended. Statistics 671 and Psychology 605 are also recommended.)

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their dissertation may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 680.

An internship, practicum, or field experience is recommended. A student is expected to be in residence full time one year (two years recommended).

Doctoral candidates must pass a final oral examination on their dissertation research.

In addition to course requirements, a doctoral student must attain a score of 550 (90th percentile) on the Subject GRE (Psychology-81) within two years of entry, successfully complete the qualifying examination covering scientific methodology before or during the third fall semester, and successfully complete the comprehensive examination in the areas of the student's major research and professional interests.

An overall "B" average is required in the course sequence Management 567-68 or Psychology 517-18 to continue in the program beyond the first year.

ACADEMIC COMMON MARKET

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

THE MASTER'S PROGRAM

Under the industrial engineering concentration, students may select either the thesis or non-thesis option. The thesis option requires 24 hours of coursework plus a master's thesis. The non-thesis option requires 30 hours of coursework plus a 3-hour industrial design project.

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, quality and reliability engineering, or general industrial engineering.

Engineering Management

The engineering management concentration has an additional admission requirement of two years' industrial engineering experience as a practicing engineer or scientist, or current full-time employment in an appropriate engineering or applied science position. The program is non-thesis and requires 33 hours of coursework plus a 3-hour capstone project. This concentration is fully supported off-campus utilizing electronic media for video taping and interactive distance teaching methods.

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

Industrial Engineering

GRADUATE COURSES


401 Integrated Manufacturing Systems (3) NC and CNC machine tools, robotics and related materials handling systems, human automation, alternative integrated manufacturing systems, and manufacturing information and control systems. PreReq: 400.

402 Production System Planning and Control (3) Theory and application of forecasting systems, regression and time series models, independent demand inventory models, development of safety stock. Coverage of all modules of Manufacturing Resource Planning (MRP) Systems: master production scheduling, resource requirements planning, bill of material and inventory file structures, material requirements planning, capacity planning, shop floor and purchase order control. Overview of
just-in-time Inventory concepts and MRP's role in manufacturing automation. Prereq: 301.

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, industrial. Prereq: 402.

405 Engineering Economy (3) Methods and problems in selection or replacement of equipment. Decisions among engineering alternatives involving capital recovery, economic life of equipment, and rate of return on investment.


412 Quantitative Methods in Project Management (2) Project planning, scheduling, and control based on network and programming studies. Resource allocation and time-cost trade off algorithms, multi-project control, computer applications, and PERT methods of handling uncertainty in activity time estimates.


421 Information Systems (3) Systems engineering approach to design, development, implementation, and evaluation of computer information systems. Information systems aspects of IE systems. Data structures and database management systems. Prereq: Senior standing.

422 Senior Industrial Engineering Problems Analysis (3) Application of industrial engineering to field assignments in industry. Systems analysis, design and implementation study. Prereq: 402, 403, and 406.


440 Total Quality Management (3) Philosophy of continuous improvement in organizations: management and implementation issues; definition, identification and analysis of systems; process improvement; quality improvement; total quality management and Lean design components; components of variation; measurement issues; issues relevant to continuous processes; managing quality in short-run environments; use of classical statistical tools: correlation and regression. Prereq: Consent of instructor. Lab. Prereq: Quality Control or consent of instructor.

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

501 Design Project (3-15) Enrollment limited to industrial engineering students in non-thesis program. May be repeated. Maximum 6 hrs. S/NC only.

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

513 Facilities Planning and Design (3) Modern materials handling techniques, computer-aided layout techniques, application of models, and use of these to design manufacturing facility. Prereq: Production Facilities Design and Material Handling or consent of instructor.

514 Information Systems II (3) Systems analysis and design and control for continuous and batch systems 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 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 of variance; single and multiple factor experimental design. Prereq: Probability and Statistics for Scientists and Engineers I or equivalent. (Same as Engineering Management 516.)


518 Advanced Engineering Economy (3) Application of engineering economic analysis in complex decision situations. Inflation and price changes; uncertainty evaluation using nonprobabilistic and probabilistic methods; parameter estimation; decision trees; multi-attributed decision analysis; and other advanced topics. Prereq: Probability and Statistics for Scientists and Engineers I or equivalent. (Same as Engineering Management 516.)


520 Human Factors and Product Safety Engineering (3) Role of human factors and safety engineering, legal implications in product design, product liability, system safety, and system failure analysis. Product testing, reliability, and system safety analysis techniques. Case histories of major incidents: occupational and environmental; analysis and implementation study. 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 interaction. Modeling techniques; queuing analysis; decision theory; performance measurement; and other selected topics. Prereq: 519 or consent of instructor.

522 Optimization Methods in Industrial Engineering (3) Classical optimization applied to constrained and unconstrained, linear and non-linear problems. Formulation of problems and solution methods. Applications in engineering, management, and other fields. Prereq: 521 or consent of instructor.

525 Linear Programming and Extensions (3) Simplex and revised simplex methods; duality; parametric and post-optimal analysis; and quadratic, separable, integer, goal, and fuzzy linear programming. Prereq: Operations Research or Engineering Management 537.


526 Dynamic System Simulation (3) Discrete, continuous-time and hybrid system simulation using current simulation software. Systems modeling, design of simulation experiments, and analysis of output. Prereq: Probability and Statistics for Scientists and Engineers I.

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. Time balancing, set-up time reduction, cost management, maintenance support and other selected topics. Application at enterprise level to achieve strategic competitive goals. Prereq: 516 or consent of instructor.

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

601 Operations Research Models in Engineering Economy (3) Mathematical programming techniques applied to capital budgeting; advanced topics in multiple attribute decision making; problem formulation and solution; linear and quadratic decision making; multi-attributed decision analysis; and other advanced topics. Prereq: 518, 523.


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

Engineering Management

GRADUATE COURSES

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

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

516 Statistical Methods in Industrial Engineering (3) (Same as Industrial Engineering 516.)

517 Advanced Engineering Economy (3) (Same as Industrial Engineering 518.)
531 Motivation and Culture in Engineering Management (3) Motivational theories and practice to improve individual and organizational capabilities. Success in meeting goals, improving creativity/innovation, and leadership and personal interaction skills. Improvements through organizational structure, policies, and work design. Prereq: 533 or consent of instructor.

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

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


535 Management of Technology (3) Creativity and innovation: evolution of advanced technology equipment; application of systems thinking; new methods 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; 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 force in success and failure; entrepreneurship; and the 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: 539 and Industrial Engineering 518.


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


Information Sciences

(Office of the Vice Chancellor for Academic Affairs)

MAJOR

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

José-Marie Griffiths, Director

Glenn E. Estes, Associate Director

W. David Penniman, Associate Director

Professors:

Estes, Glenn E. (Liaison), M.S. .... Kent State
Griffiths, José-Marie, Ph.D. ......... London (UK)
Penniman, W. David, Ph.D. ........ Ohio State
Porcell, Gary R. (Emeritus), Ph.D. .... Michigan

Associate Professors:

Fishler, Patricia L., Ph.D. ........... Florida State
Pemberton, J. Michael, Ph.D. ....... Tennessee
Pollard, Richard, Ph.D. ............. Brunel (UK)
Robinson, William C., Ph.D. ........ Illinois
Sankankas, George M., Ph.D. ...... Pittsburgh

Assistant Professors:

Bohstedt, Jim, Ed.M. .............. Harvard
Wang, Peiling, Ph.D. .............. Maryland
Whitney, Gretchen, Ph.D. ......... Michigan

The School of Information Sciences provides a program leading to the preparation of librarian 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, computing, or information science.

The mission of the school is to educate people to live, work, and flourish in an information society through excellence in teaching, research, and public service in Information Sciences. The goals and objectives of the school are:

1. Knowledge of the generation, production, management, dissemination, and uses of information.
2. Knowledge of the roles of various organizations/institutions in promoting the flow of information.
3. An understanding of the role of the information professional as mediator between information resources and their users.
4. An understanding of the roles and characteristics of information resources in facilitating access to information.
5. An understanding of the structure and content of information resources in various formats and subjects.

7. Competence in creating, managing, and accessing information in a variety of formats.
8. To provide services to the state, region, and nation in association, consulting, and continuing education activities which will promote the development and improvement of information systems and services such that the school's contributions reach beyond its immediate academic programs. The school will provide:

1. Continuing education for information professionals and, on a selective basis, to persons outside the information field.
2. Advisory services to information organizations.
3. Leadership for professional associations.
4. To conduct basic and applied research which generates the flow of new knowledge and research.
5. Increased research quality and productivity.

ADMISSION REQUIREMENTS

Applicants to the Information Sciences program must have a minimum undergraduate grade-point average of 3.0 or a satisfactory graduate degree grade-point average for admission as a potential candidate for the 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 submitted 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 43 semester hours of graduate courses, 16 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis option is available, with 6 hours required for thesis credit. At least 37 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. Upon completion of the program, all students are subject to a final examination. For students who elect the thesis option, the examination will be a defense of the thesis. Students who elect the non-thesis option will be given a written comprehensive examination.

Core Curriculum

The core curriculum is a 16 semester hour sequence of six courses required of all students: 490, 520, 530, 580, 580. These courses address the evolving information environment; foundations of Information Sciences and Technologies; information resources selection, acquisition and
evaluation; information content representation; information access and retrieval. The core curriculum includes a one-hour electronic information and communications laboratory experience required of students during the first semester: 504.

The 16-hour core is prerequisite to all elective courses for students enrolled in the MS degree program. Elective courses may begin in the final semester of core course work with permission of the advisor and the instructor of each elective course selected.

Concentrations
Upon completion of the core curriculum, students may select a concentration from one of the following:

Corporate Information Systems and Services: The concentration includes 18 hours (550, 553, 564, 567, 585, 599) of required courses and 9 hours of elective courses, one selected from each of these groups: Group A (534, 555, 556, 592); Group B (531, 532, 533, 537, 538); Group C (562, 583, 564).

Electronic Publishing: The concentration includes 18 hours (537, 561, 563, 565, 585, 587) of required courses and 9 hours of elective courses, one selected from each of these groups or all electives selected from one group: development and design aspects (430, 523, 555, 586, 589, Journalism 460 or 535 or 580); standards and technical aspects (567, 583, 584, 589, 599); policy and market aspects (538, 559, 560, 585 or 586).

Information Systems and Technology: The concentration includes 18 hours (540, 583, 584 or 588, 587, 588, 589, 599) of required courses and add 9 hours of elective courses.

Scientific and Technical Information: The concentration includes 18 hours (450, 532, 535, 540, 555, 599) of required courses and 9 hours of elective courses.

Youth Services in Public and School Libraries: The concentration includes two specializations: public library youth services and school library media services. Within the concentration, 21 hours (567, 571, 572, 573, 585, 599, one elective) are common and 6 hours are taken in the specialization (public library: 564, 592; school library: 475, 551).

FINANCIAL ASSISTANCE OPPORTUNITIES
Employment with the University of Tennessee Libraries may prove 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 special 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, 804 Volunteer Blvd., Knoxville, TN 37996-4330

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

GRADUATE COURSES

430 History of the Book (3) History of writing and various methods of bookmarking.

450 Writing About Science, Technology and Medicine (3) Same as Journalism 450.

475 Utilization of Instructional Media (3) Same as Education in the Sciences, Mathematics, Research and Technology 475. E

485 Electronic Communications and Information Resources on Internet (3) Exploration of worldwide information and communication resources including e-mail, gopher, Archie, Veronica, WAIS, WWW, and newsgroups. F, Sp, Su.

490 Information Environment (3) Generation, production, management, dissemination, and use of information. Roles of information in society, information seeking and user behavior, information industry, economic and organizational change, information professions, and issues. F, Sp, Su, A.

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

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

504 Electronic Information and Communications Laboratory (1) Methods for creating and managing information in electronic form. Communication of electronic information in networked environment. Location and use of electronic information and communication resources. For GSLIS graduate students only; must be completed satisfactorily in first semester. S/N/C only. F, Sp, Su.

520 Information Content Representation (3) Principles of distinguishing, describing, and indexing intellectual works; current approaches; citation systems, descriptive cataloging, non-subject indexing, pre- and post-coordinate subject indexing, classification and categorization, authority control of index terms; standards. F, Sp, Su, A.

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, generalized classification, authority control, bibliographic utilities, online library catalogs. F.


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, user interfaces, evaluation of retrieval system performance. Search techniques for various types of databases including multi-media, full-text, numeric, bibliographic. F, Sp, Su, A.

531 Sources and Services for the Social Sciences (3) Information sources in political science, sociology, psychology, geography, history, anthropology, business, and education. F.

532 Sources and Services for Science and Engineering (3) Information sources in engineering, physical and life sciences. Sp.

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. F.

534 Government Information Sources (3) Selection, acquisition, organization, and utilization of government information in various formats of legislative, judicial and executive branches of federal, state, local, and international government and intergovernmental agencies. Sp.

535 Advanced Information Retrieval (3) Bibliographic, non-bibliographic, full-text databases, e.g., non-bibliographic formula and structure databases, content-page full-text delivery, abstract and full-text delivery alternatives, evaluation, and testing. Sp.

536 Creation and Distribution of Information and Knowledge Resources (3) Historical, political, and societal dimensions of creation, dissemination, growth, and interdisciplinarity of information and knowledge from Aristotle's Lyceum to twentieth-century university and research environments.

537 Information Industry (3) Issues and trends concerning information industry: products and services. Standardizing technologies, choice of distribution media, entrepreneurial opportunities. Legal, ethical, and quality concerns. F.

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. F.

539 Information Policy (3) Role of government in creation, publication, 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. Sp.

540 Research Methods (3) Research methods in the study of information environments; primary and secondary research; research project design; research results interpretation; analysis of published research; techniques supporting research process. E.

550 Management of Information Organizations (3) Supervisory and management concepts, strategies, and techniques applicable to information professional work in libraries, archives, records management, and other information organizations. F.

551 School Library Media Centers (3) Planning, implementation, and evaluation of school library programs. Curriculum involvement, role of technology, site-based management, relationships with district and state services. F.

552 Information Centers in Higher Education (3) Development, mission, trends, issues, users, services, and environment of campus information centers including libraries and alternatives; learning resources center and library-computer center models. F.

553 Specialized Information Agencies (3) Development and present status, scope and objectives. Administration, organizational problems and techniques. F.


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. F.

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

560 Information Resources Selection, Acquisition, and Evaluation (3) Principles of development and management of collections in information agencies; community analysis; users and uses; policies and procedures. F.
561 Contemporary Book Publishing (3) Creation, design, production, marketing, and distribution; various types of publishers. Sp

562 Serials (3) Serials collections: selection, acquisition, storage, preservation, use, and public services. SuA

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

564 Corporate Information Systems (3) Objectives and functional elements of records systems, archival programs, management information systems and technologies within various types of organizations. Sp


566 Environmental Scanning for Information Professionals (3) Principles and practice of environmental scanning; information evaluation and synthesis, role of strategic information in modern organization.

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. F

568 Information Technologies (3) Evolution, trends, information capture, storage, preservation, access, and distribution. F,Sp

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

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

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

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

573 Practicum (3-6) Prerequisite: Consent of advisor and research director. S/NC only. May be repeated. Maximum 6 hrs.

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

575 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 American Studies, American Studies, Ancient Mediterranean Civilizations, Asian Studies, Cinema Studies, Comparative Literature, Latin American Studies, Linguistics, Medieval Studies, Russian and East European 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.

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. F,Sp, SuA

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

582 Information Systems (3) Systems concepts, design, systems analysis and design of information systems. Selecting and using information systems to support various activities. User involvement in the development process. F,Sp

583 Information Systems (3) Systems concept, designing, system analysis, design and implementation of information systems. Selecting and using information systems to support various activities. User involvement in the development process. F,Sp

584 Database Management Systems (3) Defining data needs, data structure, role of operating systems in data management, file organization, database management systems, logical data models, internal data models, database administration and evaluation. Design and implementation of application using database management system. Sp

585 Information Technologies (3) Evolution, trends, capabilities, and limitations of technologies applied to...
Medieval Studies

GRADUATE COURSES

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

Russian and East European Studies

GRADUATE COURSES

401-02 Advanced Grammar, Conversation, and Composition (3,3) Prereq: Russian Composition and conversation or equivalent。(Same as Russian 401-02.)

451 Senior Seminar (3) For majors in Russian; minors admitted at discretion of instructor. Intensive study of language, literary style, and literary criticism based on selected major novels. (Same as Russian 451-52.)

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

Urban Studies

GRADUATE COURSES

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

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

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

Women's Studies

GRADUATE COURSES

400 Topics in Women's Studies (3) Content varies. May be repeated. Maximum 6 hrs.

22 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.)

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

493 African-American Women in American Society (3) (Same as African-American Studies 493.)

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

Journalism

(College of Communications)

MAJOR DEGREES

Communications M.S., Ph.D.

James A. Crook, Director

Professors:

Adamson, June N. (Emeritus), M.S., Tennessee
Ashdown, Paul G., Ph.D. Bowing Green
Bowles, Dorothy, Ph.D. Wisconsin
Cade, Dorezler C. (Emeritus), Ph.D. Iowa
Caudill, E. Edward, Ph.D. North Carolina

Crock, James A., Ph.D. Iowa State

Everett, George A. (Emeritus), Ph.D. Iowa

Griffiths, José-Marie (Adjunct), Ph.D. London (UK)

Haskins, Jack B. (Emeritus), Ph.D. Minnesota

Lain, John L. (Emeritus), M.A. Iowa

Leiter, B. Kelly (Emeritus), Ph.D.

Littmann, Mark (Chair of Excellence), Ph.D.

Miller, M. Mark, Ph.D. Michigan State

Singletary, Michael W., Ph.D. Southern Illinois

Teeter, Dwight L., Jr., Ph.D. Wisconsin

Tencity, Carol (Adjunct), Ph.D. Illinois

Tucker, Willis C. (Emeritus), M.S. Kentucky

Associate Professors:

Heller, Robert B., M.A. Syracuse

Lucarelli, Susan M., Ph.D. Tennessee

Morro, Jerry L., Ph.D. Toledo

Assistant Professors:

Foley, Daniel M.S. Northwestern

White, Candace L., Ph.D. Georgia

The School of Journalism offers a concentration area for the master's with a major in Communications and participates in the interdisciplinary doctoral program. See Communications for additional information.
590 Communications and International Development
Design elements. Prerequisite: 203 or Advertising 350 or Consent of instructor. May be repeated. Maximum 6 hrs.

550 Writing and Editing Projects (3) Specialized writing and editing of original articles and other material; regional and specialized magazines. Individual editorial projects. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

480 Journalism in the High School (3) Functions and methods of high school publications. Problems related to staff selection, content of publications, copy, layout, photography, printing, advertising, and business. Planning course outlines and curricula for journalism in mass media studies. Su

490 Advanced Photojournalism (3) Advanced principles and methods of black-and-white photography. Introduction to color photography. News and feature photographs and photo essays. Prerequisite: 290 or consent of instructor. Sp


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. Sp

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. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

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

590 Special Topics in Art Education (3-6) Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

451 Environmental Reporting (3) Writing for news media on such environmental issues as strip-mining, water pollution, air pollution, sludge, nuclear power, fossil fuel power, and solid wastes. Presentations from and interviews of experts in environmental science and reporting. Exemplary popular literature in environmental reporting. Prerequisite: Editing for majors; consent of instructor for non-majors.

555 Issues in Science Communications (3) Topics vary. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

556 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. Prerequisite: Consent of instructor.

460 Mass Communications History (3) Development of press and role of mass communications in American history. Newspapers, radio, television, and magazines. F

490 Advanced Photojournalism (3) Advanced principles and methods of black-and-white photography. Introduction to color photography. News and feature photographs and photo essays. Prerequisite: 290 or consent of instructor. Sp


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. Sp

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. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

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460 Mass Communications History (3) Development of press and role of mass communications in American history. Newspapers, radio, television, and magazines. F

490 Advanced Photojournalism (3) Advanced principles and methods of black-and-white photography. Introduction to color photography. News and feature photographs and photo essays. Prerequisite: 290 or consent of instructor. Sp


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. Sp

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. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

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

590 Special Topics in Art Education (3-6) Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

Language, Communication, and Humanities Education

PUBLIC RELATIONS

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

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

470 Public Relations Campaigns (3) Research, planning and communication and evaluation of major public relations campaigns. Oral and written presentation of public relations project from inception to completion. Extensive out-of-class work. Prerequisite: Public Relations Principles or equivalent. F, Sp

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

526 Public Opinion (3) (Same as Journalism 525.)

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

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

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

Art Education

GRADUATE COURSES

510 History and Philosophy of Art Education (3) United States from 1680's to present. Prerequisite: Consent of instructor.

520 Studies in Art Education (3) Issues and topics current to the field of art education. Prerequisite: Consent of instructor.

530 Production and Critical Analysis of Art (3) Relationship of production and critical analysis of works of art to discipline-based art education.

540 Instructional Materials and Production Related to the Teaching of Art (3) Development and use of instructional aids concerned with all aspects of teaching art: videotapes, audiotapes, slides, charts, and learning packs.

590 Special Topics in Art Education (3-6) Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

Language, Communication, and Humanities Education

GRADUATE COURSES

455 Teaching of Foreign Languages, Grades 7-12 (3) Instructional methods, lesson planning, peer-teaching; materials for teaching foreign language and culture; evaluation techniques. Required for certification in modern foreign languages and Latin. Prerequisite: Completion or near completion of foreign language hours for certification and admission to Teacher Education Program.

459 Teaching English in the Secondary School (3) Techniques of teaching composition, language, and literature. Prerequisite: Admission to Teacher Education Program.

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

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

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

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


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

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

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

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

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

518 Educational Specialist Research and Thesis (3) May be repeated. P/NP only. E
Large Animal Clinical Sciences
See College of Veterinary Medicine and Comparative and Experimental Medicine

Law
(College of Law)

MAJOR  DEGREES


Richard S. Wirtz, Dean

Professors:
Best, Reba, M.L.S. ...................... Florida
Blaze, Douglas A., J.D. ................. Georgetown
Cohen, Neil P., LL.M. ................. Harvard
Cook, Joseph G., LL.M. .............. Yale
Hardin, Patrick, J.D. ................. Chicago
Hess, Amy M., J.D. ...................... Virginia
Jones, Durward S. (Emeritus), J.D. .... North Carolina
King, Joseph H., J.D. ............... Pennsylvania
Lacey, Forrest W. (Emeritus), J.D. ...... Michigan
Le Clercq, Frederic S., LL.B. ......... Duke
Lloyd, Robert M., J.D. ................. Michigan
Miller, Charles H. (Emeritus), J.D. ... Duke
Overtorn, Elvin E. (Emeritus), S.J.D. ....... Harvard
Phillips, Jerry J., J.D. ............... Yale
Piquet, Cheryl, M.S.L.S. ............... Tennessee
Rivkin, Dean H., J.D. .................... Vanderbilt
Sobieski, John L., J.D. ............... Michigan
Wirtz, Richard S., J.D. ................... Stanford

Associate Professors:
Aarons, Dwight, J.D. ............... UCLA
Anderson, Gary L., LL.M. ............. Harvard
Ansley, Frances Lee, LL.M. .......... Harvard
Beintema, William J., J.D. ........... Miami
Black, Jerry F., J.D. ..................... Virginia
Bunker, Mary Garrett, J.D. ............. Washington
Cornett, Judy M., J.D. .............. North Carolina
Davies, Thomas Y., J.D. ............... Northwestern
Gray, Grayfred B., J.D. ............... Vanderbilt
Kennedy, Dennis, M.A. ................. Temple
Leatherman, Don A., LL.M. ......... New York
Parker, Carol M., J.D. ............... Illinois
Pierce, Carl A., J.D. .................... Yale
Plank, Thomas E., J.D. ................. Maryland
Raymond, Glenn, J.D. ............... California
Stark, Barbara, J.D. ..................... New York
Stein, Gregory M., J.D. ............. Columbus
Wertheimer, Barry M., J.D. ......... Duke

Assistant Professors:
Browne, Kelly K., J.D. ................ Cincinnati
Davis, Melinda D., M.S.L.S. .......... North Carolina
Thorp, Steven R., J.D. ............... Mercer

Instructors:
Hoover, Mary Jo, J.D. ................. Brooklyn
McApline, Janice E., J.D. ............. Michigan
Moore, Jean (part-time), M.A.L.S. .... Michigan
Wolf, Pamela L., M.S.S.W. .......... Tennessee

The College of Law offers the Doctor of Jurisprudence degree program; a dual degree program with the College of Business Administration leading to the J.D. and the Master of Business Administration degree; and a dual degree program with the Department of Political Science, College of Arts and Sciences, leading to the J.D. and Master of 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, 104 Aconda Court, 862 Volunteer Blvd., Knoxville, Tennessee 37996-4070. 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 to 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 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
835 Representing Enterprises

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

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

DUAL J.D.-M.B.A DEGREE PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual
degree program leading to the conferral of both the Doctor of Jurisprudence and the Master of Business Administration degrees. A student pursuing the dual program is required to take fewer hours of coursework than would be required if the two degrees were to be earned separately.

Admissions
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. degree and The Graduate School and College of Business Administration for the MBA degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program studies must be started prior to entry into the last 28 hours required for the J.D. degree and the last 16 hours required for the MBA degree.

Curriculum
A dual degree candidate must satisfy the graduation requirements of each college. Dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either course for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of requirements of the dual degree program.

The College of Law will award a maximum of nine (9) semester hours toward the J.D. degree for acceptable performance in approved graduate-level courses offered by the College of Business Administration. Three of the 9 semester hours must be earned in Accounting 501, 503, or a more advanced accounting course.

The College of Business Administration will award credit toward the MBA for acceptable performance in a maximum of 9 semester hours of approved courses offered by the College of Law.

Except while completing the first year courses in the College of Law, students are encouraged to maximize the integrative facets of the dual program by taking courses in both colleges each year.

Awarding of Grades
For grade recording purposes in the College of Law, grades awarded in courses in the other unit will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college where such grades are so converted.

The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for an approved MBA course in which the student has earned a grade of B or higher and a grade of No Credit for any lower grade.

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 nine 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 College of Business Administration will award a maximum of nine 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) and be encouraged to take Local Government (Law 824). 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 political science 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.

Awarding of Grades
For grade recording purposes in the College of Law and the Department of Political Science, grades awarded in courses in the other unit will be converted to either Satisfactory or No Credit and will not be included in the computation of a student's GPA or class standing. The College of Law will award a grade of Satisfactory for an approved MBA course in which the student has earned a grade of B or higher and a grade of No Credit for any lower grade.

The College of Business Administration will award a grade of Satisfactory for an approved law course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

POLICY FOR GRADUATE STUDENTS TAKING LAW COURSES
Students pursuing a graduate degree in another college may, upon approval of the College of Law and the major department, 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. Programs. Grades must be earned according to the grading system of the respective college, e.g., numerical grades for law courses, letter grades for graduate courses. Refer to section on Grades for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, at which time both the graduate and the law cumulative will be shown on the permanent record.

PROFESSIONAL COURSES
801 Civil Procedure I (3) N. Finding of evidence, selecting proper court, jurisdiction and venue, ascertaining applicable law, and federal and state practice.
803 Contracts I (3) Basic agreement process and legal protections afforded: offer and acceptance, consideration and other bases for enforcing promises;
824 Local Government (3) Distribution of power be-
tween state and local governmental units; sources of
autonomy for local governments; legal and formal
creation of local boundaries; home rule; problems
created by fragmentation of local government units;
financing of local services; influence of federal programs
on local government finance and decision-making.

825 Introduction to Business Transactions (2) Non-
technical introduction to accounting, finance, and the
functional relationships among the various actors in
business transactions. Analysis of business transac-
tions with view toward needs of business clients. Not
available for students with business background.

827 Business Associations (4) Legal problems asso-
ciated with formation, operation, and dissolution of
business enterprises and limited liability companies;
legal rights of officers and directors of business firms;
law of partnerships, limited partnerships, general
partnerships, and corporations; and securities regulation.

828 Corporate Finance (3) Legal issues arising in con-
junction with corporate financial transactions: lia-
ence of debt and various types of equity securities,
distributions to shareholders, mergers and other corpo-
rate acquisitions. Legal valuation of corporate securities.

830 Securities Regulation (3) Basic structure of federal
securities law. Legal and practical implications of
raising of capital by new and growing enterprises;
securities transactions by promoters, officers, directors
and others involved in the sale of securities; interac-
tion of both federal and state laws and regulations;
accreditation of investors; federal preemption of state
securities laws. Federal and state enforcement of fed-
eral securities laws including the Sarbanes-Oxley
Act of 2002; recent developments in federal securities
laws and regulations.

833 Representing Enterprises (3-5) Capstone course
for concentration in business transactions. Simulated
business transactions and completion of major plann-
ing and drafting projects. Topics vary: formation of
business, acquisition of existing business, development
of real estate project, various financing transactions
and corporate reorganization. Prereq: Completion of all
courses for concentration in business transactions.

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

840 Commercial Law (4) Basic coverage of most signifi-
cant commercial laws of a small company having a
Code; securities interests in personal property (Art.
of U.C.C. and relevant Bankruptcy Code provisions);
corporation law, including checkbook and negotiable
instruments (Arts. 3 and 4 of U.C.C.); sales of goods,
including coverage of portions of Art. 2 of U.C.C.
not covered in Contracts.

841 Commercial Finance Seminar (2) Practical expe-
rience in large and complex transactions. Planning
of financing transactions and negotiating and drafting
documents. Financing techniques: equipment leasing
and matched fund lending; current issues in commer-
cial financing, and other important issues not
normally covered in Commercial Law. Prereq: 840.

842 Contract Drafting Seminar (2) Practical funda-
mentals of drafting contracts of different types.

843 Debtor-Creditor Law (3) Basic elements of federal
bankruptcy law: claims, property of estate, automatic
stay, stay orders, avoidance and recovery, fraudulent
transfers. Obligations of the trustee in bankruptcy, recog-
nition of contracts, priority of distributions, and dis-
tributional aspects of liquidation and rehabilitation.
Enforcement of judgments outside of bankruptcy.

846 Constitutional Law II (3) First Amendment rights
to freedom of religion, expression, association and the
press; Fourteenth Amendment rights against discrimina-
tion as to race, sex, etc.; rights to franchise and appor-
tionment; substantive due process; civil rights under
federal laws enforcing post-Civil War Amendments to
Constitution.

848 Civil Rights Actions (3) Litigation to vindicate
constitutional rights in private actions against the
government or its officials, as well as rights protected
by other civil rights legislation; elements of cause of action
under 42 U.S.C. Sec. 1983; actions against federal
government officials under the Bivens doctrine; institu-
tional and individual remedies; relationship between
state and federal courts in civil rights actions; and rem-
eds for violations of constitutional and other civil rights.

849 Discrimination and the Law (3) Comparison of
race, sex, and other forms of discrimination with respect
to education, employment, housing, political partici-
pation and other social and economic activities; historical
landmarks and current issues in discrimination law.

850 Supreme Court (3) History of the Supreme Court
and of procedures by which Court arrives at decisions;
influ-
ence of justices' ideology and role of Court in political
system.

854 Criminal Procedure (3) Police practices and con-
stitutional rights of persons charged with crimes;
arrest; search and seizure; identification; interrogation
and confession; electronic eavesdropping; and right to
counsel.

855 Criminal Procedure II (3) Pre- and post-trial pro-
dedure in a criminal case: bail; preliminary hearing; grand
jury; preliminary voir dire; discovery; suppression trial;
plea bargaining; jury trial; double jeopardy; and post-

859 Criminal Law Seminar (2) Advanced problems in
criminal law and administration of justice. Prereq: 809.

862 Family Law (3) Survey of laws affecting formal and
informal family relationships: premarital disputes; an-
tenuate contracts; creation and nullity; marriage and
formal and informal marriage; legal effects of marriage;
support obligations within family; marriage separation,
annulment, divorce, alimony, and property distribution;
child custody and child support; abortion; illegitimacy.

863 Children and the Law (3) Legal relationships be-
tween children, families and state; juvenile justice;
foster care; adoption; educational issues; special education;
chid abuse and neglect; healthcare; income mainte-
nance; advocacy for children and families.

866 Environmental Law and Policy (3) Study, through
methods of public policy analysis, of responses of legal
system to environmental problems: environmental legis-
lation; Clean Air Act; Clean Water Act; National Environ-
mental Policy Act; and selected regulatory issues.

867 Environmental Law Seminar (2) Selected topics in
environmental law.

869 Natural Resources Law (3) Nature of interests;
conveyancing; royalties, grants and reservations, leases,
and taxation of natural resources.

873 American Legal History (3) Selected topics in
American legal history.

877 Jurisprudence (3) Critical or comparative examina-
tion of legal theories, concepts, and problems: legal
positivism; natural law theory; legal realism; historical
jurisprudence; utilitarianism; Kantianism; socio-
logical jurisprudence; policy science; and critical
studies.

879 Law and Economics (3) Relationship between
legal and economic thought; application of basic eco-
monic concepts to legal problems; economics in legal
decision making; scholarly support for and criticism
of economic analysis of law. Designed for students with
no undergraduate background in economics or mathe-
matics.

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

886 Public International Law (3) Law-creating proc-
esses and doctrines, principles and rules of law that
regulate the international behavior of states and other
entities in international system.

887 International Business Transactions (3) Legal
status of persons abroad; acquisition and use of property
within a foreign country; doing business abroad as a
foreign corporation; engaging in business within a for-
gnent country; expropriation or annexation of contracts
or concessions.

889 International Law Seminar (2) Current interna-
tional law problems. Prereq: 886 or 887.

891 Comparative Law (3) Introduction to civil law sys-
tems of France and Germany, focusing on legal institu-
tions, methodology, and aspects of law of obligations
and commercial law.

895 Labor Relations Law (3) Political, social and eco-
nomic influences in development of federal labor rela-
920 Teaching Clients the Law (3) Communication of law as basis for decision by persons other than lawyers. Development of skills by team-teaching: practical law course to high school or adult students and by writing research papers that synthesize Tennessee or federal law in plain language.

929 Entering the Profession Seminar (1) Simulation of legal practice and professional ethics; role-playing, problems, and discussion of professional responsibilities.

930 Business Law (3) Legal aspects of business organizations: taxation, regulation, and procedural requirements; regulation of corporate practices; role of lawyers.

931 Legal Research and Writing Seminar (1) Legal research and writing: preparation of legal memos, briefs, and other legal documents.

932 Professional Responsibility (1) Professional responsibility and ethical considerations; legal and ethical issues in the practice of law.

933 Legal Issues in the Practice of Law (1) Legal issues in the practice of law: professional responsibility, client confidentiality, and ethical considerations.

934 Litigation (3) Litigation: participation as an advocate in a civil or criminal case.

935 Professional Practice (3) Professional practice: preparation of briefs, motions, and other legal documents.

936 Professional Responsibility and Ethics (1) Professional responsibility and ethics.

937 Intellectual Property (3) Intellectual property: patents, trademarks, and copyrights.

938 Environmental Law (3) Environmental law: regulation of pollution, protection of natural resources, and the law of the environment.

939 Administrative Law (3) Administrative law: regulation of government and its agencies.

940 Taxation (3) Taxation: federal and state law.

941 Commercial Law (3) Commercial law: sales, leases, and other commercial transactions.

942 Constitutional Law (3) Constitutional law: the U.S. Constitution and state constitutions.

943 Criminal Law (3) Criminal law: offenses, defenses, and penalties.

944 Civil Procedure (3) Civil procedure: pleading, discovery, and motion practice.

945 Torts (3) Torts: negligence, strict liability, and intentional torts.

946 Property Law (3) Property law: real property, personal property, and intangible property.

947 Business Organizations (3) Business organizations: formation, operation, and dissolution.

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Leadership Studies in Education
(Regular Faculty of Education)

MAJORS
Degree

College Student Personnel
M.S.

Education
Ph.D.

Leadership Studies in
Education
M.S., Ed.S., Ed.D.

Grady Bogue, Leader

Professors:
Bogue, Grady (Liaison), Ed.D. .... Memphis State
Harris, G. W., Jr., Ph.D. .... Michigan
Mertz, Norma T., Ed.D. .... Columbia
Ubben, Gerald C., Ph.D. .... Minnesota

Associate Professors:
Connelly, Mary Jane, Ed.D. ......... VIPI
Husen, Peter M., Ed.D. ......... Stanford

Assistant Professor:
Aper, Jeffrey P., Ph.D. ......... VIPI

The Leadership Studies unit offers graduate programs leading to the Master of Science with majors in Leadership Studies in Education, concentration in educational administration and supervision, and College Student Personnel; the Specialist in Education with a major in Leadership Studies in Education, concentration in educational administration and supervision; the Doctor of Education with a major in Leadership Studies in Education, concentrations in educational administration and supervision, educational administration and supervision for practicing administrators, and higher education; and the Doctor of Philosophy with a major in Education. See Education under Fields of Study for full description of all degree requirements.

The higher education doctoral program combines theory and practice in an innovative demonstration of scholarly study and research. A blend of classroom instruction, individualized advising, and supervised practice and internships allows students to develop a specialization in academic administration, community-junior college administration, student personnel administration, financial management, and college teaching. The concentration for practicing administrators focuses on k-12 administrators currently in the field.

For additional information, contact the unit leader.

ADMISSION REQUIREMENTS

General test of the Graduate Record Examination; writing sample if GRE verbal is below 50th percentile; leadership potential judged by activities in organizations, and rating forms or letters of recommendation. The Ed.D. applicant must also interview with all faculty members on campus or elsewhere.

Educational Administration and Supervision

GRADUATE COURSES

513 Administrative and Organizational Theory in Education (3) Introduction to theoretical administrative and organizational foundations of management and leadership of educational programs and institutions. F, Su

515 Human Relations and Communication in Administration (3) Development and use of effective interpersonal communication skills and channels, interpersonal relationships, supportive work climates, personnel motivation, conflict management skills, and role of values, attitudes, and ethics. F, Su

516 Research for School Administrators (3) Descriptive, experimental, and quasi-experimental designs to help students without quantitative backgrounds to read and understand technical professional literature. Introduction to inferential statistics, needs assessments, and evaluation procedures. Sp, Su

529 Politics of Education and Educational Environments (3) School/community relations in political context of modern, complex society. Administrator and supervisory competencies: political, social, ethnic, cultural, and racial environments in which schools operate. Prereq: M.S. introductory core or consent of instructor. F, Su

535 Administrative Applications of Micro Computers (3) DOS, word processing, data based management, spread sheets, and computer communications. Review and development of specific administrative applications: scheduling, attendance, student record systems, and accounting. F, Su

544 School Finance and Business Management (3) For prospective building level administrators. Financial and regulatory management tasks and procedures in individual school settings. F, Su

547 Educational Facility Planning (3) Concepts and skills for development, evaluation, conversion, construction, maintenance, and operations of quality educational environments and facilities. Prereq: M.S. introductory core or consent of instructor. F, Su

553 Strategies of Educational Planning (3) Processes for improving decision-making function through use of both qualitative and quantitative planning techniques. Policy analysis, CPM, PERT, Delphi. Prereq: Introductory M.S. course or consent of instructor. Sp, Su

554 School Law (3) Logical arrangement of case and statutory materials for public school administrators and teachers. Problems concerning law and public education. Prereq: M.S. introductory core or consent of instructor. Sp, Su

560 Internship in Educational Administration (3) Field experience in appropriate educational setting working directly with administrator. At end of planned program of study. Placement by department assignment. Some on-campus classes in conjunction with 583 or 582. Prereq: 21 hrs in educational administration and supervision or consent of instructor. E

582 Educational Leadership and District-Level (3) Role of central administrative team: relationships, behaviors, and competencies of developing and maintaining effective school organization. At end of planned program of study. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F, Su

583 Educational Leadership--Principalship (3) Knowledge, skills, and responsibilities for principal to be effective educational leader. Simulation materials and field-based activities. Culminating course with internships at end of planned course of study. Prereq: 21 hours in educational administration and supervision or consent of instructor. F, Su

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

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

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

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

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

605 Advanced Seminar in Administrative Theory (2) Interdisciplinary seminar for faculty focus on field of study for research and scholarly value from early to current basic theoretical studies and current periodical literature. Pre-requisites: graduate administration required. Of Ph.D. students in Education. Prereq: Doctoral student in Education.

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

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

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

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

629 Seminar in Politics of Education (3) Political theories and practices as they affect operation of public school systems and institutions. Inclusion of interdisciplinary discussions of community power structures and special interest groups, based on literature and research from education, sociology, and political science. Field inquiry. Prereq: 529 or 516 or equivalent or consent of instructor. F

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

646 School Personnel Administration (3) Personnel management functions for professional and supporting staff in educational organizations. Recruitment, selection, placement, personnel policies, employee wage and salary administration, fringe benefits, collective negotiations, human relations, staff development, and staff evaluation. Prereq: 546 or consent of instructor. F, Su

655 State-Federal Relations in Education (3) Interrelationships of state, federal, and local responsibilities and organization for education at state, federal, and local levels. Study of traditional, legal, fiscal and functional aspects of educational partnership. Funding partnerships: discussion of grant proposal development processes. Sp, Su

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

658 Conflict Management (3) Social conflict and its management. Causes of interpersonal, intergroup, and organizational conflict, skills and strategies used to man-
Higher Education

GRADUATE COURSES

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

535 Assessment of Student Learning Experiences in Higher Education (3) Outcome assessment in American higher education: origins of assessment policies, rationales for assessment policy and practice, constructs and outcomes typically assessed, methods for conducting assessment, and uses of assessment data. Philosophies, priorities, and values, recent assessment efforts in higher education.

536 Seminar on Policy Issues in Quality Assurance (3) Exploration of historic and contemporary approaches to definition and demonstration of quality in higher education and examination of contemporary policy issues related to quality assurance in colleges and universities.

542 The College Student and the Court (3) Legal precedent affecting student personnel services in public higher education. Student discipline, housing, dress, organizations, activities fees, tuition and related federal regulations.

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

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

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

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

619 Administration and Governance of Higher Education (3) Trends, structure and processes of collegiate governance. Development of understanding of administrative theory and practice in higher education. Prereq: 543 or consent of instructor. F

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

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

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

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

670 Values and Ethics in Educational Leadership (3) Same as Educational Administration and Supervision 670.

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

598 Seminar in Higher Education (3) Capstone experience for doctoral students. Examination of major philosophical concepts and policy principles distinctive to American higher education, review of significant and current policy reports and critiques, exploration of contemporary policy issues, and evaluation of recommended reforms in higher education. Travel to state, regional, and national policy agencies for higher education.

Leadership Studies

GRADUATE COURSES

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

502 Registration for Use of Facilities (3-15) Required 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.


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

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

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

606 Leadership Forum (2) Development of research, evaluation, policy analysis skills and critical analysis and evaluation of philosophical and policy issues affecting American education. Continuous enrollment for 2 years, on-campus, for students in Ed.D. alternative research program. May be repeated. Maximum 12 hrs. S/N only.

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

Life Sciences

(Major of Arts and Sciences)

MAJOR DEGREES

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

W.F. Harris, Chair

Coordinating Council:

Schwarz, O.J., Plant Physiology and Genetics
Doughal, D.K., Biotechnology.

The programs leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate and are designed to augment offerings of individual departments in the following concentrations: biotechnology, M.S. only, and plant physiology and genetics.

Students interested in these areas should contact either the Life Sciences chairperson or the director of the area of interest. Each program is overseen by a committee and may have unique admission requirements.

ADMISSION REQUIREMENTS

1. A Bachelor's degree with a major in a biological, behavioral, or physical science.
2. GRE (general) scores.
3. Three letters of recommendation.
4. Coursework including a year of calculus (differential and integral), one year of chemistry,
Logistics

See Marketing, Logistics and Transportation

Management

(]College of Business Administration)

MAJOR DEGREES

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

Oscar Fowler, Head

Professors:

Boling, Ronald W. (Emeritus), Ph.D., Stanford
Dewhirst, H. Dudley, Ph.D. . .......... Texas
Gilbert, Kenneth C., Ph.D. ......... Tennessee
Hake, David A., Ph.D. .......... Tennessee
James, Lawrence R. (Pilot Chair of Excellence), Ph.D. .............. Pennsylvania
Kealy, A. H. (Emeritus), MBA ...... Pennsylvania
Ladd, Robert T., Ph.D. .............. Georgia
Larsen, John M. (Emeritus), Ph.D. .... Purdue
Miller, Alex, Ph.D. .............. Washington
Neel, C. Warren, Ph.D. .......... Alabama
Reese, Don (Emeritus), Ph.D. ......... Iowa
Russell, Joyce E. A., Ph.D. ......... Akron
Stahl, Michael J., Ph.D. .......... Rensselaer
Vance, S. C. (Emeritus) (W.B. Stokely Prof.), Ph.D. .............. Pennsylvania

Associate Professors:

Wagoner, George A. (Emeritus), M.S.,.. Indiana
Whitlock, G. H. (Emeritus) (Distinguished Prof.), Ph.D. .............. Tennessee

Assistant Professors:

Bowers, Melissa A., Ph.D. ... ....... Clemson
Fowler, Oscar S., Ph.D. ......... Georgia
Fryxell, Gerald E., Ph.D. ......... Indiana
Judge, William C., Ph.D. ...... North Carolina
Madox, Robert C., Ph.D. ......... Texas
Moon, Charles E., Ph.D. ......... Michigan
Srinivasan, M. M., Ph.D. ......... Northwestern

Graduate Faculty:

Boling, Ronald W. (Emeritus), Ph.D., Stanford
Fowler, Oscar S., Ph.D., Georgia
Larsen, John M. (Emeritus), Ph.D., Purdue
Miller, Alex, Ph.D., Washington
Neel, C. Warren, Ph.D., Alabama
Reese, Don (Emeritus), Ph.D., Iowa
Russell, Joyce E. A., Ph.D., Akron
Stahl, Michael J., Ph.D., Rensselaer
Vance, S. C. (Emeritus) (W.B. Stokely Prof.), Ph.D., Pennsylvania

Graduate Program:

The department participates in a program designed to give master's level 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, E

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

504 Management of Organizational Behavior (3) Integration of individual and group differences, organization theory and design, motivation, leadership, human resources planning, and employee relations with strategy planning and decision making.

511 Organizational Theory: Integrated Structure and Behavior (3) Cases, group projects, discussion, organizational theory, organizational effectiveness, contextual factors of organizations, environment, size, technology, organizational structure configurations, organization design, social influences on organizational effectiveness, motivation, leadership, group behavior, intergroup relations, organization change, development.

521 Personnel Administration (3) Personnel functions and human resource management. Community relations, recruiting, selection, training, performance evaluation, wages and salary administration, legal framework as it affects personnel.

522 Labor Relations and Collective Bargaining (3) American labor history, structure and philosophy of bargaining, dispute settlement, and contract administration. (Same as Economics 592.)

526-27 Industrial and Organizational Psychology (1-3) Research in industrial and organizational psychology. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

531 Management of Technology-Based Organizations (1-3) 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.

541 Operations Management I (3) Techniques applicable to design of systems in operations function.

542 Operations Management II (3) Operations planning and control function. Application of models to real world systems.

551 Management of New Ventures (Integration of various functional disciplines in a corporate venture) toward general management of ventures formed both within larger corporations and independently. Preparation of a venture plan, case analysis.

567-68 Proseminar in Industrial/Organizational Psychology (1-3) Basic thoughts, concepts, and issues required for advanced graduate study in industrial and organizational psychology. Must be taken in sequence during student's first year of study in industrial and organizational psychology program. Consent of instructor required for all non-industrial/organizational psychology program students. (Same as Psychology 517-18.)

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 framework for addressing environmental issues. Most pressing environmental challenges; options compatible with sustained business performance. Cases, field projects, research papers.

593 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, E

601 Research Methods (3) Seminar covering broad range of issues: research process as applied to study of strategic management. Literature and examples of research proposal.

610 Seminar in Advanced Organization Theory (3) Analysis of functioning of complex organizations. Classical and open system 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.

625 Seminar in Organizational Psychology (3) In-depth analysis of current theories, concepts, and issues associated with psychology of organizational leadership and work motivation. Prereq. 567, 568, consent of instructor. May be repeated. (Same as Psychology 625.)
Management Science
(College of Business Administration)

MAJORS
Management Science .................. M.S., Ph.D.
Business Administration ............. M.B.A.

Admissions Requirements
The master's program requires three applicant recommendation forms and the GRE or GMAT. Applications are encouraged from all majors, but mathematics background equivalent of 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 three semesters by full-time students. However, students may start the program in any semester and may pursue an M.S.-degree in Management Science on a part-time basis.

Course Requirements

<table>
<thead>
<tr>
<th>Course Core Requirements</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Management Science 531, 532, 533, 534</td>
<td>14</td>
</tr>
<tr>
<td>Statistics 563</td>
<td></td>
</tr>
</tbody>
</table>

Admission Requirements
The doctoral program requires three applicant recommendation forms and the GRE or GMAT, in addition to The Graduate School'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, Knoxville, at least 6 of which must be at the 600 level. Both of these requirements are also exclusive of thesis or dissertation credits. Entering students who have completed graduate studies in applicable fields will be granted course credits for work which is equivalent to required courses in the program. The program includes approximately 16 to 20 semester hours of coursework in the applied area.

Qualifying Examinations
The student must demonstrate mastery of probability theory and statistical theory, 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.

The 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 essay, 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 two semester's coursework as established by the degree program for part-time students.

**PREREQUISITES FOR MANAGEMENT SCIENCE COURSES**

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

**BUSINESS ADMINISTRATION CONCENTRATION**

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

**MBA Concentration: Management Science**

Minimum course requirements are 531, 532 and 534.

**GRADUATE COURSES**

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 9 hrs.


532 Stochastic Models in Management Science (3) Discrete-time Markov chains, Poisson processes, continuous-time Markov chains, renewal theory, and queueing theory. Prereq: Statistics 563 and Mathematical Analysis or consent of instructor. Sp

533 Computational Mathematical Programming (3) Advanced modeling, computational and reporting techniques in practical mathematical programming. Prereq: 531 and proficiency in PASCAL.

534 Application of Management Science Methods (3) Applications of methods from 531 and 532 to real world problems. Exposure to existing problem in industry or elsewhere.


581 Special Topics in Management Science (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

599 Management Science Problems (1-6) Directed study on subject of mutual interest. E

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

621 Network Flows (3) Treatment of network optimization algorithms, transportation and transshipment models and primal-dual and primal-basic tree methods. Prereq: 531 or equivalent.

651 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branch and bound, cutting plane, and group theoretic algorithms. Prereq: 531 or equivalent.

651 Nonlinear Optimization (3) Solution of constrained and unconstrained nonlinear programming problems. Practical algorithms that perform well in recent practice. Prereq: 531 or equivalent.


681 Special Topics (3) Prereq: 531, 532 and consent of instructor. May be repeated. Maximum 9 hrs.

591-92 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.

David W. Schumann, Head

Professors:

Baranyai, D. J., Ph.D. .......... Purdue

Cadotte, E. R., Ph.D. .......... Ohio State

Davis, F. W., Jr., Ph.D. .......... Michigan State

Dier, G. N., DBA .............. Indiana

Frye, J. L. (Emeritus), Ph.D. .......... Florida

Gardial, S. F., Ph.D. .......... Houston

Langley, C. J., Jr., Ph.D. .......... North Carolina

Mundy, R. A., Ph.D. .......... Penn State

Patton, E. P., Ph.D. .......... North Carolina

Woodruff, R. B., DBA .......... Indiana

Associate Professors:

Foggin, J. H. (Liaison), DBA .......... Indiana

Gardial, S. F., Ph.D. .......... Houston

Holcomb, M. C., Ph.D. .......... Tennessee

Johnston, T. C., Ph.D. .......... California

Moon, M. A., Ph.D. .......... North Carolina

Assistant Professors:

Dabholkar, P. A., Ph.D. .......... Georgia State

Dicer, G. N., DBA .......... Indiana

Davis, F. W., Jr., Ph.D. .......... Michigan State

Dier, G. N., DBA .......... Indiana

Frye, J. L. (Emeritus), Ph.D. .......... Florida

Gardial, S. F., Ph.D. .......... Houston

Langley, C. J., Jr., Ph.D. .......... North Carolina

Mundy, R. A., Ph.D. .......... Penn State

Patton, E. P., Ph.D. .......... North Carolina

Woodruff, R. B., DBA .......... Indiana

**BUSINESS ADMINISTRATION CONCENTRATIONS**

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

**MBA Concentration:** Logistics and Transportation, Marketing.

Minimum course requirements for logistics and transportation—501, 508, and one course from the following: 504, 506, 507, 593, and 599.

For management—511 and 512.

**Ph.D. Concentration:** Logistics and Transportation, Marketing.

Minimum course requirements for logistics and transportation—12 hours to include 601, 602, 603. For marketing—12 hours from among the following courses: 601, 602, 603, 604, 605, 606.

**Marketing**

**GRADUATE COURSES**

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

503 Buyer Behavior—Analysis for Marketing (3) Consumer behavior concepts and processes developed and applied to market analysis and design, and control of marketing programs. Social psychology and demographic factors that affect consumer product, brand and patronage decisions. Prereq: Business Administration 504 and 505 or consent of instructor.

504 Analyzing Market Opportunity for Marketing Decisions (3) Major determinants of opportunity in markets, framework for finding markets and analyzing them for opportunity, application of market opportunity analysis to marketing strategy decisions. Prereq: Business Administration 504 and 505 or consent of instructor.

505 Marketing Research and Information Planning (3) Design of a rigorous marketing study from inception to implementation of results by recognizing key decision points and critically evaluating merit of research project. Prereq: Business Administration 504 and 505 or consent of instructor.

506 Marketing Strategy (3) Integration of concepts and applied skills from each component area of marketing to formulate cohesive, well-organized marketing program. Prereq: Business Administration 504 and 505 or consent of instructor.

507 Global Marketing (3) Strategic issues related to international and multi-national marketing operations; identification and evaluation of opportunities in overseas markets; coordination of strategies in world markets.

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.

511 MBA Marketing Concentration (6) Determination of customer value. Principles of consumer behavior, marketing research, and building customer value. Prereq: Business Administration 504 and 505 or consent of instructor.

512 MBA Marketing Concentration II (6) Delivery of customer value. Communication of customer value, marketing strategy, and providing customer responsive organizations. Prereq: Business Administration 504 and 505 or consent of instructor.

550 Market Opportunity Analysis for New Ventures (3) Concepts for understanding coverage of new venture MOA and various information sources are identified and analyze sales opportunities in markets for new product or service. Prereq: Consent of instructor.

583 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: nonbusiness marketing applications, macroenvironmental issues, market segmentation, international marketing, services marketing, marketing channels, and related issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

**Marketing Thought** (3) Marketing literature across number of topics and research area. Evaluate individual works, determine state of research in each area, and identify areas that merit further study.
Materials Science and Engineering

Graduate Courses

501 Survey of Logistics and Transportation (3) U.S. logistics and transportation; physical, economic, social, and political environment; financing, managing, maintaining, and enhancing U.S. transport infrastructure.

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. E

504 Freight Carrier Systems and Management (3) Analysis of freight carrier management's efforts to provide services demanded by consumers in logistics and transportation marketplace.

505 Logistics Systems Management (3) Development of strategy for management of logistics systems. Executive level integration of logistics operations with marketing, production, and other decision areas.

507 International Logistics and Transportation (3) Logistics strategy in the multi-national firm: materials management, international sources, and distribution.

508 Executive-in-Residence Seminar in Logistics and Transportation Strategy (3) Capstone, integrative case course in logistics and transportation strategy; participation in Executive-in-Residence program that provides student interaction with top-level logistics and transportation executives.

593 Independent Study (1-6) Directed research and study.

599 Special Topics in Logistics and Transportation (1-6) Seminar designed to study specific current problems in logistics and transportation. Topic announced prior to offering. May not be used toward degree requirements. May be repeated.

600 Doctoral Research and Dissertation (1-15) P/NP only. E

601 Seminar in Logistics and Transportation Models (3) Analysis of contemporary models and methodologies in logistics and transportation research, topical coverage at discretion of instructor.

602 Seminar in Evolution of Logistics Thought (3) Traces evolution of logistics and transportation thought; dynamic development of principles and tools developed as organizational missions and environmental change. Economic and policy issues peculiar to transportation and other service organizations.

603 Research Methodology in Logistics and Transportation (3) Various research methods used in logistics and transportation. History and development of body of knowledge. Review of literature. Discussion of contemporary research issues. Development of student's dissertation research proposal.

MAJORS

Metallurgical Engineering

Polymer Engineering

DEGREES

M.S., Ph.D.

Joseph E. Spruill, Head

Professors:

Brooks, C. R., Ph.D. .................... Tennessee
Buchanan, Raymond A., Ph.D. ....... Vanderbilt
Clark, Edward S., Ph.D. ............... California
Fellows, J. F., Ph.D. .................... Akron
Liaw, P. K. (Rachef Chair of Excellence), Ph.D. ......... Northwestern
Lowandes, Douglas H., Ph.D. ...... Colorado
Lundin, Carl D., Ph.D. ............... Pennsylvania
Oliver, Ben F., Ph.D. ................. Pedraza, A. J., Ph.D. .......... National (Argentina)
Phillips, Paul J., Ph.D. .............. Liverpool (UK)
Sri, Joseph E. (Liaisin), Ph.D. .... Tennessee
Stansbury, E. E. (Emeritus), Ph.D. ...... Cincinnati

Associate Professors:

Becker, William T., Ph.D. .......... Illinois
Benson, R. S., Ph.D. ............... Florida State
Meek, Thomas T., Ph.D. .......... Ohio State

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering. Both the metallurgical and polymer 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. Prospective students should consult materials science and engineering faculty concerning development of individual concentrations or special programs compatible with their backgrounds and goals.

Areas of concentration within the metallurgical engineering program include physical metallurgy, materials processing, welding metallurgy and materials joining, corrosion behavior, failure analysis, and mechanical and physical behavior of materials. Specializations in electronic and ceramic materials are available.

Areas of concentration within the polymer engineering 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 Metallurgical Engineering or Polymer Engineering. Additional requirements include:

1. A major consisting of 12 to 18 semester hours of graduate courses in metallurgical engineering or polymer engineering. The polymer engineering major must include 540, 541, 543, 546, 549, 550 and 572 unless similar material has been covered in prior coursework.

2. Additional courses amounting to 6 to 12 hours total in any approved engineering, chemistry, mathematics, physics, or other related fields.

3. Master’s thesis, 500 totaling 6 to 12 hours. All resident students are required to register for and participate in the graduate seminar in metallurgical engineering or polymer engineering, as appropriate, during each semester in which it is offered. Credits for the seminar do not count towards satisfying the coursework requirements.

Non-Thesis Option

Under certain conditions, a candidate may apply for a non-thesis option. To be eligible, the candidate must show evidence of significant professional experience after the baccalaureate degree; at least five years of industrial experience or research publications would be examples of such evidence. A departmental faculty meeting will consider each application individually. Upon acceptance, a supervisory committee of three will be appointed, at least two being from the Department of Materials Science and Engineering. The requirements for completion of the non-thesis option are as follows:

1. A total of at least 33 hours in graduate courses in metallurgical engineering, polymer engineering and related areas. The minimum requirements are 21 hours in the Department of Materials Science and Engineering and up to 12 hours in other engineering or science courses. The candidate’s degree program must be approved by the faculty committee.

2. Satisfactory completion of a critical review of the literature in an area related to metallurgical, polymer or materials engineering (580).

3. Satisfactory performance in an oral examination to be conducted by the faculty committee and covering the review paper and other areas of metallurgical or polymer engineering.

THE DOCTORAL PROGRAM

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

Department requirements consist of the satisfactory completion of:

1. Graduate courses in materials science and engineering amounting to approximately 24 semester hours, at least 8 of which must be in 600 series courses.

2. Supporting courses in related scientific and engineering fields amounting to approximately 24 semester hours, subject to approval by the student’s faculty committee. These related fields will normally include chemistry, mathematics, physics, and engineering.

3. The comprehensive examination, usually given in two parts, and covering such topics as 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.
ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Metallurgical Engineering, through course work and dissertation, is available to residents of Virginia; the M.S. and Ph.D. programs in Polymer Engineering are available to residents of Kentucky, Louisiana, or Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES
405 Structural Characterization of Materials (4) X-ray diffraction and fluorescence; scanning 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;
405 Structural Characterization of Materials (4) X-ray diffraction and fluorescence; scanning and transmission electron microscopy; microanalytical techniques.
422 Chemical Process Metallurgy (3) Application of chemical thermodynamics to metal processing. Ferrous and nonferrous pyrometallurgical refining, slag-metal equilibria; solidification, gas-metal processing. Prereq: 320.
426 Materials Joining (3) Processes for joining metals, polymers and ceramics: mechanical, adhesive, fusion, solidification/crystalization; surface characterization necessary for joining and chemical bonding; thermal effects on structure of materials and joints. Prereq: Introduction to Materials Science and Engineering.
443 Polymer Processing (3) Rheological measurements: flow through tubes and slits, and effects to 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; plastics classification; design and selection criteria; processing techniques; characterization laboratory. Sp
470 Environmental Degradation of Materials (3) Mechanisms, techniques and control of environmental degradation processes in metals, polymers, ceramics and composites; materials selection and design concepts; introduction to Materials Science and Engineering. Recommended for chemical engineering, mechanical engineering and engineering science and mechanics majors.
472 Fundamental Principles of Composite Materials (3) Establishment of physical principles basic to design, manufacture and application of fiber reinforced polymers, metals and ceramics. Prereq: 320 or equivalent.
474 Biomaterials (3) Metals, polymers and ceramics used in orthopaedic, cardiovascular, and dental surgical implant design and degradation problems; material properties of primary importance; tissue response to synthetic materials. Prereq: 221. Recommended for engineering science and mechanics majors.
475 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 423.)
500 Thesis (1-15) P/NP only. E
500 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E
503 Graduate Seminar in Metallurgical Engineering (1) Prereq: Admission to graduate program. May be repeated. S/N/C only. E
504 Graduate Seminar in Polymer Engineering (1) Prereq: Admission to graduate program. May be repeated. S/N/C only. E
505 Engineering Analysis (3) (Same as Chemical Engineering 505.)
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) Geometrical and mechanisms of single crystal plastic deformation; slip, twinning, and cleavage, work hardening, effect of temperature on plastic deformation; mechanical properties of single crystal deforming alloys; 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; physical metallurgy of welding; phase transformation; heat flow; residual stresses; theories of hot cracking, cold cracking and porosity formation: applications to process utilization.
528 Ceramic Matrix Composites: Materials and Mechanical Behavior (3) (Same as Engineering Science 528.)
529 Diffusion in Solids (3) Phenomenology and atomic mechanisms of diffusion in solid state. Solution and applications of diffusion equations; random walk problem and mechanisms of diffusion; diffusion in dilute and concentrated alloys; Kirkendall effect; high diffusivity paths.
530 Phase Transformations in Metallic Materials (3) Thermodynamics of phase equilibrium; theory of nucleation in solids; kinetics and morphology of diffusion controlled growth; kinetics of interface controlled phase transformations; crystallography and kinetics of martensitic transformations.
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, stress rupture and fatigue corrosion. Prereq: 470 or consent of instructor.
540 Basic Polymer Chemistry (3) Synthesis, reactions and degradation of polymers, polymerization, solution methods and spectroscopy. Prereq: Semester of inorganic chemistry and thermodynamics or equivalent.
541 Fluid Mechanics and Polymer Processing (3) Newton-Stokes equations and illustrative problems: applications of traditional and modern techniques to concepts of solidification, fluid flow effects, magnetic properties, quantum theory, specific heats, electron theory of solids.
544 Polymer Solution Thermodynamics and Characterization (3) Theories of solutions, statistical thermodynamics, characteristic of polymer solutions; polymeric solutions, and swollen gels; viscosity, light scattering and osmotic pressure. Prereq: Undergraduate physical chemistry.
545 Mechanical Properties of Solid Polymers (3) Methods of mechanical behavior; Hookean and rubber elastic behavior, deformation, fracture; linear viscoelasticity; dynamic mechanical behavior and testing; loss tangent; experimental methods. Introduction to mechanical properties of polymeric composites.
549-50 Laboratory Methods in Polymer Engineering (1,1) Basic experimental techniques and instrumentation associated with characterization, x-ray and light scattering, calorimetry, rheometry, mechanical properties of solid polymers, polymer processing operations. Coreq: 540 or consent of instructor.
560 Principles of Ceramic Processing (3) Treatment of ceramic processing, preparation and characterization; powder consolidation; drying, firing, sintering techniques, mechanisms and kinetics. Prereq: 380 or equivalent.
552 Experimental Mechanisms of Composite Materials (3) (Same as Engineering Science 562.)
571 Electron Microscopy (3) Operation of electron microscope; kinematical and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: 465 or equivalent.
572 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to definition of structures; powder and single crystal x-ray techniques; introduction to crystal structure determination; characterization of orientation; application to inorganic, metallic and polymer structures.
574 Formability of Materials (3) Modeling and analysis of finite plastic strain with application to primary and secondary forming operations; crystalline and noncrystalline materials, stress localization, failure prediction, testing. Prereq: Consent of instructor.
576 Special Topics in Materials Science and Engineering (3) Topics of current significance and interest. Prereq: Consent of Instructor. May be repeated.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
521-22 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.
523-24 Solidification and Crystal Growth (3,3) Theories of solidification, fluid flow effects, magnetohydrodynamics of incompressible fluids, growth stability theory, thermodynamic applications, rapid solidification theory, metastability. Prereq: Consent of instructor.
614 Advanced Rheology and Viscoelastic Theory (3) Continuum mechanics, formulation of viscoelastic theories for describing deformation and flow of polymeric materials. Application to polymer processing problems. Recommended for MS candidates working in rheological areas. Prereq: 541.
642 Advanced Topics in Polymer Processing (3) Application of theories of rheological behavior and 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 polymeric glasses; crystallization of polymers; nucleation, growth and morphology; secondary nucleation theory; solidification in polymers; crystallization under stress. Prereq: 543.
671 Quantitative Microscopy (3) Principal acoustic, optical, x-ray electron, neutron and field-ion techniques for examination of microstructures of materials. Prereq: 400.
675 Advanced Topics in Materials Science and Engineering (3) Latest developments and/or advanced special topics. Prereq: Consent of instructor. May be repeated.
678 Seminar in Recent Advances in Materials Science and Engineering (3) Directed and independent study of advanced topics. Prereq: Consent of instructor. May be repeated.
Mathematics

(MAJOR OF ARTS AND SCIENCES)

Mathematics ........................................ M.M., M.S., Ph.D.

John B. Conway, Head

Professors:
Alexiadis, V., Ph.D. ....................... Delaware
Allakos, N., Ph.D. ....................... Brown
Anderson, D. F., Ph.D. .................... Chicago
Baker, G. A., Ph.D. ....................... Cornell
Bradley, John S. (Emeritus), Ph.D. ...... Iowa
Carruth, J. H., Ph.D. ...................... Louisiana State
Clark, C. E., Ph.D. ....................... Louisiana State
Conway, J. B., Ph.D. ...................... Louisiana State
Dawson, Robert J., Ph.D. ................ Wisconsin
Dobbins, D. E., Ph.D. .................... Cornell
Dydek, J., Ph.D. ......................... Warsaw
Franken, Henry, Ph.D. ................... Illinois
Gross, J. L., Ph.D. ....................... Tulane
Hallam, T. G., Ph.D. ..................... Missouri
Hinton, D. B., Ph.D. ..................... Tennessee
Husch, L. S., Ph.D. ...................... Florida State
Johansson, K., Ph.D. .................... Bielefeld
Jordan, G., Samuel, Ph.D. .............. Wisconsin
Karakashian, O., Ph.D. ................. Harvard
Kupershmidt, B. A. (UTSI), Ph.D. ...... MIT
Lenth, S., Ph.D. ......................... Kentucky
McConnel, R. M., Ph.D. ................. Duke
Mathews, H. T., Ph.D. ................... Tulane
Miller, D. E. (Emeritus), Ph.D. ....... Michigan
Rajput, B. S., Ph.D. ..................... Illinois
Reddy, K. C. (UTSI), Ph.D. ............ Indian IT
Rosinski, J., Ph.D. ....................... Wroclaw
Schafer, P. W., Ph.D. .................. Maryland
Serbin, Steve, Ph.D. .................... Cornell
Simpson, H., Ph.D. ...................... Cal Tech
Soni, K., Ph.D. ......................... Oregon State
Soni, R. P., Ph.D. ....................... Oregon State
Stallman, F. W. (Emeritus), Ph.D. ...... Giessen
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:
Freire, A., Ph.D. ......................... Princeton
Kimble, K. R. (UTSI), Ph.D. ....... Ohio State
Kot, Mark, Ph.D. ....................... Duke
Kuo, Y., Ph.D. ....................... Cincinnati
Mualuy, S., Ph.D. ....................... Purdue
Piault, Conrad, Ph.D. .................. Maryland
Richter, Stefan (Liaison), Ph.D. ...... Michigan
Row, W. H., Jr., Ph.D. ................. Wisconsin
Smith, J., Ph.D. ....................... California

Assistant Professors:
Collins, Charles R., Ph.D. ............ Minnesota
Feng, Xiaobing, Ph.D. ................. Purdue
Gavrilits, Sergey, Ph.D. .............. Moscow State
Guay, Bo, Ph.D. ......................... Massachusetts
Polignone, Debra, Ph.D. .............. Virginia
Qin, Jinshui, Ph.D. .................... Pennsylvania State
Xiong, Jie, Ph.D. ....................... North Carolina

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.

THE MASTER OF MATHEMATICS PROGRAM

Before admission to the Master of Mathematics program, the applicant must have either (a) certification for teaching secondary mathematics in at least one state, or (b) three years of elementary school, secondary school, or community college teaching experience. Applicants must have successfully completed one year of calculus (141-42 or equivalent) and a course in matrix algebra (251 or equivalent).

The following requirements must be met:
1. Complete 30 hours of coursework of which 12 must be at the 500 level. The coursework must include 501, 502, 506, 507, and 568. 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, 6 hours (at least 15 of which must be in mathematics) must be in courses numbered above 500. Of the 30 hours, 9 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.

THE DOCTORAL PROGRAM

For the Ph.D. program in Mathematics, the student must meet the following requirements in addition to those of The Graduate School:
1. Satisfy either the standard program or the interdisciplinary mathematical ecology concentration. A student intending to work in mathematical ecology concentration may complete either but is encouraged to complete the interdisciplinary mathematical ecology concentration. A student may elect to switch from one to the other provided the constraints of the latter option have not been violated.

A student's status after electing such transfer is determined by the complete history of the student's earlier mathematics examinations from the standard program and the interdisciplinary mathematical ecology concentration. Descriptions of both programs are given below.

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 met, 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 Knoxville).

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.

Group I. Probability 523-524, Real Analysis 541-42, Applied Linear Algebra 553-56

Group II. Complex Analysis 543-44, Modern Algebra 551-56, Topology 561-62


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 utilization 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:

. 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 only the number of examinations necessary to complete the requirements.

c. A student may take a collection of written examinations a maximum of 3 times, but no one failing 4 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 UK graduate program in mathematics no longer than one year may take written examinations at any 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, or III, a student may demonstrate proficiency in that subject by passing the associated written examination. For this purpose, only one attempt is permitted for each of up to 3 subjects, and the 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

1. 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.

2. 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.

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     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.

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515-16 Analytical Applied Mathematics (3,3) Analysis of advanced techniques in modern context for applied problems: differential equations and analysis, perturbation theory, variational approaches, transform theory, wave phenomena and conservation laws, stability and bifurcation, distributions, integral equations. Prereq: 446 or 448, 453, and either 511-12 or both 431 and 435.

517-18 Mathematical Methods in Physics (3,3) (Same as Physics 571-72.)

519 Seminar in Applied Mathematics (1-3) May be repeated. Maximum 12 hrs.

521-22 Enumerative Combinatorics (3,3) Sieve methods, recursion, generating functions, and permutation groups applied to enumeration of discrete structures. Incidence algebras and combinatorics of partially ordered sets.

523-24 Probability (3,3) Pertinent facts from measure theory, definition of abstract probability spaces; Kolmogorov's extension theorem; series of independent random variables and laws of large numbers; general theory of distributions of random vectors and their characteristic functions; weak convergence concept; weak compactness and Prokhorov's theory; weak convergence of measures and uniform integrability; Construction of Probability Measures in Euclidean spaces; infinitely divisible distributions and central limit problem; general concept and properties of conditional expectation; Laws of large numbers; Conditional Expectation 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 theory; uniform minimum variance unbiased estimates, asymptotic efficiency and optimality; the conditional procedures and hypothesis testing; optimal tests and confidence intervals, the Neyman-Pearson lemma, uniformly most powerful tests, general linear models, estimation and tests in linear models; non-parametric methods, rank methods for comparison, linear regression and independence, robust tests; topics from decision theory. Prereq: 445-46, Recommended prereq: 426.

527 Stochastic Modelling (3) Models in probability applied to real world situations; queuing theory; branching processes; Monte Carlo simulation. Prereq: 445-46 or consent of instructor.


541 Matrix Theory and Techniques in Numerical Analysis (3) Advanced topics in study of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relationship to modern computer architectures. Prereq: 435, 471-72, or consent of instructor. May be repeated. Maximum 9 hrs. (Same as Computer Science 575.)

549 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 ecosytems. Prereq: 431,453 or consent of instructor.

583 Mathematical Evolutionary Theory (3) Population genetics and evolutionary ecology. Prereq: 431, 453 or consent of instructor.

584 Mathematical Systems Theory (3) Analytic approach to discrete and continuous dynamical control systems; optimal control. Applications to ecology. Prereq: 431, 453, 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: Itô's calculus and stochastic differential equations, integration theory, ergodic theory, probability on algebraic structures, limit theorems, geometry and probability in Banach spaces, probability methods in analysis. Prereq: 553-24 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

628 Seminar in Combinatorics (1-3) May be repeated with consent of department. Maximum 12 hrs.

631-32 Advanced Ordinary Differential Equations (3,3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature. Subject matter varies according to interests and preparations of students. Prereq: 531-32 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

635-36 Advanced Partial Differential Equations (3,3) Selected topics in 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 topological groups: convergence, summability, uniqueness, inversion theorem, Plancherel transform, Hilbert transform, Hardy-Littlewood maximal function, interpolation of operators, or Fefferman-Stein duality. Prereq: 541-42 and 543. May be repeated with consent of department. Maximum 12 hrs.

649 Seminar in Analysis (1-3) May be repeated with consent of department. Maximum 12 hrs.

651-52 Advanced Modern Algebra (3,3) Selected topics in modern algebra or number theory. Prereq: 553-52 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.


663-64 Algebraic Topology (3,3) Homology, cohomology, homotopy theory, duality theorems and Hurewicz isomorphism theorem. Prereq: 561-62 and 1 yr of abstract algebra. 455-56 or 561-52. May be repeated with consent of department. Maximum 12 hrs.

667 Geometry of Surfaces (3) Immersed and imbedded surfaces in R^3. First and second fundamental forms, Gauss curvature. Riemannian metric and connection. Introduction to differential forms, Gauss and Codazzi equations; existence of surfaces with prescribed local...
Mechanical and Aerospace Engineering and Engineering Science

(College of Engineering)

MAJOR

DEGREES

Aerospace Engineering .......... M.S., Ph.D.
Engineering Science .......... M.S., Ph.D.
Mechanical Engineering .......... M.S., Ph.D.

D. W. Dareing, Head

Professors:
Antar, B. (UTSI), Ph.D. .......... Texas
Ann milli, R. V., Ph.D. .......... VPI
Braun, G. W. (Emeritus) (UTSI), Ph.D. ...... Gottingen
Carley, T. G. (Liaison), PE, Ph.D. ...... Illinois
Collins, F. G. (UTSI), PE, Ph.D. ...... California
Crawford, R. A. (UTSI), Ph.D. ...... Tennessee
Darling, D. W., P.E., Ph.D. ......
Dube y, R. V., Ph.D. .......... Clemson
Edmondson, A. J., PE, Ph.D. .......... Texas A&M
Flan do, G. A. (UTSI), Ph.D. ...... Cal Tech
Forre ster, J. H., PE, Ph.D. .......... Iowa State
Forest y, J. W. (Emeritus), Ph.D. ......
Hillman, R. S., Ph.D. .......... Toulouse (France)
Garrison, G. W. (UTSI), Ph.D. ...... NC State
Hodgson, J. W. (Fisher Prof.), PE, Ph.D. ......
Holland, R. W. (Emeritus), PE, M.S. ..........
Jendrucko, R. J., PE, Ph.D. .......... Virginia
Johnson, W. S, PE, Ph.D. .......... Clemson
Keef er, D. R. (UTSI), Ph.D. ......
Kee hany, M. (Liaison), Ph.D. ......
Kim, K. H., Ph.D. .......... NC State
Krane, R. J., Ph.D. .......... Oklahoma
Krieg, R. D. (Condra Chair of Excellence), Ph.D. ...... New Mexico
Land es, J. D., PE, Ph.D. .......... Lehigh
Lee, C. W. (Emeritus), Ph.D. ...... Illinois IT
Liston, H. J. (Emeritus), Ph.D. ......
M.E.A. (Emeritus), George Washington
Lo, C. F. (UTSI), Ph.D. ...... Cornell
McCay, M. H. (UTSI), PE, Ph.D. ...... Florida
McCay, T. (UTSI), Ph.D. ...... Auburn
Maxwell, R. L. (Emeritus), PE, M.S. .......... Case Western
Milligan, M. W., PE, Ph.D. ...... Tennessee
Newman, M. K. (Emeritus) (UTSI), Ph.D. ......
Parang, M. P., PE, Ph.D. ...... Oklahoma
Parsons, J. R., PE, Ph.D. ...... NC State
Peters, C. E. (UTSI), D.A.S. ...... Brussels
Pih, H. (Emeritus), PE, Ph.D. ...... Illinois IT
Pitts, D. R. (Emeritus) Ph.D. ...... Georgia Tech
Remy nyik, C. J. (Emeritus), Ph.D. ...... Johns Hopkins
Schulz, R. (UTSI), Ph.D. ...... Tennessee
Scott, W. E. (Emeritus), Ph.D. ...... Johns Hopkins
Shahroki, P., Ph.D. ...... Oregon
Shole, L. E. (Emeritus), PE, M.S. .......... Kansas State
Smith, G. V., PE, Ph.D. ...... Penn State
Snyder, W. T., Ph.D. ...... Northwestern
Sollman, O., Ph.D. ...... Tennessee
Speckhart, F. H. (IBM Prof.), PE, Ph.D. ......
Stair, W. K. (Emeritus), M.S. ...... Tennessee
Stoneking, J. E., PE, Ph.D. ...... Illinois
Truc k, J. M. (Emeritus), M.S. ..........
Vertigolle, J. (Emeritus), Ph.D. ......
Wasserman, J., PE, Ph.D. ...... Cincinnati
Weistman, Y. J., Ph.D. ...... Rensselaer
Wilson, H. J., PE, Ph.D. ...... Tennessee
Wilson, C. C., Ph.D. ...... Purdue
Wu, J. M. (UTSI), Ph.D. ...... Cal Tech
Young, R. L. (Emeritus) (UTSI), PE, Ph.D. ...... Northwestern

Associate Professors:
Becker, S. E., PE, Ph.D. ...... NC State
Boulet, J. A. M., Ph.D. ...... Stanford
Caruthers, J. E. (UTSI), Ph.D. ...... Georgia Tech
Engels, R. C. (Emeritus), Ph.D. ......
Frankel, J. I., Ph.D. ...... VPI
Hamel, W. R., Ph.D. ...... Tennessee
Madhukar, M. S., Ph.D. ...... Drexel
Mathews, A., PE, Ph.D. ...... Illinois
Moudien, T. H. (UTSI), Ph.D. ......
Nguyen, K., Ph.D. ...... Colorado
Steinhoff, J. S. (UTSI), Ph.D. ...... Chicago
Vakili, A. D. (UTSI), Ph.D. ......

Assistant Professors:
Cezaux, J. L., Ph.D. ...... Rensselaer
Fannelli, G. S., Ph.D. ...... Tennessee
Kawiecki, G., Ph.D. ...... West Virginia
Lyne, E. J., M.D., Ph.D. ...... NC State
Ponke, C. D., PE, Ph.D. ...... Georgia Tech
Roach, R. L. (UTSI), Ph.D. ......
Yu, N., Ph.D. ...... California (San Diego)

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy are available with majors in Mechanical Engineering, Aerospace Engineering, and Engineering Science. Changing from one of these programs to another requires departmental approval. Each applicant is advised as to any prerequisite courses before entering a program.

In Mechanical Engineering, program concentrations include energy conversion and utilization; propulsion; heat transfer and fluid mechanics; thermodynamics; space engineering; gas dynamics; machine design and dynamics; power generation; and stress analysis.

In Aerospace Engineering, program concentrations include energy conversion and utilization; propulsion; heat transfer and fluid mechanics; thermodynamics; space engineering; aerodynamics and gas dynamics; flight mechanics; aeroacoustics; and structures and stress analysis.

In Engineering Science, program concentrations include energy conversion and utilization; propulsion; heat transfer and fluid mechanics; computational mechanics; biomedical engineering; and optical engineering (UTSI only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. 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. Specializations will be met by interdisciplinary study in engineering. The program's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics or in related interdisciplinary studies such as biomechanics.

In Mechanical Engineering or Aerospace Engineering, entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering background. The general GRE is required of all international applicants for admission.

In Engineering Science, entrance into the graduate program is available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. A program application is required in addition to the Graduate School application. The names and addresses of four references must be included with the program application. The general GRE is required of all international applicants for admission.

Each student must satisfactorily complete a program of study that has been approved by his/her advisory committee and complies with the requirements of the Graduate School. In Engineering Science, the student's major professor may be selected from a department other than the Department of Mechanical and Aerospace Engineering and Engineering Science; however, at least one member of the student's graduate advisory committee must be on the faculty of the Department of Mechanical and Aerospace Engineering and Engineering Science.

THE MASTER'S PROGRAM

In both Mechanical Engineering and Aerospace Engineering, three M.S. options are...
offered. Option I requires a thesis, while Options II and III do not. Option I is the normal program for recent graduates. Options II and III provide graduate students with significant professional work experience the opportunity to focus their programs in special areas through either greater course work or selected engineering problems. Credit requirements for these three options are summarized below.

### Course Areas

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<tr>
<th>Hours Required</th>
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<tr>
<td>Option I</td>
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<td>Option II</td>
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<td>Option III</td>
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<tr>
<td>Coursework</td>
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<tr>
<td>Mathematics (400 level or above)</td>
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<tr>
<td>Engineering courses below</td>
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</table>

All three programs require participation in the departmental graduate seminars program, and passing a final examination on all work submitted for the degree. Option II final examination will cover all course work. Option III final examination will cover all the selected engineering problems. The thesis option, Option I, requires submission and defense of a written thesis that demonstrates the ability to conduct and report an independent investigation.

The problems option, Option III, requires a formal report to be written for each selected engineering problem. In Engineering Science, two M.S. options are offered: Option I requires a thesis, while Option II does not. The Option II is restricted to those students who have had significant engineering professional work experience. In Option I, a minimum of 30 semester hours including the thesis is required. In Option II, a minimum of 30 hours is required. Credit requirements for these two options are summarized below.

### Academic Common Market

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph. D. program in Aerospace Engineering is available to residents of the states of Arkansas or Kentucky. The M.S. in Aerospace Engineering is available to residents of Kentucky. The Ph. D. program in Engineering Science is available to residents of the state of Florida (concentration in biomedical engineering only). Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

### Graduate Credit for Undergraduate Courses

Students majoring in Mechanical Engineering or Aerospace Engineering may not normally use more than one 400-level engineering course to meet their advanced degree requirements. For students majoring in Engineering Science, four hundred-level courses in engineering may be used for graduate credit at the discretion of the advising committee. However, at least two-thirds of minimum required credit hours in a master's degree program must be at or above the 500 level. With the approval of the student's major department, a student whose major is outside the Department of Mechanical and Aerospace Engineering and Engineering Science may take senior (400-level) courses in the Department for graduate credit. Such students should consult with instructors regarding prerequisites for undergraduate courses.

### Aerospace Engineering

**Graduate Courses**

- **422 Aerodynamics (3)** Theory and design of aerodynamic bodies for desired characteristics. Potential flow theory, viscous effects, compressibility effects. Subsonic, transonic, and supersonic airfoils. Prereq: 370, F 422
- **423 Viscous Flow (3)** Boundary layer theory, laminar and turbulent flow, compressibility effects; numerical solution methods. Prereq: 422 or Heat Transfer or consent of instructor. Sp 423
- **512 Viscous Flow (3)** Equations of viscous fluid flow, laminar and turbulent flow, transition, separation; boundary layer theories; exact and approximate solutions. Prereq: 422. Coreq: Mechanical Engineering 531. Mp 425
- **425 Thermodynamics of Fluids (3)** Fluids, heat transfer, and thermodynamics. Prereq: 424 or equivalent. Sp 425

**512 Viscous Flow (3)** Equations of viscous fluid flow, laminar and turbulent flow, transition, separation; boundary layer theories; exact and approximate solutions. Prereq: 422. Coreq: Mechanical Engineering 531. Mp 425
- **513 Experimental Methods in Fluid Mechanics (3)** Experimental techniques with laboratory experiments; representative experiments: hot wire anemometry and turbulence measurements. Prereq: 422 or Mechanical Engineering 531. Coreq: Mechanical Engineering 444. F 425
- **514 Advanced Fluid Mechanics (3)** Advanced fluid mechanics; nonlinear flows; small perturbation theory; slender body theory; similarity rules; separate flow measurements. Prereq: 422 or 512. Sp 514
- **525 Hypersonic Flow (3)** Hypersonic flow, hypersonic flows, hypersonic interactions, free molecule and rarefied gas flow. Prereq: 512.
527-28 Aerospace Ground Test Facilities (3,3) Atmospheric models and similarity considerations; atmospheric test facilities: continuous and intermittent test sections; tunnels and ballistic ranges; propulsion test facilities or air breathing and rocket engines, space environment and space vehicle test facilities. Prereq: 512 and 521, Mechanical Engineering 522.

529 Rarefied Gas Dynamics (3) Binary elastic collisions; kinetic theory; flow regimes, Boltzmann and model equations, transfer equation, gas-surface interactions, slip boundary conditions, free molecule, slip and transition flow, Knudsen simulation; experimental techniques: introduction to hypersonic real gas flows. Prereq: 522, Mechanical Engineering 522.

531 Magnetohydrodynamics (3) Electromagnetic field theory; chemical kinetics; thermal and thermo-physical properties of gasplasmas; governing equations and applications. Prereq: 422 and Mathematics 471.

532 Introduction to Turbulence (3) Microscopic effects, analogies, statistical treatment, correlation functions, energy spectra, diffusion; analysis of turbulent jets and pipe flow. Prereq: 511-12.

534 Atmospheric Entry (3) Reentry trajectories; lift and drag during reentry; vehicle motion and stability during reentry; aerodynamic heating and heat protection systems. Prereq: 522. Recommended prereq: 512.

544 Transonic Flow (3) Nature of flow at transonic speeds; entropy waves; shock wave phenomena; shock wave theory; shock wave equations; strong viscous interaction phenomena; solution techniques. Prereq: 522.


554 Aerospace Vehicle Stability and Control (3) Static and dynamic longitudinal directional and lateral stability and control. Coupled modes. Motion with free and fixed flight test surfaces. Automatic control systems. Prereq: 522, 551.

555 Vertical or Short Take Off and Landing Aircraft (3) Performance, stability, control of rotary wing, tilt wing, vectored lift and jet and vertical lift aircraft. Vertical and transition flight modes. High lift systems. Automatic controls. Simulation facilities and flight testing. Prereq: 555.


561 Fundamentals of Aeroacoustics (3) Generation, propagation and absorption of sound in static and moving media. Prereq: Consent of instructor.

564 Spacecraft Attitude Dynamics and Control (3) Rotational attitude dynamics of space vehicles. Gyroscopic instruments, passive and active attitude control devices. Linear control theory and attitude stabilization. Prereq: 551, Mathematics 471.

574 Space Engineering: Satellite Technology (3) Satellites and rockets (orbital launch vehicles and launching), spacecraft structure, power systems, attitude control systems, and guidance systems, radio communication, space flight planning, satellite communication, spacecraft testing, reliability, and application of satellites (communication, weather, earth observation, and future applications). Prereq: 425, Mathematics 471, 404.

590 Selected Engineering Problems (2-6) Enrollment limited to students in programs program. Prereq: Consent of advisor.

599 Special Topics in Aerospace Engineering (1-3) May be repeated. Maximum 6 hrs.

631 Magnetohydrodynamics I (3) Electromagnetic field equations, motions of single charged particle, statistical description of plasma, Boltzmann equation, conduction and diffusion in ionized gases, continuum magnetohydrodynamic equations. Prereq or coreq: 512. Prereq: Mathematics 581 or equivalent.

632 Magnetohydrodynamics II (3) Alfvén and shock waves, exact solution for magnetohydrodynamic channel flow; one-dimensional model of channel flow; engineering applications of magnetohydrodynamics; propulsion and power generation. Prereq: 631 and Mathematics 582.

641-42 Physical Gas Dynamics (3,3) High speed, high temperature gas flow from molecular point of view. Kinetic theory, statistical mechanics, equilibrium flow, vibrational and chemical rate processes, non-equilibrium vibrational and chemical flow, non-equilibrium kinetic theory, flow with translational non-equilibrium. Prereq: 622, Mechanical Engineering 522.

645 Theory of Turbulence (3) (Same as Engineering Science and Mechanics 645.)

651-52 Advanced Aerodynamics (3,3) Subsonic, transonic, supersonic, and hypersonic flows treated in generalized and unified manner with various viscous/inviscid effects. Relationships among various regimes of fluid flows. Fundamental assumptions, limitations of approximations and consequences. Foundations of gas dynamics, applications to airplanes, rocket, ground testing and jet propulsion. Discussion of special topics according to interest of students. Prereq: 511, 522.


690 Advanced Topics in Aerospace Engineering (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Engineering Science

GRADUATE COURSES

421 Materials of Engineering (3) Mechanical properties of engineering materials; data collection and processing; time dependent and cyclic dependent properties. Prereq. 521, Materials Science and Engineering 201, 3 hrs or 2 hrs and 1 lab.

423 Fracture-Safe Design (3) Critical review of variables controlling fracture toughness: part and flaw geometries, fracture mechanics criteria; fracture toughness of a large variety of materials; fracture mechanics of brittle failure. Prereq: 512 and Materials Science and Engineering 201. (Same as Materials Science and Engineering 475.) 3 hrs or 2 hrs and 1 lab.

433 Dynamic Systems (3) Three dimensional dynamical systems of particles and rigid bodies: gyroscopic; variable mass systems; central force motion; Lagrange's equations; stability; transfer functions. Prereq: Dynamics.

435 Engineering Acoustics (3) Concepts of acoustics, measures of sound and their units; noise generation and transmission, noise control principles and application, materials and procedures for noise abatement. Prereq: Senior standing or consent of instructor.

442 Fluid Mechanics II (3) (3) Differential forms of basic laws; compressibility, isentropic flow, shocks, duct flow phenomena; micro- and macro-structure; critical flow, transitional flow; energy methods; internal and external viscous flows, boundary layers, elementary turbulent closure models. Prereq: 511 and Materials Science and Engineering 475. 3 hrs or 2 hrs and 1 lab.

461 Experimental Stress Analysis (3) Theory, techniques, and instrumentation of resistance strain gauges; theory and techniques of brittle coating methods; introduction to other strain measuring devices. Prereq: 521, Electrical and Computer Engineering 301. 2 hrs and 1 lab.

483 Photomechanics (3) Introduction to photoelasticity, photoelastic coating method, Moiré method, interferometry, and holography. Prereq: 521, Physics 232. 2 hrs and 1 lab.

485 Dynamic Data Acquisition (3) Use and calibration of instrumentation for measuring and recording dynamic events; Fourier analysis, transfer function analysis, digital signal processing, transduction, experimental parameter estimation with applications to modal vibration analysis. Prereq: 431, Electrical and Computer Engineering 301. 1 lab.

471 Clinical Engineering and Biomedical Instrumentation (3) Function and characteristics of health care delivery systems; hospital organization and health care economics; development and management principles for hospital and professional organizations; microprocessor control systems; instrumentation system operational characteristics; performance of transducers, signal conditioning, data readout; use of existing equipment in current applications. Prereq: Consent of advisor.

473 Biomechanics (3) Mechanical properties of living tissues; biomechanics of injury; mechanics of prostheses; material compatibility of prosthetic devices; biomechanical problems related to impact. Prereq: 521.


494-95 Special Engineering Science Topics (1-3,1-3) Problems related to recent developments and practice. Open to juniors or seniors. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

523 Theory of Elasticity (3) Equations of equilibrium, strain-displacement relations compatibility, and constitutive equations in three-dimensions. Beams, disks, thick-walled tubes, plates with holes; stress concentrations. Airy and complex potential stress function, plane stress and plane strain in rectangular and polar coordinates. Thermal stresses in beams, rings, plates, and shells; thermal buckling problems.

525 Theory of Plates (3) Classical bending theory of thin plates; buckling and large deflection problems. Prereq: 523 or 533.


528 Ceramic Matrix Composites: Material and Mechanics (3) Microstructure and microstructural design; fabrication of ceramic matrix composites; interface characterization and mechanics; electron microscopy analysis, nondestructive evaluation; fracture; fatigue; applications. Prereq: 429 or consent of instructor. (Same as Materials Science and Engineering 528.)


538 Advanced Engineering Acoustics (3) Introduction to theory and application of acoustic analysis; vibration of continuous systems; plane and spherical waves, transmission phenomena; boundary, scattering, reflection, resonators, filters, absorption mechanisms, microphones, ultrasonic, sonar transducers. Prereq: 435 or undergraduate vibrations course.

539 Continuum Mechanics (3) Cartesian tensors, transformation laws, development of mechanics concepts; stress, strain, deformation, constitutive equations. Conservation laws for mass, momentum, energy. Applications in solid and fluid mechanics.

541 Fluid Dynamics I (3) Kinematic, kinetic and thermodynamic properties of fluid mechanics. Development of rate deformation laws; mass, momentum and energy conservation relationships; non-dimensionalization. Applications of Euler and Navier-Stokes equations: exact solutions, potential flow, transonic, boundary layer approximations; coupled heat/mass transfer models. Coreq: 539.

542 Fluid Dynamics II (3) Development of basic concepts and governing equations for turbulence and turbulent field motion. Formulation for correlation function, energy spectra, diffusion tensors, cold turbulent fluid transport processes, free turbulence, wall turbulence; use of engineering turbulence closure models; examination of modern numerical and experimental methods. Prereq. 541.

557 Computational Mechanics Seminar (1) Current developments in computational fluid/thermal/structural mechanics. For departmental thesis students only. May be repeated.

562 Experimental Mechanics of Composite Materials (3) Stress-strain relationships for orthotrophic and transversely isotropic materials; analysis of composite laminas and laminate; stress and strain transformation; laminate plate theory; fiber, matrix, fiber-matrix interface, and composite mechanical properties (ten nale, flexure, compressive, shear); physical properties; notch-tip stress field, stress intensity factor, notch sensitivity; strain energy release rate, composite fracture toughness; failure modes. Lab. Prereq: Mechanical and Aerospace Engineering and Engineering Science 521 or consent of instructor. (Same as Materials Science and Engineering 562.)


566 Optical Engineering I (4) Wave optics; scalar diffraction theory, introduction to Fourier optics; ray or geometric optics; coherence; mirror, gratings; paraxial method of introduction; introduction to aberrations.


571 Biomechanics of Hard and Soft Tissue (3) Introduction to terminology, physiology, and analytical methods for mechanics of living tissue. Continuum mechanics of heterogeneous materials. Analysis of the circulatory fluid and arterial fluids. Flow properties of blood, rheology of blood in microvessels; biophysical mechanisms of liquids, mechanical properties of solid tissues; fluid flow, heart and smooth muscle; bone and cartilage. Research paper.


578 Fuzzy Systems in Engineering (3) (Same as Nuclear Engineering 578.)


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

589 Measurement Science II (3) (Same as Nuclear Engineering 589 and Aviation Systems 589.)

621 Analysis and Design of Thin Shell Structures (3) Geometry of surfaces, derivation of thin shell theory for arbitrary shell geometry. Applications of theory in structural engineering. Prereq: 525 or Civil Engineering 562.

624 Viscoelasticity (3) Viscoelastic constitutive relations; isothermal boundary value problems; wave propagation in viscoelastic materials; stability problems; determination of viscoelastic properties. Prereq: 523 and 539 or Polymer Engineering 541.

625 Computational Plasticity and Creep (3) Theory and numerical algorithms used to describe plastic and creep deformation in finite structural models. Perfect plasticity, kinematic and isotropic hardening; Mroz, mechanical sublayer, and two-surface models; volumetric plasticity models; traditional creep models and unified creep-plasticity models. Numerical algorithms, including error maps, and plane stress plasticity algorithms in parallel. Prereq: 529 or 523, Mechanical and Aerospace Engineering and Engineering Science 521.


641 Advanced Topics in Fluid Mechanics and Conve ctive Heat Transfer (3) Convective momentum, heat and mass transfer; boundary layer analysis; stability, transition, turbulence, closure models; Navier-Stokes equations, closure procedures: time- and ensemble averaging, large-scale structures, high-speed flow, reacting, nonreacting, excitation, ionization. Applications in propulsion, lasers, aerodynamics. Prereq. 542.

646 Theory of Turbulence (3) Mathematical descriptions of turbulence; isotropic turbulence, energy spectra, Kolmogorov’s hypothesis, large and small eddy structure for turbulent flows; turbulent diffusion by continuous movement; applications to turbulent jets, wakes, pipe flow, and boundary layers. Prereq: 542, (Same as Aerospace Engineering 645.)

657 Computational Mechanics Seminar (1) Current developments in computational fluid/thermal/structural mechanics. For departmental thesis students only. May be repeated.

681 Advanced Topics in Engineering Mechanics (3) Advanced problems in mechanics, group or individually. Prereq. Consent of Instructor. May be repeated with consent of department.

Mechanical Engineering

NOTE: Not all the courses listed below are available at both the UT Knoxville and the UTSI campuses.

GRADUATE COURSES


455 Introduction to Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering solid mechanics systems. Participation in team design effort; design report. Prereq. Dynamics and Vibrations of Machines.

465 Introduction to Thermal Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering solid mechanics systems. Participation in team design effort; design report. Prereq. 332, 344, F.


471 Refrigeration and Air Conditioning (3) Vapor compression and absorption systems; heat pump systems; psychometric processes; air washers; cooling towers; solar radiation; building heat transmission. Prereq. 332, 344.

475 Thermal Engineering (3) Thermal systems, turbomachinery, heat exchangers, combustion and analysis design, second law and economic analysis. Prereq. 332, 344, F,Sp.


484-85 Selected Topics in Mechanical Engineering (1-4, 1-4) Problems and topics related to developments in mechanical and practice in mechanical engineering. Prereq. Consent of Instructor.


507 Application of Numerical Linear Algebra in Systems and Control Engineering (3) (Same as Chemical Engineering 507 and Electrical Engineering 507.)


514 Phase Change Heat Transfer (3) Mechanisms and modeling of nucleation, transition and liquid boiling processes; critical heat flux; forced convection boiling and post dry-out heat transfer; condensation processes; heterogeneous nucleation; dropwise and filmwise condensation; flow condensation; phase change processes; moving phase fronts; mathematical modeling. Prereq. 344, 511.

527 Advanced Topics in Experimental Mechanics (3) Advanced problems in mechanics, group or individually. Prereq. Consent of Instructor. May be repeated with consent of department.
Mechanical and Aerospace Engineering and Engineering Science

Mechanical and Aerospace Engineering and Engineering Science

GRADUATE COURSES

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

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

521-22 Advanced Strength of Materials (3,3) Three-dimensional transformations for stress and strain, elementary theory of elasticity, unsymmetrical bending, beams on elastic foundation, energy methods, shear center, beam-columns, thick-walled pressure vessels, elementary theory of plates. Prereq: Mechanics of Materials II or Mechanical Engineering 466, Mathematics 431 or Engineering Analysis.

531 Dynamics I (3) Kinematics and dynamics of particles in two dimensions. Prereq: Mechanical Engineering 466, Mathematics 431 or Engineering Analysis.


559 Computational Mechanics Laboratory I (1) Utilization of networked X-terminals/engineering work station environment for conducting computational mechanics experiments. May be taken for credit with each of courses 551, 552, 553, and 557. Coreq: 551.

575 Applied Artificial Intelligence (3) (Same as Nuclear Engineering 575.)

576 Expert Systems in Engineering (3) (Same as Nuclear Engineering 576.)

577 Neural Networks in Engineering (3) (Same as Nuclear Engineering 577.)

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Aviation Systems 588, Civil Engineering 588.)

595 Seminar (1) All phases of mechanical and aerospace engineering and engineering science, reports on current research at UTK and UTMS. May be repeated. S/NC only.

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

651-52 Advanced Topics in Computational Fluid Dynamics (3,3) Approximation theory; analysis of accuracy, convergence, and stability for smooth and non-smooth solutions; shocks, artificial dissipation, two and three-dimensional, compressible viscous and inviscid
The Department of Microbiology offers both the M.S. and Ph.D. Students have the option of selecting from a variety of graduate research programs. For a departmental brochure, contact the department head.

ADMISSION REQUIREMENTS

Students are expected to have completed an undergraduate program with a 3.0 or better GPA on a 4.0 system. Included in the undergraduate course work should be: (1) a full year of general biological science, (2) one year of calculus, (3) two years of chemistry, including one year of organic, (4) one year of physics, and (5) an introductory course in microbiology. In many cases, deficiencies in requirements may be removed by taking appropriate courses during the first year of graduate study. The department also requires the general portion of the Graduate Record Examination. A satisfactory score on each part is 550 or higher with rare exceptions. Three letters of recommendation should be submitted by current or former faculty members.

Each new graduate student meets with an advisory committee chaired by the department Director of Graduate Studies to plan a program of study for the first one or two semesters until a research advisor is selected. All first-year students participate in a laboratory rotation program during the first semester of study. This program allows the student to adjust smoothly to the research programs of the department, to develop a background of research procedures and concepts, and to facilitate the selection of a research professor. Usually the student selects a research professor toward the end of the laboratory rotation period. The major professor assists in the selection of and carrying out of a suitable research program and in the naming of a thesis or dissertation committee.

THE MASTER'S PROGRAM

The program leading to the M.S. is designed to provide the student with broad basic knowledge, to permit the acquisition of technical competence in the fundamentals of research, and to encourage creative and independent thinking. Two to three calendar years are usually needed for the course of study that has the following requirements: (1) 30 hours including 6 thesis credits; (2) a 3.0 GPA in all courses taken for graduation; (3) 12 hours of credit have been earned in courses graded on the A-F system; (4) a 3.0 GPA in courses taken during the department; (4) a complete course sequence in biochemistry or molecular biology; (5) presentation of a research thesis and its oral defense.

THE DOCTORAL PROGRAM

The program leading to the Ph.D. is designed to develop the student's ability to pursue independent and original research in microbiology and allied fields, to teach both oral and written communication of the results of research to the scientific community, and to train effective teachers. Students may enter the program after receiving either a bachelor's or master's degree. Students who enter with a bachelor's degree usually receive the Ph.D. after four or five years; those with the master's degree usually take three or four years to complete the degree. Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one semester as a teaching assistant; (4) one semester of physical chemistry; (5) one course in statistics; (6) two semesters of biochemistry or molecular biology; (7) satisfactory performance in a comprehensive examination that must be attempted before the end of the fifth semester in the program and passed before admission to candidacy; and (8) the presentation of a research dissertation and its oral defense.

GRADUATE COURSES

410 Bacterial Physiology (3) Modern concepts of structure and function of bacterial cell. Prereq: Introduction to Microbiology. F

411 Bacterial Genetics (3) Transmission and expression of genetic information by bacteria. Prereq: Introduction to Microbiology. Sp

420 Medical Microbiology (3) Disease-producing microorganisms, including bacteria, rickettsia, chlamydia and fungi. Prereq: Introduction to Microbiology. Sp

429 Medical Microbiology Laboratory (2) Laboratory exercises designed to accompany 420. Prereq: Introduction to Microbiology Laboratory. Coreq: 420. Sp

430 Immunology (3) Principles of inflammation and immunity; immunoglobin structure and theories of formative and diversity; complement; hypersensitivities; cell cooperation and recognition in immune mechanisms; soluble factors. Prereq: Biology 220. (Same as Biochemistry and Cellular and Molecular Biology 430). F

439 Immunology Laboratory (2) Laboratory exercises designed to accompany 430. Coreq: 430. (Same as Biochemistry and Cellular and Molecular Biology 439). F


449 Virology Laboratory (1) Laboratory procedures for isolation, handling, and culturing of animal viruses. Prereq: 310. Coreq: 440. Sp

470 Microbial Ecology (3) Physiological diversity and taxonomy of microorganisms from natural environments. Functional role of microorganisms in natural and simulated ecosystems. Prereq: 310. F

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

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

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

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.

596 Laboratory Rotation (1) Familiarization with research areas in department through series of rotations in laboratories of individual faculty members. May be repeated. Maximum 3 hrs. S/NC only.

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

601 Journal Club in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

602 Journal Club in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

603 Journal Club in Immunology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

604 Journal Club in Virology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E
The program requires 510 and 520; 9 hours of music education electives at the 500 level; 6 hours of Thesis 500; 6 hours of 500-level courses in music theory or history; 2 hours of applied music at either the 400 or 500 level; 2 hours of music ensemble at the 500 level; and 3 hours of electives at the 500 level.

A three credit research problem and three extra hours coursework in Music Education may be substituted for Thesis. If a larger thesis problem is desired, the thesis credit may be increased to 9 hours, and 3 hours of Music Education electives may be dropped.

Diagnostic tests in theory, ear training, and music history will be required.
Music General

GRADUATE COURSES

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

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

511 Lecture Recital (2) E

521 Special Topics in Performance (1-3) Prereq: Consent of department head. E

530 Music in the Middle Ages (3) Gregorian and liturgical music.

540 Music in the Renaissance (3) From 1400 to 1600.

550 Music in the Baroque Period (3) From c.1600 to 1750; rise of opera and oratorio, sacred and secular cantatas, instrumental forms, performance practice.

560 Music in the Classic Period (3) Evolution of classical style from pre-classic music to music of Haydn, Mozart, and early Beethoven.

570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romanticists.

580 Music in the Twentieth Century (3) From 1900, Debussy, to present, Stockhausen and others.

590 World Music (3) Attitudes and techniques of ethnomusicology. Survey of world music cultures. Interview and transcription projects.

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

599 Accompanying (1) May be repeated.

Music Instrumental

GRADUATE COURSES

490 Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to conductor's art; musical analysis and practice in conducting. Prereq: Music Education 320 or equivalent.

501 Graduate Recital (2) E

514 Instrumental Literature (3) Band literature and origins of band, its important expanded cultivation during the first century in United States and Europe.

520 Saxophone (1-4) Prereq: Studio music and jazz major or consent of instructor.

520 Seminar in Jazz (3) Topic varies.

530 Music in the Middle Ages (3) Gregorian and medieval chant, secular monophony, and rise of polyphony.

540 Baritone (1-4) Prereq: Music History 220 and consent of instructor.

540-50 Advanced Piano Pedagogy (1-2) Study of psychology, procedures and literature utilized by Shinichi Suzuki in Japan. Prereq: 495 or consent of instructor. May be repeated. Maximum 4 hrs.

550-50 Advanced Band Pedagogy (1-2) Intern experience in field other than area of major interest. S/NC only.

552 Laboratory Band (1) May be repeated.

554 Varsity Band (1) May be repeated.

556 Marching Band (1) May be repeated.

559 Marching Band (1) May be repeated.

560 Organ Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

565 Music in the Baroque Period (3) From c.1600 to 1750; rise of opera and oratorio, sacred and secular cantatas, instrumental forms, performance practice.

570 Music in the Classic Period (3) Evolution of classical style from pre-classic music to music of Haydn, Mozart, and early Beethoven.

570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romanticists.

580 Music in the Twentieth Century (3) From 1900, Debussy, to present, Stockhausen and others.

590 World Music (3) Attitudes and techniques of ethnomusicology. Survey of world music cultures. Interview and transcription projects.

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

599 Accompanying (1) May be repeated.

Music Performance

GRADUATE COURSES

403 Flute (1-4)

405 Oboe (1-4)

410 Bassoon (1-4)

415 Clarinet (1-4)

420 Saxophone (1-4)

425 Horn (1-4)

430 Trumpet (1-4)

435 Trombone (1-4)

440 Baritone (1-4)

445 Tuba (1-4)

450 Percussion (1-4)

455 Voice (1-4)

460 Violin (1-4)

465 Viola (1-4)

470 Cello (1-4)

475 String Bass (1-4)

476 Electric Bass (1-4)

479 Guitar (1-4)

480 Piano (1-4)

485 Harpsichord (1-4)

486 Organ (1-4)

490 Organ (1-4)

501 Organ Literature (3) Band literature and origins of band, its important expanded cultivation during the first century in United States and Europe.

531 Recital Project (2,2) Preparation and accompaniment of full recital for accompanying concentrations only. S/NC only.

540-50 Advanced Piano Pedagogy (1,2) Study of psychology, procedures and literature utilized by Shinichi Suzuki in Japan. Prereq: 495 or consent of instructor. May be repeated. Maximum 4 hrs.

540-50 Advanced Band Pedagogy (1,2) Intern experience in field other than area of major interest. S/NC only.

550-50 Advanced Band Pedagogy (1,2) Intern experience in field other than area of major interest. S/NC only.

552 Laboratory Band (1) May be repeated.

554 Varsity Band (1) May be repeated.

556 Marching Band (1) May be repeated.

559 Marching Band (1) May be repeated.

560 Organ Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

565 Music in the Baroque Period (3) From c.1600 to 1750; rise of opera and oratorio, sacred and secular cantatas, instrumental forms, performance practice.

570 Music in the Classic Period (3) Evolution of classical style from pre-classic music to music of Haydn, Mozart, and early Beethoven.

570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romanticists.

580 Music in the Twentieth Century (3) From 1900, Debussy, to present, Stockhausen and others.

590 World Music (3) Attitudes and techniques of ethnomusicology. Survey of world music cultures. Interview and transcription projects.

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

599 Accompanying (1) May be repeated.

Music History

GRADUATE COURSES

410 Music History Genre (3) Topics vary. May be repeated. Maximum 6 hrs.

420 History of Opera (3) Dramatic, vocal, and orchestral elements in opera of Italian, French, and German schools, 1900-present.

430 Symphonic Literature (3) Literature for orchestra from Baroque to present, evolution of symphony.

440 Music of North America (3) Folk and art music of U.S. and Canada from colonial times to present.

450 Composer Seminar (3) Life and works of single composer. Subjects vary.

460 Music Aesthetics (3) Nature of music and musical experience, sense perception and emotions, music and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.

460 Music in Christian Worship (3) Hymnody, liturgies, and liturgical music.

460 Church Music Methods and Administration (3)

510 Music Bibliography (2) Bibliographic methodology in music. F

520 Music Research (1) Principles of research methodology applied to writing of research proposal and project.

530 Music in the Middle Ages (3) Gregorian and medieval chant, secular monophony, and rise of polyphony.

540 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chansons, madrigal, and other vocal and instrumental forms and genres.

540 Baritone (1-4) Prereq: Music History 220 and consent of instructor.
teaching, analysis of vocal problems in selected students, and supervised teaching.

570 Vocal Chamber Music Performance (2) Prereq: Consent of instructor.

580-85 Choral Literature I-II (2,2) Choral music from middle ages to present with consideration of historical development of major choral genres.

590 Advanced Choral Conducting (3) Expansions and continued refinement of conducting techniques, development of choral rehearsal skills. Prereq: Consent of instructor.

594 Project in Choral Conducting Performance (1-3) Public performance, critical document: recording project. Prereq: Consent of instructor. May be repeated.

595 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Music Theory

GRADUATE COURSES

430-40 Counterpoint I-II (3,3) 430—Study of species counterpoint in modal and tonal styles, works of Palestrina and J. S. Bach. Prereq: 220. 440—Writing of contrapuntal forms of 18th century and fugue; analysis of works from 18th through 20th centuries. Prereq: 430.

450 Choral Arranging (2) Analysis of scores and writing of arrangements for choruses. Prereq: Theory IV or consent of instructor.

510 Musical Styles (3) Elements of design and their role in definition of musical styles. Prereq: Consent of instructor.

520 Analytical Techniques (3) Analytical techniques, contemporary approaches. Tonal and atonal music. Prereq: Consent of Instructor.

530 Music Theory Pedagogy (3) Techniques, methods, and materials involved in college-level theory programs. Prereq: Consent of instructor.

540 Computer Projects (1-3) Programming languages, design and implementation of projects in computer-managed instruction. Prereq: Consent of instructor.

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

Music Voice

GRADUATE COURSES

425 Functional Diction for Singers (3) Comprehensive survey of singing diction in six languages: English, French, German, Italian, Latin and Spanish. Basic instruction in International Phonetic Alphabet; development of basic diction skills; overview of diction styles and traditions in each language; survey of diction resources and reference materials. Does not fulfill deficiency requirements for graduate students in voice or accompanying.

510 Vocal Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

520 Music Theatre Performance Techniques (1) Improvisation, movement, and basic techniques for dramatic vocal performance. Prereq: Vocal major or consent of instructor. May be repeated. Maximum 2 hrs.

530 Opera Performance (2) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

540 Opera Production (1-3) Prereq: Consent of instructor. May be repeated. Maximum 5 hrs.

550-60 Advanced Vocal Pedagogy I-II (2,2) Study of vocal production, examination of different methods. 560—Study of teaching materials, observation of studio teaching, analysis of vocal problems in selected students, and supervised teaching.

570 Vocal Chamber Music Performance (2) Prereq: Consent of instructor.

580-85 Choral Literature I-II (2,2) Choral music from middle ages to present with consideration of historical development of major choral genres.

590 Advanced Choral Conducting (3) Expansions and continued refinement of conducting techniques, development of choral rehearsal skills. Prereq: Consent of instructor.

594 Project in Choral Conducting Performance (1-3) Public performance, critical document: recording project. Prereq: Consent of instructor. May be repeated.

595 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Nuclear Engineering

(College of Engineering)

MAJOR DEGREES

Nuclear Engineering ...................... M.S., Ph.D.

Thomas W. Kerlin, Head

Professors:

Dodd, H. L., Ph.D. ...................... Tennessee
Kerlin, T. W. (Liaison), Ph.D. ........ Tennessee
Mihaljko, J. T., Ph.D. ................. Texas A&M
Miller, L. F., Ph.D. .................... Tennessee
Shannon, T. E., Ph.D. ................. Tennessee
Uhrig, R. E. (Distinguished Prof.), Ph. D. ........ Iowa
Upadhya, B. R., Ph.D. ............... California

Associate Professors:

Groer, P. G., Ph.D. ..................... Vienna
Katz, E. M., Ph.D. ..................... Tennessee
Pevey, R. E., Ph.D. .................... Tennessee
Ruggles, A. E., Ph.D. ................. Rensselaer
Scott, T. H., Ph.D. .................... Florida
Townsend, L. W., Ph.D. ............. Idaho

Assistant Professor:

Hines, J. W., Ph.D. ..................... Ohio State

The Department of Nuclear Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees. Students may elect a traditional nuclear engineering M.S. or Ph.D. program (focusing on fusion energy or fission energy) or a radiological engineering M.S. or Ph.D. program. Each student must pass an oral examination on his/her engineering practice reports and all graduate coursework. The student must enroll for six semester hours of NE 598 (Nuclear Engineering Practice).

THE DOCTORAL PROGRAM

Students in the field of nuclear engineering desiring to study for the Doctor of Philosophy must have a Bachelor of Science or Master of Science from a recognized university, with a major in engineering or physics. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, physics, and nuclear engineering. Specific course requirements for the Ph.D. in Nuclear Engineering include:

1. A minimum of 48 semester hours beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 24 semester hours in doctoral research.
3. A minimum of 30 semester hours in nuclear engineering courses numbered 500 and above (or the equivalent), with at least 9 semester hours of 600-level courses. These are exclusive of thesis or dissertation credit.
4. A minimum of 12 semester hours in mathematics, computer science, or statistics courses beyond nuclear engineering undergraduate requirements numbered 400 or above.
5. A minimum of 6 semester hours in courses numbered 500 or above from a
department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.

4. A reading knowledge of one foreign language may be specified by the student's doctoral committee.

The comprehensive examination is prepared by the nuclear engineering faculty and consists of 12 hours of written examinations. All past examinations are filed in the library, and students are encouraged to review them. Students are invited to take the comprehensive examination after completing approximately 30 semester hours of coursework. A student who fails the written part of the examination must take and pass the examination the next time it is offered to remain in the Ph.D. program. Registration for NE 600 is not permitted until the written examination is passed. The comprehensive examination is completed with a successful oral defense of the dissertation proposal. A candidate must successfully defend, in an oral examination, all work presented for the degree—all coursework and the dissertation.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Nuclear Engineering is available to residents of the states of Alabama, Kentucky, or Mississippi. The M.S. program is available to residents of the states of South Carolina, Georgia, or Virginia (concentration in radiological engineering only). Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

400-level courses in nuclear engineering may be used for graduate credit. However, students must recognize that at least two-thirds of the minimum required hours (30) in a master's degree program must be taken in courses numbered 500 or above.

GRADUATE COURSES

403 Nuclear Engineering Laboratory (3) Cross-section measurement, diffusion properties of neutrons, critical-leakage experiment, control rod calibration, statistical weight, shielding, xenon poisoning, dynamics and controls experiments. Prereq: Nuclear Engineering Laboratory or equivalent. Coreq: 471, 466.

404 Nuclear Fuel Management (3) Variety of topics relative to nuclear fuel cycle. Mining and milling, fuel fabrication, in-core fuel management, reprocessing and waste disposal. Economic and regulatory issues. Prereq: 470.

405 Reactor Dynamics, Control and Safety (3) Reactor models, transient analysis, safety analysis, control systems and safety systems. Prereq: 470.

406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma ray and neutron attenuation, biological effects, approximate methods of shield design, discrete ordinates, and Monte Carlo. Prereq: Physics 232.

421 Introduction to Nuclear Criticality Safety (3) Fundamentals of nuclear criticality safety; criticality accidents; safety standards; overview of experiments, computational methods, and approximations. Prereq: Introduction to Nuclear Engineering.


432 Radiation Risk Analysis (3) Radiation risk estimates for external and internal radiation, dose-response models, dose rate effects, prediction of radiation risks, radiation safety standards.

433 Radioassay and Dosimetry Laboratory (3) Measurements of radioactivity in various materials. Characterization of radiation fields, radiochemical techniques, alpha and beta spectroscopy, radiation dosimetry.

463 Introduction to Fusion Energy I (3) (Same as Electrical Engineering 463.)

464 Introduction to Fusion Energy II (3) (Same as Electrical Engineering 464.)


471 Nuclear Reactor Theory II (3) Thermal spectrum computational methods: heterogeneous effects in fast and thermal spectra, point and slab; nuclear cross section reactivity feedback; design equations that relate thermal and neutronic variables; power distribution calculations and reactivity control methods. Prereq: 470.

494 Special Topics in Nuclear Engineering (3) Problems related to recent developments and practice. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 6 hrs.

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

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

511-12 Transport Processes in Nuclear Engineering (3.3) Rheology of Newtonian and non-Newtonian fluids; integral and system conservation equations; boundary layer, energy, and momentum; exact and approximate solutions of equations of motion; boundary layer analysis; numerical analysis of fluid flow and heat transfer.

521 Nuclear Systems Dynamics and Control (3) Introduction to state variable methods for system dynamics and control analysis and analysis of these methods to nuclear plant dynamics, simulation and control problems.

522 Experimental Methods in Reactor Dynamics (3) Introduction to time and frequency domain techniques. Measurement, analysis, and interpretation of experimental data, and interpretation of process signals for reactor surveillance and diagnostics.

541 Reactor Fuel Management (3) Topics related to nuclear fuel management. Applicable topics in reactor physics, fuel depletion, isotopic inventories, reactivity control and numerical methods. Prereq: 401.


543 Selected Topics in Nuclear Criticality Safety (3) Criticality safety computational and experimental methods for enrichments, fabrication, storage, reprocessing, and transport applications; overview of safety practices and regulatory requirements. Prereq: 421 or consent of instructor.

550 Nuclear Instrumentation (3) Physics and electronics associated with radiation detection, methods of data analysis, applicability of particular instrument measurements and fundamentals of nuclear instrumentation operation.

551 Radiation Protection (3) Interactions of photons, neutrons, beta particles, and heavy charged particles with matter and mechanisms of energy loss; methods of radiation detection, internal and external radiation dosimetry, chemical and biological effects of radiation, regulations and standards. Prereq: Introduction to Nuclear Engineering and Differential Equations I or equivalents.

552 Radiation Monitoring and Dose Assessment (3) Methods for area and environmental monitoring; dose assessment; pathways analysis; risk projections and regulations. Prereq: 551.

561 Plasma Diagnostics I (3) (Same as Electrical Engineering 561.)

571 Reactor Theory and Design (3) Analytical and numerical techniques for neutronics modeling of nuclear systems. Forward and adjoint Boltzmann transport equation, Multigroup diffusion theory, Core analysis methods and code. Prereq: 401 or consent of instructor.

572 Nuclear System Design (3) Design and analysis of a nuclear system, interface with non-nuclear aspects of system design: system reliability and economics; class project. Prereq: 571 or consent of instructor.

575 Applied Artificial Intelligence (3) Symbolic methods for artificial intelligence systems with focus on application to engineering problems. Prereq: Consent of instructor. (Same as Mechanical and Aerospace Engineering 575.)

576 Expert Systems in Engineering (3) Application of expert systems to engineering problems. Development of expert systems, programming, advanced topics. Prereq: 575 or consent of instructor. (Same as Mechanical and Aerospace Engineering 576.)

577 Neural Networks in Engineering (3) Neural network technology for use in intelligent systems; rationale for neural computing, structure of neural computing systems, programming, Prereq: Consent of instructor. (Same as Mechanical and Aerospace Engineering 577.)

578 Fuzzy Systems in Engineering (3) Fuzzy numbers, fuzzy environment, uncertainty and randomness, approximate reasoning, fuzzy models and structures, decision process in fuzzy environment, fuzzy computing, fuzzy logic controllers, fuzzy expert systems and other engineering applications. (Same as Engineering Science 578.)

581 Reactor Shielding (3) Application of analytical methods to Boltzmann transport equation to shield design problems. Spherical harmonics, moment methods, discrete ordinates, adjoint calculations, coupled analysis, and fast reactor shield design. Prereq: 406 or equivalent.

582 Monte Carlo (3) Analysis of radiation transport problems in radiation shielding by Monte Carlo method, detector response, integral of MORSE code, evaluation of integral, analog transport particle, techniques of variance reduction, forward and adjoint models of analy- sis, importance function biasing, splitting/weight window survival, and contribution theory. Prereq: 581.

585 Process System Reliability and Safety (3) Qualitative and quantitative techniques for assessing and improving process systems reliability and safety. Fault tree analysis and associated dependent failure analysis. (Same as Chemical Engineering 585.)

586 Measurement Science I (3) Principles of measurement, introduction to measuring devices. Prereq: Consent of instructor. (Same as Chemical and Aerospace Engineering 586.)

588 Measurement Science II (3) (Modern industrial measurements, advanced topics in measurement. Prereq: 586. (Same as Aviation Systems 586, Civil Engineering 588.)

599 Measurement Systems (3) (Modern industrial measurements, advanced topics in measurement. Prereq: 586. (Same as Aviation Systems 589 and Engineering Science 599.)

575 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of Instructor. May be repeated with consent of department.

578 Nuclear Engineering Practice (3-9) Experience in selecting and reporting on engineering problems. Prereq: Approval of department. May be repeated. Enrollment limited to alternative plan students. S/N/C only.

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

611-12 Selected Topics in Reactor Theory (3) Transport theory, control rod theory, stochastic methods. Selected topics from literature. Prereq: 572.
Nursing

(College of Nursing)

MAJOR

Nursing ............................................. M.S.N., Ph.D.

Joan L. Creasia, Dean
Sandra Thomas, Director of Ph.D. Program
Martha Alligood, Director of MSN Program

Professors:
Alligood, Martha R. (Liaison), Ph.D. ... New York
Creasia, Joan L., Ph.D. ............. Maryand
Goodell, Dale H., Ph.D. .......... Peabody
Mozingo, Johnie N., Ph.D. ... Walden
Pierce, Joan U., Ph.D. ............. Utah
Thomas, Sandra P., Ph.D. ........ Tennessee

Associate Professors:
Bowen, Sheila, Ph.D. ...................... Tennessee
Davie, Mitzi, Ph.D., Tennessee
Droppleman, Patricia G., Ph.D. ...... Tennessee
Dyer, Theresa, Ed.D. ............. Tennessee
Fenise, Mildred M., Ph.D. ........ Vanderbilt
Jolly, Mary Lue, Ed.D. .......... Kentucky
McGuire, Sandra, Ed.D. ......... Tennessee
Modrinc-McCarthy, Mary Anne, Ph.D. ... Tennessee
Smith, Helen, Ph.D. .................. Maryland
Tuck, Inez, Ph.D. ................. North Carolina (Greensboro)
Wallace, Debra C., Ph.D. ........ South Carolina

Assistant Professors:
Brow, Alle J., M.S.N., Alabama (Birmingham)
Conion, Kathleen P., M.S.N., SUNY (Buffalo)
Evans, Ginger W., M.S.N. ......... Tennessee
Evans, Maude M., M.S.N. ......... Tennessee
Fox, Marie X., M.S.N. ............ Texas Women's University
Hilton, Sally M., M.S.N. ........ Texas Women's University
Kollar, Mary, Ph.D. .......... Pennsylvania
Pierce, Margaret, M.S.N. ........ Tennessee
Pullen, Lisa, Ph.D. ................. Mississippi State

THE MASTER'S PROGRAM

The College of Nursing offers the Master of Science in Nursing degree with concentrations in adult health nursing, family nurse practitioner, mental health nursing, nursing administration, and nursing of women and children.

Admission Requirements
1. Meet requirements for admission to The Graduate School.
2. Hold a Bachelor's degree in Nursing from a National League for Nursing accredited program or complete the equivalent of an upper division undergraduate major in nursing in addition to meeting all M.S.N. degree requirements.
3. Have an undergraduate GPA of 3.0 or higher or a GPA of 3.3 for courses in the undergraduate major.
4. Submit scores of the general portion of the Graduate Record Examination.
5. Submit Graduate Program Data Form.
6. Submit Graduate School Rating Forms from three individuals familiar with the applicant's current work performance or academic aptitude.
7. New students normally are admitted to the program only at the beginning of fall semester. However, under special circumstances and on a space available basis, a B.S.N. graduate may be admitted at the beginning of spring or summer terms in a temporary non-degree status. Applications for fall admission must be received by February 1.

Special Requirements
1. Each student must hold personal professional liability insurance.
2. Registered nurses must be licensed to practice nursing in Tennessee.
3. Each student must present proof of hepatitis B vaccination and rubella and rubella immunization or sufficient titer for immunity; TB status.
4. Each student must present evidence of current 2-person CPR certification.
5. Non-registered nurse students must have completed courses in chemistry, nutrition, microbiology, anatomy, and physiology plus 12 semester hours of behavioral science courses.

Thesis and Non-Thesis Options
The thesis option is available for interested students and is especially encouraged for those who are considering pursuit of doctoral degrees sometime in the future. Students who choose the non-thesis option must register for 580 Nursing Project or 582 Supervised Research.

Program Requirements
All students must complete a minimum of 36 semester hours distributed as follows:

Core (12 credits)
503-04 Advanced Clinical Reasoning I, II 6
510 Theoretical Foundations of Nursing 3
520 Advanced Practice Nursing and Health Delivery Systems 3

Research (0-12 credits)
501 Nursing Research: Methods, Design & Analysis 3
500 Thesis 6 OR
580 Nursing Project 3 OR
582 Supervised Research 3

Concentration (12 credits)—choose one
530-31 Adult Health Nursing I, II 12
540-41 Family Nurse Practitioner I, II 12
550-51 Nursing of Women and Children I, II 12
560-61 Mental Health Nursing I, II 12
590-91 Nursing Administration I, II 12

Elective (3 credits)—waived for those who choose thesis option 3

Students who enter the program as non-RNs must complete the following undergraduate nursing courses in addition to meeting the requirements listed above:

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>Clinical Pharmacology</td>
<td>3</td>
</tr>
<tr>
<td>302</td>
<td>Introduction to Professional Nursing</td>
<td>5</td>
</tr>
<tr>
<td>304</td>
<td>Nursing Assessment and Health Promotion</td>
<td>4</td>
</tr>
<tr>
<td>306</td>
<td>Health Deviation Concepts I</td>
<td>3</td>
</tr>
<tr>
<td>316</td>
<td>Health Deviation Concepts II</td>
<td>4</td>
</tr>
<tr>
<td>330</td>
<td>Family/Community Health Nursing</td>
<td>6</td>
</tr>
<tr>
<td>414</td>
<td>Community Mental Health Nursing</td>
<td>6</td>
</tr>
<tr>
<td>415</td>
<td>Family/Community Health Nursing</td>
<td>6</td>
</tr>
<tr>
<td>431</td>
<td>Nursing of Children</td>
<td>4</td>
</tr>
</tbody>
</table>

Registered nurses whose bachelor's degrees are not in nursing must have completed courses in chemistry, nutrition, microbiology, anatomy, and physiology plus 12 hours of behavioral science courses. They must also complete 305, 332, 403 and 433 and complete or successfully challenge the following:

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>Clinical Pharmacology</td>
<td>3</td>
</tr>
<tr>
<td>304</td>
<td>Nursing Assessment and Health Promotion</td>
<td>4</td>
</tr>
<tr>
<td>306</td>
<td>Health Deviation Concepts I</td>
<td>3</td>
</tr>
<tr>
<td>316</td>
<td>Health Deviation Concepts II</td>
<td>4</td>
</tr>
<tr>
<td>331</td>
<td>Nursing of Adults</td>
<td>2</td>
</tr>
<tr>
<td>402</td>
<td>Family Health Nursing Theory</td>
<td>3</td>
</tr>
<tr>
<td>412</td>
<td>Psychosocial Long Term Nursing Theory</td>
<td>2</td>
</tr>
<tr>
<td>432</td>
<td>Nursing of Children Theory</td>
<td>2</td>
</tr>
</tbody>
</table>

Final Examination Requirements
All students must successfully complete a final examination as required by The Graduate School. For thesis students, the examination will consist of an oral defense of the thesis as well as other written or oral questions designed to measure student mastery of the entire program of study. For non-thesis students, the written examination will cover the entire program of study and may, at the discretion of the student's committee, be followed by an oral examination.

Special Policies
1. If the clinical performance of any student for any course is found to be unsatisfactory, the student will receive a grade of "F" for the course.
2. If a student achieves a final grade of "D" or "F" for any required undergraduate or graduate nursing course, he or she will not be permitted to repeat the course and will be required to withdraw from the program.
3. If the clinical performance of any student is characterized by unethical, unprofessional or unsafe behavior, or behavior that places the client in jeopardy, the student will be required to withdraw from the program.

THE DOCTORAL PROGRAM

The College of Nursing offers a doctoral program leading to the Doctor of Philosophy degree with a major in Nursing. This is a unified program offered jointly with The University of Tennessee, Memphis, College of Nursing. Students may complete all or part of the program at either site. The dissertation must be completed in its entirety at one site.

The doctoral program prepares nursing scholars capable of integrating research, theory, and practice into their roles as researchers,
Section of Nursing

Applicants are required to submit the following:

1. Academic transcript(s) of all college and university work.
2. Graduate record examination scores prior to March 15 of the year program prior to February 15.
3. A minimum of 1 hour per semester must be taken for 4 semesters.

Possible cognate areas include, but are not limited to, anthropology, child and family studies, psychology, education, management, medical ethics, public health, social work, philosophy, and statistics.

**Doctoral Committee**

Early in the student's program, a nursing faculty advisor will be selected by the student in consultation with the program director. The student's comprehensive examination committee consists of the faculty teaching core courses and one representative from the cognate area. The student then selects the dissertation committee. Five faculty holding the rank of assistant professor or above comprise the committee, three of whom (including the chair) must be approved by the Graduate Council to direct doctoral dissertations. At least two members of the committee must be from an academic unit other than nursing.

**Special Policies**

1. A maximum of 6 graduate hours taken before acceptance into the doctoral program may be applied toward the degree.
2. Minimum grades of B in all nursing doctoral courses and a 3.0 cumulative GPA are required for continuation in the program.

**MINOR IN GERONTOLOGY**

Graduate students in the College of Nursing may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary course gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to the Office of Graduate Admissions and Records for specific requirements.

**ACADEMIC COMMON MARKET**

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

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>Thesis (1-15) P/NP only</td>
<td>E</td>
</tr>
<tr>
<td>501</td>
<td>Nursing Research: Methods, Design, and Analysis (3) Basic principles of research in application to clinical questions; critical evaluation of nursing and health-related research. Prereq: coreq: 510; graduate level statistics. F, Sp</td>
<td></td>
</tr>
<tr>
<td>502</td>
<td>Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E</td>
<td></td>
</tr>
<tr>
<td>503</td>
<td>Advanced Clinical Reasoning I (3) Principles of biostatistics, education, and innovative strategies for achievement of wellness: health habita, psychological, and cultural, and other dimensions of whole person as related to risks for lifestyle diseases. F</td>
<td></td>
</tr>
<tr>
<td>504</td>
<td>Advanced Clinical Reasoning II (3) Development of advanced clinical reasoning skills for assessment of client health status and needs: physiological and physiologically concepts as dimensions of whole person. Implications for therapeutic nursing interventions. Prereq or coreq: 503. F</td>
<td></td>
</tr>
<tr>
<td>505</td>
<td>Advanced Clinical Pharmacology (3) Pharmacologic agents utilized to treat common, recurrent health problems; indications, contraindications, side and interactive effects of commonly prescribed drugs. Prereq: 301 or equivalent or consent of instructor. F, Sp</td>
<td></td>
</tr>
<tr>
<td>510</td>
<td>Theoretical Foundations of Nursing (3) Historical review of nursing science; nursing's paradigm and selected philosophies, conceptual and theoretical approaches as structure which guide critical thinking in analysis, reasoning, and decision making for advanced practice nursing. F, Sp</td>
<td></td>
</tr>
<tr>
<td>520</td>
<td>Advanced Practice Nursing and Health Delivery Systems (3) Nursing's role in dynamic health care system: health policy and organizational, social, ethical, political, economic and technological factors which impact advanced practice nursing and delivery of health care. Prereq: 501, 504, Coreq: First course in concentration. Sp</td>
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<tr>
<td>530</td>
<td>Adult Health Nursing I (6) Advanced nursing practice for health promotion, restoration, and maintenance of young, middle-aged, and older adults. Prereq: 501, Coreq: 520. Didactic (2) and practicum (4). Sp</td>
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<tr>
<td>531</td>
<td>Adult Health Nursing II (6) Continuation of 530. Delivery, provision, and management of health care for adult groups and communities. Prereq: 530. Didactic (2) and practicum (4). F</td>
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<td>540</td>
<td>Family Nurse Practitioner I (6) Nursing management and primary care of individuals and families with actual and potential acute health problems; clinical experience in role of family nurse practitioner providing advanced practice nursing care in variety of settings. Prereq: 504, Coreq: 501. Coreq: 520. Didactic (2) and practicum (4). Sp</td>
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<tr>
<td>541</td>
<td>Family Nurse Practitioner II (6) Continuation of 540. Nursing management and primary care of individuals and families in all developmental life stages; role refinement and exploration of major issues of family nurse practitioner; clinical experience in variety of settings. Prereq: 504, Coreq: 501. Coreq: 520. Didactic (2) and practicum (4). F</td>
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<tr>
<td>543</td>
<td>Nurse Practitioner (9) Exploration and application of holistic nursing concepts to nursing management of common and chronic health problems. Role refinement and exploration of major issues in delivery of holistic primary nursing care. Prereq: 540. Didactic (2) and practicum (4). F</td>
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<tr>
<td>550</td>
<td>Nursing of Women and Children I (6) Advanced practice nursing for women and children; clinical experience in role of nurse practitioner or clinical nurse specialist in variety of settings. Health promotion and nursing interventions for actual or potential health problems of women, children, and families. Prereq: 504. Coreq: 501, Coreq: 520. Didactic (2) and practicum (4). Sp</td>
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<tr>
<td>551</td>
<td>Nursing of Women and Children II (6) Continuation of 550. Role refinement of nurse practitioner or clinical nurse specialist in role of nurse practitioner or clinical nurse specialist in variety of settings. Prereq: 550. Didactic (2) and practicum (4). F</td>
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<tr>
<td>555</td>
<td>Parent Child Nursing Field Work and Seminar (5) Seminar and interactive clinical practicum designed to further develop knowledge and skills utilized for advanced parent-child nursing practice. Prereq or coreq: 551. 1 hr and 4 labs. Sp</td>
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<tr>
<td>557</td>
<td>Nurse Midwifery Seminar I (1) Exploration of art and science of midwifery, nature and scope of midwifery practice, professional and ethical issues in advanced nursing practice. Prereq or coreq: 501, 510. F</td>
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<tr>
<td>558</td>
<td>Nurse Midwifery Seminar II (1) Exploration of psychological, developmental, and sociocultural theories as related to individual and family patterns of illness and wellness. Role of nurse-midwife in advanced prac-</td>
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</tbody>
</table>
hours in one area outside the department are required. A minimum of 24 hours at the 500 and 600 level is required. A written comprehensive examination is required for completion of the program.

Foodservice and Lodging Administration

**Thesis Option:** The program consists of a minimum of 33 hours with at least 16 hours of coursework in the department. HRA 537, 546, NTR 541, and 3 hours of graduate-level statistics are required. Six hours of Thesis 500 are required. Six hours outside the department are recommended. A minimum of 22 hours at the 500 and 600 level is required. An oral comprehensive examination is required upon completion of the thesis.

**Non-Thesis Option:** The program consists of a minimum of 36 hours with at least 20 hours of coursework in the department. HRA 537, 546, NTR 541 and 3 hours of graduate-level statistics are required. Six hours in one outside area are recommended. A minimum of 24 hours at the 500 and 600 level is required. A written comprehensive examination is required for completion of the program.

**THE PH.D. CONCENTRATIONS**

**Nutrition Science**

The nutrition science concentration enables students to study the science of nutrition from the cellular level to the application of nutritional principles by people in a changing environment. The doctoral program emphasizes human nutrition, nutritional epidemiology, experimental nutrition, and intermediary metabolism. Cognate areas may include anthropology, biochemistry, chemistry, communications, education, food technology, human development, physiology, public health, sociology, statistics, and/or toxicology.

Minimum requirements include:

- Sixteen hours in nutrition including 4 hours at the 600 level (exclusive of dissertation);
- NTR 511, 512, 541, and 2 hours from either 542-544;
- Four hours of NTR 540, attendance required every semester;
- Professional seminar; HE 610;
- Six hours of statistics;
- Six hours in a cognate area;
- Nine hours at the 600 level;
- Students without college teaching experience are required to take the fall semester teaching seminar for GTAs and NTR 548 comprising a faculty-supervised problem in college teaching.

**Consumer Environments**

Students enrolled in the Ph.D. program with a concentration in consumer environments are provided with a foundation of coursework relevant to understanding the consumer in the designed environment and management of facilities. From this base, students in foodservice and lodging administration focus on areas of specialization in foodservice systems and in lodging administration to further theory and the application of theory in the field. For further information, see consumer environments concentration under Human Ecology.

**ACADEMIC COMMON MARKET**

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

**Nutrition**

**GRADUATE COURSES**

414 Nutrient-Drug Interactions (2) Nutrient effects on efficacy and toxicity of drugs; drug effects on absorption and metabolism of nutrients. Prereq: Fundamentals of Nutrition or equivalent. Sp, A

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

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

508 Culture, Food, and Nutrition (3) Food-related behavior of individuals and groups in United States. Sociocultural, economic, and technological influences. Nutrition and food surveys, public policy. Prereq: Nutrition for Educators or Advanced Nutrition or consent of instructor. F, A

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

511 Advanced Physiological Chemistry (4) Bioenergetics, flux control and hormonal interrelationships. Prereq: Advanced Nutrition or equivalent. F


513 Community Nutrition I (3) Orientation to community; assessment of nutrition problems, needs, and resources; functional roles of public health nutritionist. Concurrent field experiences. Prereq: Advanced Nutrition or consent of instructor. F

514 Community Nutrition II (3) Planning, implementation, and evaluation of public health nutrition programs. Concurrent field experiences. Prereq: 513 or consent of instructor. Sp

515 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state or regional community nutrition program. Location of in-depth study to be selected in consultation with instructor. Prereq: 513, 514 and consent of instructor. S/N only. Su

516 Maternal and Child Nutrition (3) Nutrition principles related to growth and development during pregnancy, infancy, and childhood to age 5, high risk conditions. Prereq: Advanced Nutrition or consent of instructor. F

517 Childhood and Adolescent Nutrition (3) Application of nutrition principles to school-age children; effects of disease on growth and development; nutritional assessment and counseling for nutrition. Prereq: Advanced Nutrition or consent of instructor. Sp, A

518 Nutrition and Aging (3) Nutritional problems of adults; nutritional requirements, dietary intake; effects of nutrition on biological aging. Prereq: Advanced Nutrition or consent of instructor. Sp

520 Nutritional Ecology (2) Examination of issues in natural, political, physical, and social environments that impact availability of food and nutrition in U.S. food supply. F, A

521 Physiological Basis for Diet and Disease (2) Altered nutrient needs as result of metabolic changes that occur in selected disease states. Prereq: Nutrition in Disease or consent of instructor. Sp

522 Nutrition Counseling (2) Individual eating habits and disorders, evaluation strategies for effectiveness of helping process. Prereq: Nutrition in Disease or consent of instructor. F, A

524 Nutrition Education: Principles, Implementation, and Evaluation (3) Conceptual models, principles, application, and evaluation models in nutrition education research. Prereq: 508 or consent of instructor. Su, A

540 Seminar in Nutrition (1) May be repeated. S/N only. E

541 Research Methods (1) Basic principles of planning, conducting, and interpreting nutrition and foodservice systems administration research. Prereq: 6 graduate hrs in nutrition and food system administration and statistics. Sp

542 Advanced Experimental Nutrition (2) Application of research principles to individual project using experimental animals. Prereq: or coreq: 541. Sp

544 Food and Nutrition Survey Methods (2) Project for assessment of food consumption, nutrient intake, nutritional status, and sociocultural economic parameters in populations. Prereq or coreq: 541. Sp

547 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor. S/N only. E

548 Directed Study in Nutrition (1-3) Advanced study in nutrition. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

549 Special Topics (1-3) Recent advances in nutrition or food systems administration. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

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

602 Advanced Topics in Nutrition Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in nutrition. Prereq: 512 or consent of instructor. May be repeated. F

603 Current Trends in Food and Sociocultural Change (2) Critical evaluation of research. Prereq: 508 or consent of instructor. F

**Hotel and Restaurant Administration**

**GRADUATE COURSES**

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

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

530 Computer-Assisted Foodservice and Lodging Management (3) Application of computer technology to foodservice and lodging industry; inventory, cost accounting, production, nutrient analysis, program management, and sales planning and analysis. Prereq: Quantity Food Procurement, Production and Service, Microcomputer Applications or consent of instructor. F, A

531 Advanced Financial Management (3) Financial planning, operations and automation techniques used in foodservice and lodging management: developing budgets, accounting systems and financial reports. Prereq: Food and Lodging Cost Control or consent of instructor. F, A

532 Advanced Human Resource Management (3) Identifying labor needs; development and maintenance of work force. Prereq: Food and Lodging Personnel Development or consent of instructor. F, A

533 Advanced Food Production and Delivery Systems Management (3) Individual and group production and delivery systems; application of quantitative methods and models to optimize decisions. Prereq: Quantity Food Procurement, Production and Service or consent of instructor. F

534 Special Topics in Foodservice and Lodging Administration (1-3) Lecture/discussion format. Con-
Ornamental Horticulture and Landscape Design

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREE
Ornamental Horticulture and Landscape Design M.S.

Don B. Williams, Head

Professors:
- Cathlan, L.M., Ph.D.,................. Rutgers
- Crater, G. Douglas, Ph.D............... Ohio State
- Graham, E. T. (Emeritus), Ph.D. .... Penn State
- Grashoff, Peter M. (Rachelle Chair of Excellence), Ph.D. ....Australian National University
- McDaniel, G.L., Ph.D. ................. Iowa State
- Williams, Don B., Ph.D. .............Penn State

Associate Professors:
- Augé, Robert M., Ph.D. ............... Washington State
- Day, J. W., Ph.D. ..................... Mississippi State
- Rogers, S. M., M.L.A. .................. Georgia

Trigiano, R., Ph.D. ..................... NC State
- Wiltse, Willard T. (Liaison), Ph.D. .... Maryland

Assistant Professor:
- Hamilton, Susan, Ed.D. .............. Tennessee
- Menendez, Garry, M.S. ............... Tennessee
- Starman, Terri W., Ph.D. .............. Texas A&M

The Department of Ornamental Horticulture and Landscape Design offers the Master of Science with concentrations in floricultural science and technology, nursery science and technology, or turfgrass science and technology. Various interests may be emphasized in any of these commodity areas, including micropropagation, innovative production and maintenance systems, computer-aided management systems, and the molecular biology, genetics, histology and stress physiology of ornamentals.

For admission, the student must have a B.S. in ornamental horticulture, horticulture, plant science, or a related agricultural or basic science discipline. Undergraduate transcripts must be evaluated by the department for prerequisite requirements, if any. Graduate research assistantships are available on a competitive basis. For further information, contact the department head.

THE MASTER'S PROGRAM

Thesis Option
1. A thesis is required. A master's committee of no fewer than 3 faculty members will be selected. Prior to research for the thesis, a proposal must be approved by the master's committee. Registration for 6 hours of Thesis 500 is required.
2. In addition to the thesis requirement, a minimum of 24 hours of graduate credit is required. Not more than 10 hours of the minimum 30 hours can be below the 500 level. The academic program must be approved by the master's committee which may require additional coursework if the student's progress or background indicates such need.
3. All students are required to include 510 Research Methods in Ornamental Horticulture and Landscape Design (2 hours) in their program and are expected to attend this course and participate in discussions each semester enrolled.
4. Twelve hours of coursework in the major must be at the graduate level, exclusive of Thesis 500.
5. An oral examination covering the thesis and coursework is required.

Non-Thesis Option
1. A master's committee of no fewer than 3 faculty members will be selected. Prior to research for the thesis, a proposal must be approved by the master's committee. Registration for 6 hours of Thesis 500 is required.
2. In addition to the thesis requirement, a minimum of 24 hours of graduate credit is required. Not more than 10 hours of the minimum 30 hours can be below the 500 level. The academic program must be approved by the master's committee which may require additional coursework if the student's progress or background indicates such need.
3. All students are required to include 510 Research Methods and 2 hours of 590 Seminar in their program and are expected to attend this course and participate in discussions each semester enrolled.
4. Twelve hours of coursework in the major must be at the graduate level.
5. Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 32 hours of approved graduate work.

GRADUATE COURSES

410 Nursery Management and Production (3) Modern management approaches and applications for growing trees and shrubs. Prereq: Consent of Instructor.

420 Advanced Floriculture Science and Technology (3) Physiology and greenhouse production of floriculture crops. Prereq: Consent of Instructor.

430 Plant Disease Fungi (4) (Same as Entomology and Wildlife Science)Prereq: Consent of Instructor.

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

501 Special Topics in Ornamental Horticulture and Landscape Design (1-3) Topics to be assigned. May be repeated. Maximum 6 hrs. Prereq: Consent of Instructor.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester in which the student uses University facilities. Prior to face to face time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

507 Research Methods in Ornamental Horticulture and Landscape Design (2) Literature retrieval; research proposal writing; use of computers for word processing, data entry, statistical analysis, and graphics production. Prereq: Consent of Instructor.

511 Plant Pathology (4) (Same as Entomology and Plant Pathology) Prereq: Consent of Instructor.

550 Plant Microtechnique (3) Practical light and scanning electron microscopy methods for analyzing developmental aspects and microscopic methods for visualizing pathological structures in forest trees and plant species. Prereq: B.S., M.S., or Ph.D. in Plant Science.

570 Physiology and Development of Ornamental Plants (3) Basic and advanced principles of the physiology of ornamental plants related to growth and development in production and utilization. Prereq: Consent of Instructor.

590 Seminar (1) Current literature and developments. May be repeated. Maximum 3 hrs.
Pathology
See College of Veterinary Medicine and Comparative and Experimental Medicine

Philosophy
(College of Arts and Sciences)

MAJOR
Philosophy .................................................. M.A., Ph.D.

Kathleen Bohstedt, Head

Professors:
Aquila, Richard E., Ph.D. ............... Northwestern
Brenkert, George G., Ph.D. ................. Michigan
Cebik, L. B., Ph.D. ............................... Nebraska
Davis, John W. (Emeritus), Ph.D. ....... Emory
Edwards, Rem B., Ph.D. ....................... Emory
Grabar, Glenn C., Ph.D. ...................... Michigan
Nelson, James L., Ph.D. ................. SUNY (Buffalo)
Postow, Betsy C., Ph.D. ...................... Yale
Van de Vate, Dwight, Jr., Ph.D. ........... Yale

Associate Professors:
Bennett, James O., Ph.D. ................. Tulane
Bohstedt, Kathleen Emmett (Lisison), Ph.D. ............... Ohio State
Cohen, Sheldon M., Ph.D. ............... Northwestern
Nolt, John E., Ph.D. ........................... Ohio State
Osborne, Martha Lee, Ph.D. ............. Tennessee

Assistant Professors:
Baylis, Françoise, Ph.D. ................. Western Ontario
Hamin, L. Phillips, Ph.D. .................. Georgia

The Department of Philosophy offers graduate study leading to the Master of Arts and Doctor of Philosophy. The M.A. program includes thesis and non-thesis options and offers concentrations in medical ethics and in religious studies. The Ph.D. program also has a concentration in medical ethics. Detailed information may be obtained from the Director of Graduate Studies in Philosophy.

THE MASTER'S PROGRAM
The department offers both a thesis and a non-thesis option. The course requirements for an M.A. with thesis are 30 hours, including hours in Philosophy 500. Of non-thesis hours, at least two-thirds must be in courses at or above the 500 level. No philosophy course numbered under 400 may be taken for graduate credit.

There are no particular courses that M.A. students are required to take. The nature of the student's coursework should be determined in consultation with the student's faculty committee. The non-thesis M.A. requires 30 hours of coursework of which at least two-thirds must be in courses at or above the 500 level. Students seeking the non-thesis option must also pass a final written examination on all work offered for the degree. An additional oral examination may be required.

THE DOCTORAL PROGRAM
Students must hold an M.A. with a major in Philosophy or an equivalent degree when entering the Ph.D. program. Twenty-seven hours of coursework beyond the M.A. is required, of which 6 hours will be in courses numbered above 600. See the Philosophy Department Graduate Student Procedures for specific course requirements.

Students must demonstrate a reading knowledge of one foreign language, normally a living language in which there exists a significant body of philosophical literature. (In special circumstances relating to the area of dissertation research, the Graduate Committee may approve a language not satisfying these conditions.) This may be done by passing the doctoral language examination given by the appropriate department, if available, or by passing French 302 or German 332 with a B or better. Bi- or multilingual (normally, foreign) students, whose native language (other than English) is one in which there is a significant body of philosophical literature, are exempted from the foreign language requirement. Students receiving the Ph.D. with concentration in medical ethics are also exempted.

CONCENTRATIONS
Medical Ethics
The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Detailed information concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Director of the Medical Ethics Program.

Religious Studies
The department has an M.A. program of graduate study with a concentration in religious studies. Details concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Department of Religious Studies.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.A. and Ph.D. programs in Philosophy are available to residents of the states of Alabama or West Virginia; Kentucky, Texas, or Virginia (concentration in medical ethics only); the Ph.D. program to residents of Louisiana, or Mississippi; and the M.A. program to residents of Oklahoma (concentration in medical ethics only). Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES
400 Special Topics (3) May be repeated when topic varies. Maximum 6 hrs.
411 Modern Religious Philosophies (3) (Same as Religious Studies 411)
412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) (Same as Religious Studies 412)
420 Topics in History of Philosophy (3) Figures or movements from antiquity through mid-twentieth century: Prereq: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 9 hrs.
425 American Philosophy (3) Colonial to early 20th Century: Prereq: 6 hrs of philosophy or consent of instructor.
435 Intermediate Formal Logic (3) Metatheory of formal logic and philosophy of logic: Prereq: Consent of instructor.
440 Contemporary Ethical Theory (3) Topics in meta-ethics or ethics: Prereq: 6 hrs of philosophy or consent of instructor.
446 Theoretical Issues in Medical Ethics (3) Prereq: 240 or 345 or consent of instructor. (Same as Religious Studies 446)
450 Philosophy of Science (3) Methodological and conceptual issues in natural and social science: patterns of theory modification and replacement, nature of explanation and causation, status of theoretical entities: Prereq: 350 and 1 yr of natural or social science, or consent of instructor.
455 Philosophy of History (3) Speculative and critical aspects of philosophy of history: Prereq: 6 hrs of philosophy or consent of instructor.
473 Philosophy of Mind (3) Problems of mind and body in relation to consciousness and personal identity: Prereq: 6 hrs of philosophy or consent of instructor.
475 Analytic Metaphysics and Epistemology (3) Topics in metaphysics and epistemology in recent Anglo-American tradition: Prereq: 6 hrs of philosophy or consent of instructor.
479 Studies in Recent Continental Philosophy (3) Selected thinkers or topics: existentialism, phenomenology, humanism, structuralism, post-structuralism: Prereq: 8 hrs of philosophy or consent of instructor.
500 Thesis (1-15) Only. E
502 Registration for Use of Facilities (3-18) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May be used toward degree requirements. May be repeated: S/N only. E
520 Topics in Ancient or Medieval Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.
522 Topics in Modern Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.
524 Topics in Twentieth-Century Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.
528 Topics in Contemporary Philosophy (3) Intensive critical work on themes in late 20th-century philosophy. May be repeated. Maximum 9 hrs.
540 Topics in Ethics or Value Theory (3) May be repeated. Maximum 9 hrs.
542 Topics in History of Ethics (3) Dominant movements in history of ethics. May be repeated. Maximum 9 hrs.
544 Topics in Applied Ethics (3) Single author, tradition, or topic in ethical theory, application to issues in health, business, technology, ecology, and other practical fields. May be repeated. Maximum 9 hrs.
546 Orientation to Medical Ethics (3) Survey of ethical theories in application to issues in medical ethics.
547 Ethical Issues in Mental Health (3) Values in "mental health" and "mental illness," informed consent in psychiatric competence, patients' rights, involuntary hospitalization and treatment, and behavior control therapies.
548 M.A. Clinical Practicum (3) Series of clinical rotations at one or more local health care institutions. Open only to graduate students concentrating in medical ethics: Prereq: 547 and consent of Medical Ethics Committee and the UTMC Graduate Education Committee.