Fields of Instruction

Accounting and Business Law

(College of Business Administration)

MAJORS

DEGREES

Accounting ........................................... M.Acc.
Business Administration ...................... MBA, Ph.D.

Jan R. Williams, Head

Accounting

Professors:

Dittrich, Norman E., CPA, Ph.D. ........ Ohio State
Kiger, Jack E. (Distinguished Prof.), CPA, Ph.D. ......................... Missouri
Read, W. H. (Emeritus), CPA, MBA ........................................ Northwestern
Scheiner, James H., CPA, Ph.D. ..... Ohio State
Stanga, Keith G. (Distinguished Prof.), CPA, Ph.D. ........ Louisiana State
Williams, Jan R. (Ernst & Young Prof.), CPA, Ph.D. .......... Arkansas

Associate Professors:

Anderson, Kenneth E., CPA, Ph.D. .......... Indiana
Borthick, A. Faye, CPA, DBA ............ Tennessee
Herring, Hartwell C., III, CPA, Ph.D. .... Alabama
Izard, C. Douglass, CPA, Ph.D. ........... Mississippi
Posey, Imogene A., CPA, M.S. .......... Tennessee
Reeve, James M., CPA, Ph.D. .............. Oklahoma State
Roth, Harold P., CPA, Ph.D. ............. VPI
Slagle, Warren L. (Emeritus) ............ Tennessee
Townsend, Richard L., CPA, Ph.D. ........ Texas

Assistant Professors:

Gatian, Amy W., Ph.D. ......................... VPI
Letsinger, M. Clyde, CPA, M.S. ......... Tennessee
Turpen, Richard A., CPA, Ph.D. .......... Alabama

Distinguished Lecturer:

Wolfe, Singleton B. (Emeritus), B.S. ......... VPI

Lecturers:

Anderson, Ellen B., M.Acc. ......... Tennessee
Hendrick, Lee W., J.D. ................. Houston
Hughes, Harry N., B.S. ............... Tennessee

THE MASTER OF ACCOUNTANCY PROGRAM

The objective of the Master of Accountancy (M.Acc.) program is to provide persons having an undergraduate accounting background and a high level of ability and motivation with the depth and understanding of accounting which will enhance their probability of success in a career in professional accounting. Moreover, the student's educational experience should develop perspectives toward the discipline of accounting in a manner that will enable the student to spearhead innovation and change in response to needs in public accounting, business, industry, and government.

Admission Requirements

Application deadlines for international students are: Fall, March 1; Spring, July 15; Summer, November 15. Application deadlines for U.S. citizens and permanent residents are: Fall, June 1; Spring, October 1; Summer, February 1. Although the program is designed for students who have completed an accredited baccalaureate degree program with a major in Accounting, those with outstanding undergraduate records in any area may earn the M.Acc. degree by completing prerequisites in accounting and by including courses in other business and related disciplines to supplement the applicant's undergraduate background. Students entering the program are expected to have completed coursework in calculus and computer science. For students with no previous exposure to calculus, Mathematics 305 is available.

In addition to the general admission requirements for The Graduate School, M.Acc. applicants are required to take the Graduate Management Admission Test (GMAT) and submit information on forms provided by the College of Business Administration. Applicants whose native language is not English must submit results of the Test of English as a Foreign Language (TOEFL).

Course Requirements for the M.Acc. Program

A student's program encompasses a minimum of 30 semester hours of graduate coursework. Specifically, the student must complete courses in accounting and other areas as indicated below. Each course is 3 semester hours of graduate credit.

Accounting Core (9 hours): 511, 513, 521.

Accounting Concentration (12 hours):

1. Financial/Auditing: 512, 531, 519, one accounting elective.
3. Taxation: 531, 532, 533, 539.

Non-accounting Electives (9 hours):

Non-accounting courses taken in either other business or non-business areas, upon approval of M.Acc. advisor.

Transfer Credits

A maximum of six semester hours taken at other AACSB accredited institutions that otherwise conform to the transfer policy of The Graduate School may be credited toward M.Acc. degree requirements.

Other Requirements

To qualify for the degree, a student must maintain a B average (3.0) or above in the core and concentration area accounting courses and a B average or higher in the overall program. The student must satisfactorily demonstrate his/her ability to recognize, analyze, and solve accounting policy problems and integrate concepts from the various areas of accounting by passing a comprehensive written examination. This examination is included in the capstone courses in each concentration as follows: 519, Research in Financial Accounting and Auditing; 539, Tax Policy and Special Topics; and 549, Systems Policy.
BUSINESS ADMINISTRATION

CONCENTRATIONS

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

MBA Concentration: Controllership

The concentration in controllership provides added accounting skills appropriate for those seeking employment in the controllership or general management functions of a variety of organizations. Although the controllership concentration provides broad preparation for the Certified Management Accountants' examination, it is not designed to meet the minimum educational requirements to take the Certified Public Accountants' examination. Minimum course requirements are three courses from the following: 504, 505, 522, 541.

Ph.D. Concentration: Accounting

This degree provides a research-oriented terminal degree for those seeking entry-level faculty positions in accounting. Students take approximately three years of coursework beyond the bachelor's degree, including a doctoral sequence designed to expose students to various areas of research. Courses in accounting and other areas are selected to supplement the student's individual background and to prepare the student in an area of accounting specialization (financial, managerial, auditing, tax, or systems). The final year is normally spent completing the doctoral dissertation. Minimum course requirements are 12 hours including 611, 612, 619, and one other accounting course to be approved by Ph.D. accounting program advisor.

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 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 semesters' coursework as established by the degree program for part-time students.

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 degrees is completed. May not be used toward degree requirements. May be repeated. S/N only. E

503 Managerial Accounting (3) Concepts and analysis relevant to internal decision-oriented users of accounting information for planning, decision making, controlling, and product costing. Prereq: 501.


505 Taxation for Business Decisions (4) Conceptual foundation and analysis of current issues in taxation; impact on use and management of financial and investment information applied to individual, corporate, partner, and fiduciary taxpayers. Prereq: 504 and Financial 501.


513 Seminar in Advanced Auditing (3) Theory and concepts underlying application of philosophy of auditing to current auditing issues. Prereq: 411.

519 Seminar in Accounting and Auditing Research (3) Problem-oriented research design in financial accounting and auditing. Research methodologies and approaches to particular research questions. Research project. Prereq or coreq: 512 and 513.

521 Seminar in Advanced Managerial Cost Accounting (3) Analysis of conceptual and current issues; impact on development and practice of managerial and cost accounting. Approaches to management accounting, decision and control models, and planning and control under conditions of uncertainty. Prereq: 321.

522 Budgetary Planning and Control Systems (3) Alternative approaches to formulation and use of planning and control systems to meet organizational objectives. Control systems and corporate structure, discretionary expense centers, profit centers, transfer pricing, and control in manufacturing, service, and not-for-profit organizations. Prereq: 321 or 503.

531 Tax Research and Planning (3) Development of expertise in tax research utilizing authoritative sources of tax law and advanced study of tax alternatives available to minimize tax liability compatible with achieving tax-payer objectives. Prereq: 431.

532 Corporate Taxation and Reorganizations (3) Organization and structure, distributions, liquidations, reorganizations, and special problems in taxation of corporations and shareholders. Prereq or coreq: 531.

533 Taxation of Partnerships and S Corporations (3) Formation, operation, termination, and other special problems of partnerships. Election for S Corporations, and comparison of partnerships and S Corporations. Prereq or coreq: 531.

534 Unified Estate and Gift Transfer Taxation (3) Taxation of wealth transfers: transfers at death, inter vivos transfers, and generation skipping transfers. Income taxation of estates and trusts. Determination and payment of state and federal wealth transfer and income taxes. Prereq 431.

539 Tax Policy and Special Topics (3) Basic concepts of tax policy, current issues in tax policy, and selected topics in taxation. Topics vary. Prereq: 531. Prereq or coreq: 532, 533.

541 Database Systems (3) Design, implementation, and use of database systems for collection, organization, and distribution of economic information for organizations. Prereq: 312 or 501; 521 or 503; 341 or Business Administration 506.

542 Systems Analysis and Design (3) Analysis and design of information systems for management and distribution of economic information about organizations. Prereq: 541.

549 Systems Policy (3) Seminar in emerging topics in management systems and knowledge-based systems. Prereq: 541. Prereq or coreq: 542.

592 Graduate Internship in Accounting (3) Full-time resident professional employment for one academic semester involving qualified job experience, written report of responsibilities, and evaluation of student performance. Prereq: Consent of instructor.


594 Graduate Seminar in Accounting (3) Topics vary. Prereq: Consent of instructor.

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

611-12 Doctoral Seminar in Accounting (3,3) Analysis of issues reflected in accounting literature. Prereq: Consent of Ph.D. program advisor.

619 Doctoral Research in Accounting (3) Study of research methodology and application of various research methods in accounting literature. Prereq: Consent of Ph.D. program advisor.

621-22 Accounting Colloquium (1,1) Research and discussion of contemporary issues in practice of accounting. Prereq: Consent of Ph.D. program advisor. May be repeated. S/N only.

Business Law

Professors:

Fisher, Bruce D., LL.M. George Washington
Townsend, Mahlon L. (Emeritus), J.D. Tennessee

Assistant Professors:

Bentley, Denise D., J.D. Vanderbilt
Massingale, Cheryl S., MBA, J.D. Tennessee

GRADUATE COURSES

501 Legal, Ethical, and Societal Environment (3) Legal/ethical environment: recognized schools of jurisprudence (legal ethics), sources of law, anatomy of civil and criminal lawsuits; how regulations are made and enforced, constitutional rights and duties of business; antitrust law; Federal Trade Commission; product liability; consumer protection; employer-employee relations; securities regulation; environmental law, and international business law.

Advertising

(College of Communications)

MAJOR DEGREES

Communications M.S., Ph.D.

Ronald E. Taylor, Head

Associate Professors:

Hovland, Roxanne, Ph.D. Illinois
Jackson, DeForest, M.S. Tennessee
Stankey, Michael J., Ph.D. Illinois
Taylor, Ronald E., Ph.D. Illinois

Assistant Professor:

Hoy, Maria, Ph.D. Oklahoma State

The Department of Advertising offers a concentration area for the Master's degree with a major in Communications and participates in the interdisciplinary doctoral program. See Communications for additional information.

GRADUATE COURSES

490 Special Topics (3) Topics vary: advanced media strategy, advanced creative strategy, direct marketing, and advertising and social issues. E

510 Advertising and Society (3) Analysis of advertising as an institution in a free-enterprise democratic society and its relation to social, legal, cultural, and economic institutions. F
Aerospace Engineering

See Mechanical and Aerospace Engineering

Agricultural and Extension Education

(College of Agriculture)

MAJOR   DEGREE

Agricultural and Extension Education  M.S.
Roy R. Lessly, Head

Professors:
Carter, Cecil E., Jr., Ph.D. Ohio State
Dickson, Lewis H. (Emeritus), Ed.D. Cornell
Todd, John D., Ed.D. Illinois

Associate Professor:
Lessly, Roy R., Ed.D. Oklahoma State

Assistant Professor:
Waters, Randol G., Ph.D. Penn State

The Department of Agricultural and Extension Education offers a program leading to the Master of Science degree with a major in Agricultural and Extension Education. The program is designed primarily for teachers of Vocational Agriculture and staff employed by the Agricultural Extension Service. However, due to the flexibility of the program, it would be of value to agriculturalists and students interested in agricultural and continuing education. The program may be completed under a thesis or non-thesis option with a concentration in either agricultural education or agricultural extension education. Candidates for the Master's degree must meet the general requirements of The Graduate School and those stipulated by the department.

THE MASTER'S PROGRAM

Thesis Option
A candidate for the Master's degree who elects the thesis option must successfully complete:
1. A minimum of 30 hours of graduate credit in courses approved by the student's advisory committee. Six hours of thesis may be counted toward this requirement.
2. A minimum of 20 hours of graduate credit in courses numbered at or above the 500 level.
3. A minimum of 12 hours of graduate credit in courses appropriate to the area of concentration taught in the department and a minimum of 6 hours taught from outside the department.
4. A minimum of 3 hours of graduate credit coursework in either research methodology or statistics.
5. A final oral examination.

Non-Thesis Option
A candidate for the Master's degree who elects the non-thesis option must successfully complete:
1. A minimum of 36 hours of graduate credit in courses approved by the student's advisory committee.
2. A minimum of 24 hours of graduate credit in courses numbered at or above the 500 level.
3. A minimum of 12 hours of graduate credit in courses appropriate to the area of concentration taught in the department and a minimum of 6 hours taught from outside the department.
4. A minimum of 3 hours of graduate credit coursework in either research methodology or statistics.
5. A creative component designed by the student and approved by the student's advisory committee for 3 hours of graduate credit.
6. A written and oral comprehensive examination.

GRADUATE COURSES

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

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

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

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

522 Extension Teaching Methods (2) Teaching/learning methods and techniques applicable to extension work, interrelationships and relative effectiveness. Result demonstrations, method demonstrations, meetings, tours, audio-visual aids. Prereq: 411 or consent of instructor. Sp

523 Extension Program Evaluation (2) Principles, instruments and techniques of identifying, gathering, analyzing, and using data in program planning and teaching and to determine progress of clientele. Prereq: 411, 521, or consent of instructor. Sp

524 Research Methodology (3) Social research design, hypothesis testing, sampling, survey construction, scaling, interviewing, data coding, basic descriptive and relational statistics, and presentation of results. Prereq: 436, 438 or consent of instructor.

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

526 Agricultural Education for First-Year Teachers (2) Developing competencies needed by first-year teachers for planning, organizing and conducting program of vocational agriculture in local community. Group meetings in selected centers and visits by instructor. Prereq: 435, 436. Sp

527 Adult Education and Strategies for Teaching (3) Psychological, philosophical and sociological theories for adult education in agriculture; methods and strategies for organizing classes and teaching adults. Prereq: 411 or 436 or consent of instructor.

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

529 Supervised Occupational Experiences in Agricultural Education (3) Historical and philosophical bases for supervised occupational experience programs and organizational patterns and procedures for conducting programs for farm and off-farm agricultural occupations. Prereq: 435, 436 or consent of instructor.

530 Special Topics in Agricultural and Extension Education (1-3) Current issues. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

531 Extension History, Philosophy and Objectives (2) Historical and philosophical foundation of adult education in agricultural science, agriculture, client groups, issues, legislative and political movements, influence of organizations and agencies. Cooperative Extension Service, origin, legislation and growth and nature of present day objectives and programs. Prereq: 411 or consent of instructor. Sp

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

593 Special Problems in Agricultural and Extension Education (1-4) Special research and/or special reports based on supervised independent study. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
or 600-level courses. The student's committee must include a member of the faculty from the department who will be responsible for designating courses required for the minor.

THE DOCTORAL PROGRAM

A minimum of 78 hours of graduate credit beyond the B.S. degree, including 24 hours of dissertation research, but excluding any Master's research credit, is required. A minimum of 24 hours of agricultural economics, 15 hours of economic theory, and 9 hours of quantitative methods are required. The program must include a minimum of 8 hours in courses numbered at or above the 600 level (excluding dissertation credits).

Comprehensive exams include four written exams and a final oral examination. First exam courses are in general agricultural economics, economic theory, quantitative methods, and the area of concentration. Provisions exist for waiving the economic theory exam with a sufficient academic record in specific economic theory courses. A minor will consist of a minimum of 9 hours of coursework taken in the department and approved by the minor professor. At least 6 hours of credit in the minor area must be in 500- and 600-level courses.

Agricultural Economics

GRADUATE COURSES

412 Agricultural Finance (3) Macro-finance, financial objectives, acquisition of debt and equity funds, capital investments, capital allocation, credit analysis, borrower and lender loan application analysis, insurance strategies, computer applications, kinds and sources of agricultural credit, and financial intermediation. Prereq: Economics 210 or consent of instructor. F

430 Agricultural and Trade Policy (3) Values, goals, and policy process; historical development and current characteristics of commodity, credit, food, and trade policy; relationship between domestic and international agricultural policy. Prereq: 210 or consent of instructor. Sp

440 Agricultural Production Economics (3) Application of microeconomics to problems of resource allocation, enterprise selection, scale of operation, and historical development of agricultural economic analysis. Prereq: 210 and Economics 311. F

442 Farm Business Management II (3) Advanced topics and methods for farm business analysis using micro and mainframe computers: linear programming applications in farm planning, spreadsheet analysis of whole farm business; systems analysis and management control; risk analysis and management; income tax management; farm growth and intergenerational transfer. Prereq: 342. Sp

450 Agricultural Price Analysis (3) Analysis of demand and supply mechanisms in agriculture; price determination; spatial equilibrium; temporal price patterns; pricing institutions. Prereq: 350 and Economics 311. F

452 Agribusiness Firm Management (3) Operations of firms selling farm supplies and merchandising agricultural products. Analytical tools and economic theories for decision making. Prereq: Economics 201; Sp

460 Rural Economic and Community Development (3) Historical and theoretical concepts and problems facing rural communities; linkages between farm and nonfarm sectors; modeling and analyzing rural development. Prereq: 210 or consent of instructor. F

470 Natural Resource Economics (3) Nature of natural resources; economic efficiency as basis for natural resource use; externalities in natural resource use; factors influencing environmental quality; alternative public policy options for influencing natural resource use or improving environmental quality. Prereq: 210 or consent of instructor. Sp

493 Independent Study in Agricultural Economics (1-3) Directed individual or team research and report writing. Off-campus intern experience and reporting. Special courses in specific topics. Student must arrange with instructor before registering. Graduate credit for non-majors only. Prereq: Junior standing. May be repeated. Maximum 6 hrs. E

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester a full-time 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

520 Research Methodology (1) Nature of scientific method and research processes; role of assumptions, hypotheses, theory and models; methodological problems of social sciences; establishing research priorities. Prereq: Consent of instructor. F

522 Mathematical Programming Methods in Agricultural Economics (3) Linear, integer and quadratic programming techniques with empirical applications to problems of firm and region maximization, cost minimization, transportation, risk, allocation over space and time. Prereq: Consent of instructor. Sp

524 Econometric Methods in Agricultural Economics (3) Application of statistical methods to agricultural economic models; estimation of supply, demand and production functions; microeconomic forecasting models; interpretation of results. Prereq: Statistics 461 or consent of instructor. F

540 Advanced Agricultural Production Economics (3) Theoretical and empirical concepts in agricultural resource allocation; use of both static and dynamic issues; decision theory with application to agricultural firms; aggregate impact of farm decisions on industry. Prereq: 440 or equivalent. F

550 Advanced Agricultural Marketing (3) Analysis of structure, conduct and performance of agricultural marketing system; application of price theory concepts to existing circumstances in agricultural industries; examination of methods used to evaluate conduct and performance; analysis of transportation issues and location theory. Prereq: Economics 311 or consent of instructor. Sp

560 Advanced Rural Economic Development (3) Theoretical and historical perspectives on process of economic development; analyze role of agriculture, sectoral interdependence and policy development; application of theory to specific development issues. Prereq: 460 or consent of instructor. Sp

570 Advanced Natural Resource Economics (3) Analysis of natural resource allocation and use, valuation of both static and dynamic issues; historical development and current characteristics of commodity, credit, food, and trade policy; relationship between domestic and international agricultural policy. Prereq: 210 and Economics 311. F

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

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

630 Agricultural Policy Analysis (3) Evaluation of public policy as related to agricultural industry and rural areas. Prereq: Economics 510 and 513 or consent of instructor. F

640 Agricultural Supply Analysis (3) Critical evaluation of both theoretical and empirical procedures used for estimating agricultural supply relationships using regression techniques, production functions, mathematical programming, firm growth models and simulation in supply analysis. Prereq: 540 or consent of instructor. F,A

650 Operations Analysis in Marketing (2) Components and functions of operations systems; levels of analysis and tools, operational efficiency, interregional competition. Prereq: 450 and 550 or consent of instructor. Sp
Graduate programs leading to the Master of Science and Doctor of Philosophy with a major in Agricultural Engineering are available to graduates of a recognized curriculum in engineering or science, or one of the physical or biological sciences. A graduate program leading to the Master of Science in Agricultural Engineering Technology is available to graduates in a recognized curriculum in agricultural or other related fields. Each applicant will be advised about any prerequisite courses before entering a program. The student's program of study must be approved by the student's advisory committee and must comply with the requirements of The Graduate School. A completed departmental data sheet and three completed Graduate School Rating Forms are required in addition to The Graduate School application.

THE MASTER’S PROGRAMS

Agricultural Engineering Requirements

1. A total of at least 24 hours credit in graduate coursework in Agricultural Engineering Technology and related areas. The minimum requirements are 12 hours in agricultural engineering; 9 hours in other engineering, mathematics, physical and biological science, or agricultural, or business-related areas (as approved by the advisory committee); and 3 optional hours from either one of these two categories.
2. Active participation in graduate seminars conducted by the department. Resident students must register for a minimum of 2 hours in Agricultural Engineering 610 (included in the 24 hours credit of #1) and must attend the graduate seminar each semester whether registered or not.
4. A final oral examination covering the thesis, related areas, and graduate coursework.

Agricultural Engineering Technology Requirements

1. A total of at least 24 hours in graduate coursework in Agricultural Engineering Technology and related areas. Minimum requirements are 12 hours in agricultural engineering technology; 9 hours in other agricultural, business, physical and biological science, or engineering-related areas (as approved by the graduate committee); and 3 optional hours from either one of these categories.
2. Active participation in graduate seminars conducted by the department. Resident students must register for a minimum of 2 hours in Agricultural Engineering Technology 552 (included in the 24 hours credit of #1) and must attend the graduate seminar each semester whether registered or not.
4. A final oral examination covering the thesis, related areas, and graduate coursework.
5. A minor in another subject area can be included in the program.

THE DOCTORAL PROGRAM

Concentrations for the doctoral program in Agricultural Engineering include agricultural power and machinery, agricultural structures and environment, agricultural electrical and electronic systems, food and process engineering, and soil and water conservation engineering. Students applying for entrance into the doctoral program must submit evidence of ability to perform and report independent research to the satisfaction of the department. The Master’s thesis may be offered as such evidence. Scores on the GRE aptitude and engineering tests also are required.

Departmental Requirements

1. A minimum of 72 hours credit beyond the Bachelor’s degree, excluding courses for the Master’s thesis. Of this, 24 hours must be 600 Doctoral Research and Dissertation.
2. Graduate courses in agricultural engineering comprising a minimum of 18 hours credit.
3. Supporting graduate courses (outside the Agricultural Engineering Department) in related engineering, agricultural, mathematics, and other scientific fields comprising at least 24 hours. The remaining minimum of 6 hours required for the degree may be taken either in agricultural engineering or related fields.
4. A minimum of 24 hours from coursework numbered greater than 500, of which at least 9 hours must be in courses numbered greater than 600.
5. Active participation in graduate seminars conducted by the department. Resident students must register for a minimum of 2 hours in Agricultural Engineering 610 and must attend the graduate seminar each semester whether registered or not.
6. Satisfactory performance in both written and oral comprehensive examinations prior to admission to candidacy. A final oral examination also is required which includes a defense of the dissertation and subject matter that the student’s graduate advisory committee considers appropriate.

Agricultural Engineering

(430) Mobile Hydraulic Power System Design (2) Functional and operational characteristics of mobile hydraulic system components; pumps, valves and actuators: analysis and design. Prereq. Engineering Science and Mechanics 341. 1 hr and 1 lab. Sp,A

(435) Design of Mechanisms for Agricultural Machines (2) Types of mechanisms; transmission angles; synthesis of planar mechanisms; introduction to space mechanisms. Prereq. Mechanical Engineering 465 or equivalent. 1 hr and 1 lab. Sp,A

(440) Irrigation and Drainage Design (2) Design of irrigation and drainage systems; crop response, climate, water quality and quantity, and system characteristics. Prereq. 340 or equivalent. 2 hrs and 1 lab. Sp,A

(445) Processing and Materials Handling Design (2) Development of systems and components for processing and utilization of crops considering product characteristics, energy and mass balance, storage, handling and economic merit. Prereq. 330. 1 hr and 1 lab. Sp,A

(450) Electrical Distribution and Utility Design (2) Design of on-farm electrical systems, control, motors, stray voltage, special electrical loads, and safety. Prereq. Electrical Engineering 301. 1 hr and 1 lab. Sp,A

(455) Waste Management System Design (2) Waste renovation principles and livestock waste handling techniques; problem definition, feasibility study, analysis, synthesis, and preparation of plans and specifications. Prereq. Engineering Science and Mechanics 341, Plant and Soil Science 210, Industrial Engineering 405, English 569. 1 hr and 1 lab. Sp,A

(460) Design of Agricultural Structures (2) Design fundamentals for wood, steel and concrete components, compression and tension members; beam and column
Agriculture

GRADUATE COURSES

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

Animal Science

(College of Agriculture and College of Veterinary Medicine)

MAJOR DEGREES

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

Kelly Robbins, Head

Professors:

Barth, K. M., Ph.D. ......................... Rutgers Bell, M. C. (Emeritus), Ph.D. ................ Ohio State Bletner, J. K. (Emeritus), Ph.D. ................ Ohio State Chamberlain, C. C. (Emeritus), Ph.D. Iowa State Erickson, B. H., Ph.D. ..................... Kansas State Hall, O. G., Ph.D. ....................... Iowa State Harsand, S. L. (Emeritus), Ph.D. ............. Florida


Associate Professors:


Assistant Professors:


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

During the first term of matriculation in each degree program, all graduate students are required to enroll in 595. Students are also required to enroll in 596 each fall term, and in 597 each spring term.

THE MASTER'S PROGRAM

For admission to the M.S. program, a student must have obtained a 3.0 grade-point average on a 4.0 scale (or a 3.0 each term during the junior and senior years) in a completed undergraduate degree program in one of the animal sciences or in a related area. The student must submit evidence (letters of recommendation, personal interview, etc.) that indicates ability to complete requirements for the M.S. Prerequisite courses may be required if the student has insufficient undergraduate background. If the student has an unsatisfactory grade-point average, acceptance may be on a
probationary (non-degree) basis and a minimum of 12 hours of graduate coursework must be completed the first term with a minimum grade-point average of 3.0 for admission to the M.S. program.

The program requires the writing of a thesis based on original research; the completion of a minimum of 24 hours of graduate coursework, of which at least 14 hours must be taken in courses numbered at or above the 500 level; and 6 hours of thesis. Included in the course requirement are 1 hour of Agriculture 512 and a minimum of 3 hours in statistics. These statistics courses must be chosen from the 400, 500, or 600 level of courses approved for use in the ICGSP Graduate Statistical Program (ICGSP). The remaining of the coursework will be selected jointly by the student and the major professor depending on the student's area of concentration and professional objectives.

The advisory committee will consist of the major professor, a faculty member of Animal Science, who will act as chairperson of the committee, and at least three other faculty members, one of whom may be outside of the Animal Science Department. The advisory committee approves the student's coursework and research problem and conducts the final oral examination which consists of a comprehensive oral examination and a defense of the thesis.

THE DOCTORAL PROGRAM

The doctoral program requires a minimum of 48 semester hours of coursework beyond the B.S. and a minimum of 24 hours of doctoral research and dissertation. Students must present their M.S. thesis research, their dissertation proposal, and the completed dissertation research in the departmental seminar. The 48 hours of coursework must include:

1. A minimum of 16 hours in related fields outside of animal science.
2. At least 24 hours credit at the 500 and 600 level, exclusive of doctoral research and dissertation, of which a minimum of 6 hours must be at the 600 level. Students in the nutrition, breeding, physiology, or anatomy concentrations must complete at least 12 hours at the 500 and 600 level in the respective concentration or closely related area.
3. A minimum of 1 hour of Agriculture 512 in addition to that required at the M.S. level.
4. A minimum of 6 hours in 400-, 500-, or 600-level statistics courses approved for the ICGSP.

A minimum of five faculty members will constitute the student's advisory committee, of which at least one must be outside Animal Science. The major professor will be the chairperson. The student and the major professor select a program of study depending on the student's area of concentration and professional goal. The advisory committee approves the coursework and the dissertation research proposal and determines if there is to be a foreign language requirement. The advisory committee conducts the comprehensive written and oral examination and the final dissertation defense examination.

**GRADUATE COURSES**

481 Beef Cattle Production and Management (3) Integration of principles of nutrition, physiology, and breeding into complete beef cattle production and management programs. Structure of industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives evaluated: production response and economic returns. Prereq: Animal science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab. Sp

482 Dairy Cattle Production and Management (3) Integration of principles of nutrition, physiology, and breeding into complete dairy cattle management program. Structure of industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives evaluated: production responses and economic returns. Prereq: Animal science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab. Sp

483 Pork Production and Management (3) Integration of principles of nutrition, physiology, and marketing into complete pork production and management program. Structure of industry, enterprise establishment, systems of production, production practices and herd improvement program. Alternatives evaluated: production responses and economic returns. Prereq: Animal science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab. Sp

484 Poultry Production and Management (3) Structure of poultry enterprises: rearing, housing, feeding, processing and marketing, management policies. Systems approach to analysis and hypothesis testing procedures for linear and non-linear regression. Prereq: Animal science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab. F

486 Lamb and Wool Production and Management (3) Integration of principles of selection, nutrition, breeding, physiology, and marketing into complete lamb and wool production and management programs. Structure of industry, enterprise establishment, systems of production, production responses and economic returns. Alternatives evaluated: production responses and economic returns. Prereq: Animal science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab. Sp

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

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

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

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

523 Advanced Mammalian Reproduction (3) Current topics and "new frontiers" in reproductive biology. Prereq: 322. Sp,A

524 Advances in Mammary Physiology (3) Development, anatomy, and function of mammary glands; endocrine interactions associated with mammary development and function; factors affecting yield and composition of bovine secretions. Prereq: 322 or consent of instructor. Sp,A

531 Analytical Techniques in Animal Sciences (3) Physical and chemical analyses of feeds, ingredients, tissues, and biological fluids associated with nutrition, physiology and food products research. Prereq: Consent of instructor. 1 hr and 2 labs. F

532 Experimental Techniques in Animal Nutrition (3) Animal nutrition, feeding systems for growth, digestion, balance and radiocisotope tracer studies. Prereq: 531: 1 hr and 2 labs. Sp

533 Nonruminant Animal Nutrition (3) Physiological development, growth, and metabolism of non-ruminant animals during the life cycle. Concepts and methodology concerning nutrient requirements, interaction, availability and deficiencies of nutrients. Nonruminant additives and environmental effects on nutrient utilization; nutritional effects on products. Prereq: 322 or consent of instructor. F

534 Ruminant Animal Nutrition (3) Digestive physiology of ruminant stomach, rumen fermentation, determination of nutrient requirements and livestock regulation of ruminant animals. Prereq: 322. Sp

541 The Genetics of Populations (2) Application and extension of principles and concepts learned in basic courses in genetics, and theoretical and practical understanding of the useable comprehension of the genotypes of populations. Prereq: Basic courses in genetics, breeding and statistics 3 or 1 lab. F

542 Applied Animal Breeding (3) Procedures for estimating population parameters, determination of response to various selection methods and breeding systems. Estimation of genetic and phenotypic interrelationships among metric traits, estimation of breeding values, optimum methods of simultaneously altering several metrics. Prereq: Applied animal breeding methodology. Prereq: 541 or equivalent. Sp,A

571 Design and Analysis of Biological Research (3) Experimental design and procedures; selection of experimental units; analysis and interpretation of data; statistical models and contrasts, analyses of variance, covariance, treatment means, and mean separation and regression. Prereq: Plant and Soil Science 471 or equivalent; knowledge of software package on micro- or mainframe computer. (Same as Plant and Soil Science 571.) Sp,A

572 Least-Squares Analysis (2) Least-squares estimation and hypothesis testing procedures for linear models with possible singular covariance structures, measurement and model, model validation, estimation of covariance matrix, and model selection. Prereq: 571 or equivalent. 2 hrs and 1 lab. F

573 Intermediate Statistical Computing (2) Application of statistical procedures to analysis and handling of data using computers. Capabilities of existing software and hardware, statistical analysis methods with high speed digital computers. Prereq: 571 or equivalent; knowledge of FORTRAN, mainframe and software package. 2 hrs and 1 lab. F

581 Advanced Livestock Management (3) Objective functions to evaluate alternative livestock production management policies. Systems approach to analysis and integration of reproductive management programs, genetic improvement policies, alternative feeding systems, and herd health programs. Consideration of time, risk, and uncertainty in livestock production. Tools, linear programming, as aids in decision-making and resource allocation. Prereq: Management, economics, computer science, statistics. 2 hrs and 1 lab. F

595 Colloquium in Animal Science (1) Orientation; teaching, research and extension programs. Guidance in preparation of student's course of study and research plans. Required of beginning graduate students in animal science program. S/NC only. E

596 Discipline Oriented Seminar (1) Required of all animal science graduate students. Presentations by students and animal science majors on animal breeding, animal nutrition, animal physiology, animal management or animal anatomy. May be repeated. Maximum 5 hrs. S/NC only. E

597 Commodity Oriented Seminar (1) Required of all animal science graduate students. Presentations by students and animal science majors on animal breeding, animal nutrition, animal physiology, animal management or animal anatomy. May be repeated. Maximum 5 hrs. S/NC only. Sp

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

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

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

632 Advanced Energy-Protein Nutrition (4) Chemical forms, digestion, absorption, intermediary metabolism, deficiencies, excesses, and effectiveness of energy and protein. Prereq. 533 or 534, and Biochemistry 410 or Nutrition 511 or consent of instructor. Sp,A

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

Animal Science 43
Animal Science-
Veterinary Medicine

See Veterinary Medicine for program description.

GRADUATE COURSES

501 Special Topics in Anatomy and Physiology of Domestic and Laboratory Animals (1-4) May be repeated. Maximum 6 hrs. E

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

521 Animal Physiology (4) Introduction to major body systems and interrelationships: nervous, muscle, blood, cardiovascular, kidney, respiratory, gastrointestinal, and endocrine. Concepts of metabolism, temperature regulation, and acid-base balance. Prereq: General undergraduate anatomy and physiology, and biochemistry, or consent of instructor. 3 hrs and 1 lab. F

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

552 Anatomy of Domestic Carnivores (4) Gross dissection by systems and regions of dog with comparison to cat. Prereq: Consent of instructor. 1 hr and 3 labs. F

553 Anatomy of Farm Animals (3) Gross dissection by regions of horse, cow and pig with lectures/demonstration. Prereq: 552 and or consent of instructor. Sp

554 Comparative Hematology (3) Morphology, physiology and development of blood and blood forming organs; similarities and differences of major domestic and laboratory species. Prereq: Undergraduate physiology and/or consent of instructor. 2 hrs and 1 lab. Sp,A

555 Anatomy of the Central Nervous System (1) Gross and microscopic anatomy of mammalian brain and spinal cord using sheep as model. Prereq: Consent of instructor. Sp,A

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

652 Disorders of the Endocrine System (2) Pathological and physiological aspects of diseases: endocrine glands of various animal species. Prereq: 521 or consent of instructor. Sp,A

653 Advanced Mammalian Neurophysiology (3) Advanced physiological theories and principles related to normal function of central and peripheral nervous systems. Special senses and current electrodagnostic procedures for evaluating neural systems. Prereq: Advanced course in animal physiology or equivalent and an advanced neuroanatomy course, or Psychology 526, and consent of instructor. Sp,A

Anthropology

(College of Liberal Arts)

MAJOR

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

William M. Bass, Head

Professors:

Bass, William M., Ph.D. .................. Pennsylvania
Faulkner, Charles H., Ph.D. ............. Indiana
Jantz, Richard L., Ph.D. .................... Kansas
Parmalee, Paul W., Ph.D. ................. Texas A&M
Smith, Fred H., Ph.D. ..................... Michigan
Wheeler, Margaret C., Ph.D. ............. Yale

Associate Professors:

Harrison, Faye V., Ph.D. ................. Stanford
Harrison, Ira E., Ph.D. ................... Syracuse
Howell, Benita J., Ph.D. .................. Kentucky
Kippel, Walter E., Ph.D. ................. Missouri
Logan, Michael H., Ph.D. ................ Penn State
Schroedl, Gerard F., Ph.D. .............. Washington State
Simek, Jan F., Ph.D. ...................... SUNY Binghamton

Assistant Professors:

Bass, Mary Ann, Ph.D. .................. Kansas State
Galloway, Alison, Ph.D. ................. Arizona
Willey, P. S., Ph.D. ...................... Tennessee

Research Associate Professor:

Chapman, Jefferson, Ph.D. .............. North Carolina

Research Assistant Professors:

Smith, Maria O., Ph.D. ................. Tennessee
Tardif, Suzette D., Ph.D. .............. Michigan State

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

THE MASTER'S PROGRAM

For admission, an applicant must provide three letters of recommendation and a letter of intent. An undergraduate background in anthropology is required, but students lacking this may be admitted under special circumstances.

M.A. Requirements

1. A minimum of 30 hours for graduate credit. A minimum of 24 of these hours must be in anthropology, including the following:

a. 510 and 560
b. one of the following courses: 512, 513, 514, 515
c. one of the following courses: 520, 531, 561, 564
d. two of the following courses: 580, 581, 582, 583

These requirements must be met prior to taking the Graduate Evaluation Examination.

2. Successful completion of the departmentally developed Graduate Evaluation Examination (GEE). It is expected that it will be taken at the end of the third semester in residence. The GEE is given each year in January.

3. An introductory statistics course (usually Statistics 531) if such a course has not been previously taken.

4. Successful completion of the thesis and final oral examination.

THE DOCTORAL PROGRAM

An incoming student should possess an M.A. in Anthropology. Students with an M.A. in another discipline may be admitted after completing specific requirements outlined in the departmental brochure. In addition to the requirements prescribed by The Graduate School for the Ph.D., the Anthropology Department requires the following:

1. Formulation of an advisory committee and establishment of a plan of study in consultation with the committee.

2. No minimum credit hour requirement. Specific courses to be taken are determined by students and their advisory committees.

3. Demonstration of competence in statistics by completing Statistics 531 and 532 with a grade of B or better.

4. Demonstration of knowledge of one foreign language. This language should normally be French, German, Russian or Spanish, but another language may be substituted at the committee's discretion. This requirement may be met by:

a. Successful performance on a language examination administered by the appropriate language department. Students electing this alternative should consult with their advisor.

b. Completion of the intermediate (200 level) sequence of a language with a grade of B or better in the second semester.

5. Written and oral comprehensive examinations in three areas of specialization to be determined by the committee.


ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

411 Linguistic Anthropology (3) Basic linguistic concepts applied to research in cultural anthropology; investigation of language usage. Prereq: 130 or Linguistics 200. (Same as Linguistics 411.)

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

413 Dynamics of Culture (3) Major forms of culture change, ranging from evolution and diffusion to religious revitalization and political revolt. Continuity and change in diverse cultural settings through use of archaeological, ethnographic, and contemporary cases. Prereq: 130.

440 Cultural Ecology (3) Concepts and methods in studying dynamic interaction between prehistoric and present day cultures and their environments: ecological theory, methods of analysis, and review of selected case studies. Prereq: 120, 130, 410, or consent of instructor.

450 Current Trends in Anthropology (3) Analytical, integrative review of current directions of research and theory in anthropology.

460 Selected Topics in Archaeology (3) Regional or theoretical problems in archaeology for undergraduate and graduate students. Practical experience in laboratory study of archaeological materials. Prereq: 120 or consent of instructor. May be repeated. Maximum 6 hrs.

461 African Prehistory (3) African cultural history from earliest evidence of human activity to time of European contact. Stone age of African south of Sahara. Prereq: 120 or consent of instructor. (Same as Afro-American Studies 461.)

462 Early European Prehistory (3) Origins and evolution of human culture in Europe through beginnings of settled life. Paleolithic and Mesolithic chronology and lifeways. Prereq: 120 or consent of instructor.

463 Rise of Complex Civilizations (3) Development of complex societies in Old World from origins of agricultural economics to rise of States. Mesolithic, Neolithic, and Metal Age lifeways in Africa, Europe, and Asia. Prereq: 120 or consent of instructor.

464 Principles of Zooarchaeology (3) Basic osteological and identifications of major vertebrate groups; aboriginal use of animals in subsistence and culture. Identification and interpretation of archaeologically derived molluscan and vertebrate remains; introduction to laboratory use of comparative collections. Prereq: 120 or consent of instructor.

480 Human Osteology (4) Intensive examination of human skeleton. Prereq: 110 and consent of instructor. 3 hrs and 1 lab.

481 Museology I: Museums, Purpose and Function (3) A critical view of museums. Prereq: 110 or consent of instructor.

482 Museology II: Exhibition Planning and Installation (3) (Same as Art 482.)

484 Museology III: Field Projects (1-12) (Same as Art 484.)


494 Primate Behavior (3) Social organization and behavior of selected primates: group composition, size, and structure; patterns of other social interactions; communication; and cultural behavior. Application of primate studies to human ethology. Prereq: 110 or consent of instructor.

499 Human Response to Environmental Stress (3) Physiological perception of stress from physical environment and physiological, anatomical and behavioral responses to stress.

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

501 Graduate Research (1-9) Independent investigation of special problems in anthropology. May be repeated. Maximum 18 hrs.

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 Method and Theory in Cultural Anthropology (3) Development of concepts and theories by cultural anthropologists; formulation of research problems and methods of collecting, organizing, and utilizing data. Prereq: Consent of instructor.

511 Special Topics in Cultural Anthropology (3) Seminars for advanced students on topics of special interest: ethnomedicine, psychological anthropology, comparative social organization, religion, and art. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

512 Urban Studies in Anthropology (3) Process of urbanization examined cross-culturally; theory and method in researching urban communities; urban problems and applied anthropology.

513 Rural Studies in Anthropology (3) Theory, method, and ethnographic research on selected problems and aspects of traditional agrarian groups in U.S. and peasant societies. Prereq: Cultural area course or equivalent. May be repeated. Maximum 6 hrs.

514 Anthropology of Development (3) Application of anthropological theory, methods, and findings to community and national development programs. Analysis of anthropologists' roles, values, and ethical issues in selected case studies. Survey of anthropologists' work in non-academic settings.

515 Medical Anthropology (3) Cultural impact on disease patterns; theories of disease causation, and models of therapy. Medical and applied aspects of the anthropological study of health and disease. Prereq: Consent of instructor.

516 Nutritional Anthropology (3) Anthropological contributions to study of food-related cultural and biological variability in present and past populations. Prereq: 110, 120, 130, or consent of instructor. Recommended prerequisite: Basic nutrition course.

520 Seminar in Zooarchaeology (3) Approaches to analysis and interpretation of archaeological fauna. Extensive reading; evaluation and discussion of major contributions to study of food-related cultural and biological variability in present and past populations. Prereq: 110, 120, 130, or consent of instructor. Recommended prerequisite: Basic nutrition course.

521 Laboratory Studies in Zooarchaeology (4) Examination and comparison of skeletons of major vertebrate groups; shells of terrestrial and aquatic molluscs, in relation to animal remains from archaeological contexts. Basic osteology and shell characters of species encountered in aboriginal sites; use of comparative collections. May be repeated. Maximum 6 hrs.

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

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

531 Quantitative Methods in Archaeology (3) Application of quantitative techniques to archaeological data critically examined through literature and problem solving. Basic and advanced statistical analyses and other mathematical methods. Prereq: Consent of instructor.

560 Theory in Archaeology (3) Detailed consideration of theory in contemporary archaeology: models of scientific explanation, research design, archaeological formation processes, and methods of analysis and interpretation.

561 Archaeological Resource Management (3) Federal legislation and regulations affecting identification, protection, and management of archaeological resources. Professional ethics and responsibilities and relationships of federal and state agencies, public interest groups, and professional archaeologists in conduct of federally sponsored archaeology. May be repeated. Maximum 6 hrs.

562 Problems in Old World Archaeology (3) (Same as Classics 562.)

563 Lithic Artifact Analysis (3) Methods for analyzing prehistoric stone tools in practical laboratory/lecture format. Stone tool production, use, stylistic variability, and discard processes.

564 Archaeological Field School (3) Archaeological research on prehistoric American Indian cultures in Southeastern United States; Tennessee prehistory.

560 Advanced Human Variation (3) Genetic and morphological variation among extant human groups; relations of variation to geography, ecology and subsistence.


563 Skeletal Biology (3) Practical and theoretical approaches to analysis of prehistoric human skeletal remains. Demography, vital statistics, pathology, nutrition, and measures of biological relationships as related to population as adaptive unit. Prereq: 480.

564 Quantitative Methods in Biological Anthropology (3) Application of statistical procedures to biocultural problems; interpretation of statistical results. Linear models. Prereq: Statistics 532 or equivalent.

565 Anthropometry (3) Techniques of measuring and describing skeletal material and human subjects: practical applications to growth, nutrition and human engineer- ing. Prereq: Consent of instructor.

566 Bone Anatomy and Physiology (3) Examination of bone microstructure, cellular anatomy, hormonal regulation and micro and macronutritional response to load- ing. Prereq: 480 or consent of instructor.

567 Laboratory in Forensic Anthropology (3) Discussion and lab experience with forensic anthropological techniques, X-ray examination, hair analysis, bone microstructure. Prereq: Human Organs, 480, 561 or consent of instructor. 2 hrs and 1 lab.

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

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

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

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

601 Advanced Graduate Research (1-6) Independent investigation of special problems in anthropology by advanced graduate students. May be repeated. Maximum 12 hrs. Only 3 hrs may count toward 600-level requirement.

610 Seminar in Cultural Anthropology (3) Selected topics. As a primary requirement for doctoral students in cultural anthropology. May be repeated. Maximum 6 hrs.

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

620 Seminar in Nutritional Anthropology (3) Analytical review of major theoretical viewpoints in nutritional anthropology. Prereq: 516 and consent of instructor.

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

661 Selected Topics in Paleoenthropology (3) May be repeated. Maximum 6 hrs.

669 Selected Topics in Paleoenthropology (3) May be repeated. Maximum 6 hrs.

695 Gross Human Anatomy (9) Skeleton, muscles, and cardiovascular system. Dissection of cadavers. Prereq: 480 or Human Biology, 5 hrs and 5 labs.
Architecture

(Office of the Provost)

J. William Rudd, Dean
William J. Lauer, Associate Dean

Professors:
Anderson, G. L., M.Arch
Conley, G. B., Arch.
Grieger, F., M.Arch
Kelsy, R. M., S.Arch
Lauer, W. J., M.S.Arch
Lester, A. J., M.Arch
Lizon, P., Ph.D.
Moffett, M. S., Ph.D.
Robinson, M. A., M.Arch
Rudd, S. W., M.A.
Shell, W. S., M.Arch
Watson, J. S., M.Arch
Wodhouse, L. M., Ph.D.

Associate Professors:

Herz, M. D., B.Arch.
Kinzy, S. A., M. Arch.
Martella, W. E., B. Arch.
Narancic, V., B.Arch.
Rabun, J. S., M.A.

Assistant Professors:

Bovill, C. H., M.Arch.
Coddington, J., M.Arch.
French, R. C., B. Arch.
Kaplan, M., M.Arch.
Livingston, M., M.F.A.
Reno, J. E., M. Arch.
Slucky, H., B. Arch.
Ware, S. M., B. Arch.
Wells-Bowie, L., M. Arch.
Woolley, D. L., M. Arch.

The School of Architecture does not currently offer a graduate degree program; however, the courses listed below are available for graduate credit to students enrolled in other graduate programs. Besides the undergraduate five-year Bachelor of Architecture degree program, the School of Architecture offers a three-year program leading to a Bachelor of Architecture to students who already hold a Bachelor’s degree or an advanced degree in another field.

This program begins with intensive initial studies in architecture and can be completed within three years. A minimum of 6 semesters’ residency is required. The degree is the first professional degree recognized for purposes of eventual qualification for the license to practice architecture.

Applicants must provide a transcript of previous academic work and must have attained at least a 2.5 overall grade-point average. Appropriate goals and abilities must be shown by the applicant as well.

Second degree students are required to submit a portfolio which demonstrates a proficiency in freehand and orthographic drawing skills prior to taking Basic Architecture I. If an otherwise qualified student does not have these skills, he/she can come to the School of Architec-
Assistant Professors:

Longobardi, Pam, M.F.A. ......... Montana State
Lyons, B., M.F.A. .................. Arizona State
Wilson, D., M.F.A. ............. California (San Diego)

The Master of Fine Arts is the terminal de-
gree in studio art. It is offered in the concentra-
tion areas of ceramics, graphic design/    
illustration, drawing, fiber-fabrics, painting, print-
making, sculpture, and watercolor. Inter-area
studies are available with consent of the faculty.

THE MASTER'S PROGRAM

To become a candidate, the applicant must be
admitted by The Graduate School and
approved by the Department of Art. In addition to
the admission requirements of The Graduate
School, the Department of Art specifically re-
quires the following:
1. A detailed letter of intent including state-
manship requesting assistance, if desired.
2. Three letters of recommendation from
former professors or professionals in the field.
3. An undergraduate major in art or evi-
dence of equivalent proficiency.
4. A portfolio to be evaluated by the faculty.
Further information is available by writing to
the Department of Art.

M.F.A. Requirements
A minimum of 60 hours is required:
1. Successful completion of 20 hours of studio in a concentration area. An area-program
must be approved by the graduate faculty only after the second semester in residence.
Ten hours of concentration must be in second
year courses (512, 514, etc.).
2. A minimum of 9 hours of art history for
graduate credit.
3. Eleven hours of electives which may consist of any combination of courses offered by
the University for graduate credit.
Student must have completed all other
requirements prior to registration.
5. A student with the permission of the
area faculty can petition to take 3 hours of out-
side academics as a substitute for 3 hours of art
history in a third area. The petition
is to be presented to the graduate
commitee for final approval and should directly
address the need and relevance of this
substitution to the student's concentration.
Four semesters (normally the first 40
hours) beyond the Bachelor's degree are re-
quired in residence. An exception is made for
working professional designers who may
complete their first 20 hours, with the permission
of the faculty, on a part-time basis. Residence is
defined by the Department of Art as
(1) a minimum enrollment of 6 hours per semester and (2) use of Department of Art facilities so that
students are available for discussion and criti-
cism.

The candidate's committee will consist of
a minimum of 3 members and a maximum of 6
members and will be appointed prior to registra-
tion for Art 599. Three members of the
committee shall be as follows: one from the
candidate's concentration area who shall be the
major professor, one from art history, and one
from a studio discipline outside the concentra-
tion area.

Exhibition and oral examination: With the comple-
tion of all requirements for the M.F.A.,
the student must produce an exhibition and, in
the presence of work, must satisfactorily
complete an oral examination.

Academic Standards
1. First-year evaluation: At the end of the first
2 semesters in residence, the student must
present a portfolio for evaluation by the faculty and
receive permission to continue in the pro-
gram.
2. Second-year evaluation: With comple-
tion of all coursework, the student must present
work for evaluation by the faculty and receive
permission to register for Projects in Lieue of
Thesis.
3. In a review by the student's major
area faculty, the student's progress is deemed
insufficient, the faculty may recommend a work
period without advancement toward the degree,
pробation with specific goals set for a specific
time, or dismissal.

ACADEMIC COMMON MARKET

An agreement among southern states for
sharing graduate programs allows legal resi-
dents of some states to enroll in certain pro-
grams at UT Knoxville on an in-state tuition
basis. The M.F.A. program in Art is available to
residents of the state of Alabama. Additional
information may be obtained from the Residency
Assistant in the Office of Graduate Admissions and
Records.

GRADUATE MINOR IN THE HISTORY OF
ART

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

GRADUATE COURSES

401 Fiber: Advanced Projects (3-6) Prereq: 302 or
consent of instructor. May be repeated. Maximum 12
hrs.
402 Fabric: Advanced Projects (3-6) Prereq: 301 or
consent of instructor. May be repeated. Maximum 12
hrs.
405 Advanced Computer Enhanced Design (3) Prereq:
404 or consent of instructor. May be repeated. Maximum 6 hrs.
406 Goldsmithing (3-6) Metal smithing techniques:
granulation, electroforming, electroplating, electropol-
ing, anodizing, and photo processes with individual
studio problems to develop personal style of expression.
Prereq: 6 hrs of metal smithing or consent of instructor.
May be repeated. Maximum 12 hrs.
409 Special Topics in Fiber/Fabric (3) Student- or in-
structor-initiated course offered at convenience of de-
partment. Prereq: Determined by department. May be
repeated. Maximum 12 hrs.
411 Drawing IV (6) Individualized pursuit of personal
drawing techniques and concepts; supplemented by in-
dividual and group critiques; weekly life drawing ses-
413 Painting IV (6) Individual concepts and personal
expression with varied media. Prereq: 313. May be re-
peated. Maximum 12 hrs.
415 Watercolor IV (6) Water-based media on paper: in-
dividual concepts and personal approaches. Prereq: 315.
May be repeated. Maximum 12 hrs.
419 Special Topics in Drawing and Painting (3) Stu-
dent- or instructor-initiated course offered at conven-
ience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
421 Ceramics: Individual Projects (3-6) One topic per-
term: low fire ceramics, alternative firing methods, spe-
cialized clay techniques. Individual direction. Prereq:
321 and 322. May be repeated. Maximum 12 hrs.
422 Ceramics: Advanced Projects (3-6) Development of
thematic investigation of stoneware, slips, underglazes,
airbrush, and lusters. Relationship between form and
424 Ceramics: Clay and Glazes (3) Clay chemistry,
color bodies, glaze theory, glaze calculation, intensive
forming, mixing and testing of clay bodies and glaze
formulas. Prereq: 321 and 322.
425 History of Ceramics Seminar (3) Ceramics from
ancient through contemporary. Ceramics sculpture, and
vessel aesthetic. Slide lectures and individual presenta-
tions. May not be used toward art history requirement.
Prereq: 321 and 322.
426 Kilns: Design, Construction and Operation (3) Design-
ing kilns, traditional, and modern refractories,
construction methods, and operation of wood, gas, and
electric kilns. Prereq: 321 and 322.
429 Special Topics in Ceramics (3) Student- or in-
structor-initiated course offered at convenience of de-
partment. Prereq: Determined by department. May be
repeated. Maximum 12 hrs.
431 Photography III (3-6) Individual development of
photographic processes and techniques. Prereq: 232 and
331. May be repeated. Maximum 12 hrs.
439 Special Topics in Photography (3) Student- or in-
structor-initiated course offered at convenience of de-
partment. Prereq: Determined by department. May be
repeated. Maximum 12 hrs.
441 Advanced Sculpture (3-6) Individual development of
sculptural problems and techniques. Prereq: 6 hrs of
300 level sculpture. May be repeated. Maximum 12 hrs.
449 Special Topics in Sculpture (3) Student- or in-
structor-initiated course offered at convenience of de-
partment. Prereq: Determined by department. May be
repeated. Maximum 12 hrs.
451 Advanced Graphic Design (3) Conceptual and
applied design for printed materials: publications, post-
ers, advertisements. Prereq: 352.
452 Advanced Corporate Design (3) Corporate graph-
453 Advertising Illustration (3) Advertising illustration
media and techniques as applied to product illustration.
Prereq: 354.
454 Editorial Illustration (3) Editorial illustration media
and techniques as applied to book, magazine, and
newspaper illustration. Prereq: 453.
456 Graphic Design/ Illustration Practicum (1-12) Practical
experience in design or illustration field. Only by
prearrangement with department. Prereq: Senior stand-
ing and consent of instructor. May be repeated. Maxi-
imum 12 hrs.
459 Special Topics in Graphic Design/Illustration (3) Student- or instructor-initiated course offered at conven-
ience of department. Prereq: Determined by department.
May be repeated. Maximum 12 hrs.
462 Intaglio III (3-6) Individual projects through ad-
vanced color printing methods and combinations with
other print media. Prereq: 362. May be repeated. Maxi-
imum 12 hrs.
463 Lithography III (3-6) Individual projects through ad-
vanced color etching methods from stones and alu-
464 Screen Printing III (3-6) Individual development of
screen printing problems and techniques. Greater devel-
opment of image and personal concept. Prereq: 364.
May be repeated. Maximum 12 hrs.
469 Special Topics in Printmaking (3) Student- or in-
structor-initiated course offered at convenience of de-
Art and Music Education

471 History of North American Art (3) Landmarks in painting, sculpture, and design from prehistory to 1900.

472 History of 20th-Century American Art (3) Developments in architecture, painting, and design from 1900.

473 19th-Century American Painting (3) From West and Copley to emergence of "The Eight."

474 History of Modern Architecture in Europe and America (3) 20th-century styles: Sullivan and skyscraper. 20th century: Viennese leaders, the Bauhaus, Gropius, Van der Rohe, Le Corbusier, and Wright. Asilo to Kahn, Tange and Metabolism, Arne Jacobsen, Sori, and Venturi.

475 History of the 19th Century in Painting in Europe and America (3) French: Neoclassicism, Romanticism, Friedrich, Constable, Turner, Corot and Barbizon landscape, Hudson River Group, Pre-Raphaelite Brotherhood, Manet, Courbet, Impressionism, Auen, Homer, Seurat through Cezanne.

476 History of 20th Century Painting in Europe and America (3) Fauvism, Die Brucke, Cubism, Der Blaue Reiter, Futurism, Dada and Surrealism, geometric abstraction, social commentary, painting. Abstract Expressionism in U.S. and parallellism in Europe: Pop, Op, Minimal and Concept art.

479 Special Topics in Art History (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.

481 Museology I: Museums, Purpose and Function (3) Development of museums of art, history, and applied science. (Same as Anthropology 481.)

482 Museology II: Exhibition Planning and Installation (3) Exhibition concept development and implementation. Exhibition design and installation techniques. Publicity, production, mounting and training, shipping and storage. Prereq: 481 or consent of instructor. (Same as Anthropology 482.)

484 Museology III: Field Projects (1-12) Special field projects: restoration, preservation, registration, and other related research on or off campus. Prereq: 481 and 482. May be repeated. Maximum 12 hrs. (Same as Anthropology 484.)

485 History of Printmaking (3) Prints from 15th century to present. 20th century in Europe and U.S. Prereq: 172 and 173.

486 Art of Indian Asia (3) History of Indian art: Central Asia and Southeast Asia.

489 Studies in Art History (3) Concentration in individually designated area. Prereq: 12 hrs of art history, and consent of instructor. May be repeated. Maximum 6 hrs.

494 Individual Problems (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

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

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.

505 Graduate Fiber and Fabric I (2-6) May be repeated. Maximum 10 hrs.

506 Graduate Fiber and Fabric II (2-6) May be repeated. Maximum 10 hrs.

511 Graduate Drawing I (2-6) May be repeated. Maximum 10 hrs.

512 Graduate Drawing II (2-6) May be repeated. Maximum 10 hrs.

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

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

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

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

521 Graduate Ceramics I (2-6) May be repeated. Maximum 10 hrs.

525 Graduate Ceramics II (2-6) May be repeated. Maximum 10 hrs.

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

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

551 Graduate Graphic Design/Illustration I (2-6) May be repeated. Maximum 10 hrs.

552 Graduate Graphic Design/Illustration II (2-6) May be repeated. Maximum 10 hrs.

561 Graduate Printmaking-Intaglio I (2-6) May be repeated. Maximum 10 hrs.

562 Graduate Printmaking-Intaglio II (2-6) May be repeated. Maximum 10 hrs.

563 Graduate Printmaking-Lithography I (2-6) May be repeated. Maximum 10 hrs.

564 Graduate Printmaking-Lithography II (2-6) May be repeated. Maximum 10 hrs.

565 Graduate Printmaking-Screen Printing I (2-6) May be repeated. Maximum 10 hrs.

566 Graduate Printmaking-Screen Printing II (2-6) May be repeated. Maximum 10 hrs.

571 Studies in Medieval Art (3) Art and architecture of Middle Ages: major monuments from Byzantine or western Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

572 Studies in Italian Renaissance Art (3) Art and architecture of 14th, 15th, and 16th centuries in Italy. Early or High Renaissance or Mannerist periods. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

573 Studies in Baroque Art (3) 17th-century art and architecture: major artists and works from southern or northern Europe. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

574 Studies in Modern Western Art (3) Selected topics in 19th- and 20th-century western art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

575 Studies in Modern American Art (3) Selected topics in 19th- and 20th-century American art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

576 Studies in Asian Art (3) Selected topics in Japanese or Chinese art. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

579 Special Topics in Art History (3) Student- or instructor-initiated course offered at convenience of department. Prereq: M.F.A. candidate or consent of instructor. May be repeated with consent of department. Maximum 9 hrs.

590 Seminar in Art Criticism (3) Theory and practice. Prereq: M.F.A. candidate or consent of instructor.

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

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

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

595 Visiting Artist Seminar (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hrs.

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

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

409 Special Topics (2-4) Student- or instructor-initiated course offered at convenience of department. May be repeated.

410 Drawing (2-4) Intermediate to advanced. May be repeated.

420 Ceramics (2-4) Intermediate to advanced. May be repeated.

430 Photography (2-4) Intermediate to advanced. May be repeated.

440 Painting/Watercolor (2-4) Intermediate to advanced. May be repeated.

450 Metal Design (2-4) Intermediate to advanced. May be repeated.

460 Fiber (2-4) Intermediate to advanced. May be repeated.

470 Fabric (2-4) Intermediate to advanced. May be repeated.

480 Enameling (2-4) Intermediate to advanced. May be repeated.

490 Wood (2-4) Intermediate to advanced. May be repeated.

Art and Music Education

(College of Education)

MAJORS

DEGREES

Art Education .................................................. M.S.

Music Education ............................................. M.S.

Music Education

Charles H. Ball, Head

Professors:

Ball, Charles H., Ph.D. .................................. Peabody

Hull, H. N., Ed.S ........................................... Peabody

Humphreys, A. W. (Emeritus), Ed.D. ....... Illinois

Jones, J. H. (Emeritus), Ed.D. .............. Columbia

Julian, W. J., Ph.D. ......................................... Michigan

Moore, M. C., Ph. D. ........................................ Northwestern

Robertson, J. W. (Emeritus), E.D. ........ Columbia

Tippis, A. W., Ph.D. .......................................... Michigan

Associate Professors:

Gill, H. L. (Emeritus), B.S. ......................... Milwaukee State Teachers

McDaniel, Walter H. (Emeritus), M.S. .......... Tennessee

Mintz, J. O., Ed.D. ........................................ Columbia

Salties, J. R., M. S. ........................................ Tennessee

Watkins, J. Paul, M.S. ................................. Tennessee

Assistant Professor:

Root, Patricia, M.A ....................... Washington State
ments are sufficiently flexible to allow programs to be tailored to the specific needs of the individual, all emphasize a balance between creative work in the arts discipline, advanced teaching techniques, and a study of the philosophical and historical foundations of the field.

For additional information, contact the head of the Department of Art and Music Education, Room 211-A Music Building: (615) 974-3331.

Art Education

The Master of Science program requires Art Education 510, 520, and 593; 6 hours of 500-level courses in art history; 6 hours of 500-level courses in studio art; Curriculum and Instruction 580; 6 hours of 500-level elective courses in education; and 6 hours of Thesis 500.

The thesis may be of the conventional type or an exhibition of original works of art produced under the direction of Art and Art Education faculty and accompanied by a written analytical and critical essay. This essay must include a) a philosophical statement, b) an explanation of process and media for each work presented, and c) a compositional analysis of each work. A comprehensive written examination will be required during the final semester of work.

GRADUATE COURSES

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

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

510 History and Philosophy of Art Education (3) United States from 1860's to present, Prereq: Consent of instructor.

520 Program Development in Art Education (3) Current trends and practices in art education; unit planning, sequential organization and teaching methods. Prereq: Consent of instructor.

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

593 Independent Study in Art Education (3-6) Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs.

Music Education

The Master of Science requires Music Education 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 6 hours of music or music education 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 6 credit hours and 3 credit hours of Music Education electives may be dropped.

Diagnostic tests in theory, music history, music education, and applied music will be required. A final written and oral examination will be required.

GRADUATE COURSES

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

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

510 Foundations of Music Education (3) Historical, philosophical and aesthetic bases. Prereq: Consent of instructor.

520 Research in Music Education (3) Definition of research problems, data collection and analysis, and research report writing. Application of knowledge of research techniques to analysis of existing research literature in music education. Prereq: Consent of instructor.

530 Advanced Band Literature and Conducting (3) Reading, conducting, and interpreting band scores suitable for school, college, and community bands; contemporary and standard band literature. Prereq: Consent of instructor.

540 Advanced Choral Literature and Conducting (3) Reading, conducting, and interpreting vocal scores suitable for school, college, church, and community groups. Prereq: Consent of instructor.


555 Administration and Supervision of School Music (3) Problems of supervision, research, and service education, teacher preparation, guidance. Prereq: Consent of instructor.

560 Psychology of Music Teaching (3) Research on musical perception and cognition and its application to teaching of music. Definition and measurement of musical ability. Prereq: Course in general psychology and 1 yr of music theory or consent of instructor.

570 Studies in Elementary and Middle School Music (3) Current trends and research in teaching of music in elementary and middle school. Prereq: Consent of instructor.

580 Seminar in Music Education (3) Class investigation and individual reporting of pertinent topics and issues in music education. Prereq: Consent of instructor.

590 Special Topics in Music Education (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

593 Special Problems in Music Education (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Astronomy

See Physics and Astronomy

Audiology and Speech Pathology

(College of Liberal Arts)

MAJORS

DEGREES

Audiology ......................................................... M.A.
Speech and Hearing Science ................................. Ph.D.
Speech Pathology .................................................. M.A.

Patrick J. Carney, Head

Professors:

Adler, Sol, Ph.D. ........................................ Ohio State
Asp, Carl W., Ph.D. ........................................ Ohio State
Carney, Patricia D., Ph.D. .............................. The Master's, Iowa
Luper, Harold L., Ph.D. ................................ Ohio State
Nabekle, Igor V., Sc.D. ................................ Prague
Peterson, H. A., Ph.D. ...................................... Illinois
Silverstein, B., Ph.D. ........................................ Purdue

Associate Professors:

Burchfield, Samuel B., Ph.D. ......................... Michigan State
Ferrell, Charles J., M.A. .............................. Tennessee
Wallace, GloriaJean L., Ph.D. ................. Northwestern

Assistant Professor:

Arthur, Deborah, M.A. .................................. Tennessee
Gordon, Pearl A., Ph.D. ............................... Tennessee
Krishnan, Ravi A., Ph.D. ............................. Texas

THE MASTER'S PROGRAM

A major is offered in Audiology or in Speech Pathology. A minor is offered in each of the two areas when approved by the department.

The intent of each major program is to provide the student with the scholarly and professional skills necessary for functioning as an independent professional clinician in any clinical environment.

Students majoring in either of the two areas are expected to complete the academic requirements for clinical certification from the American Speech-Language-Hearing Association, including the required number of clock hours of clinical practicum (minimum 200 hours as a graduate student, 375 total). An exception to this rule must be approved by the appropriate departmental committee. Enrollment in clinical practicum courses is required for all clinical practice experiences. If the undergraduate preparation does not include sufficient coursework in speech pathology, audiology, psychology, and related fields, the student may be required to make up such deficiencies.

Students may elect either the thesis or the non-thesis option. Students in both programs are required to take 511 in the Master's program with the thesis will include a minimum of 30 semester hours of approved graduate credit, including 6 hours of 500 credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. At least two-thirds of these total courses must be at the 500 or 600 level, including no more than 6 hours of thesis and no more than 6 hours of practicum. Students in the non-thesis option program must present a total of 36 semester hours of approved graduate credit and pass a final written examination. A minimum of 24 hours must be at the 500 or 600 level, no more than 6 of which may be practicum. The decision as to choice of the thesis or non-thesis program is normally made following completion of 511 and a conference with the student's advisor.

THE DOCTORAL PROGRAM

The Ph.D. program in Speech and Hearing Science seeks to develop individuals for research or college teaching careers in the concentration areas of speech and language pathology, audiology, speech science, or hearing science. This degree program is
research oriented, with primary emphasis upon developing the scientific and cognitive skills which allow individuals to identify and independently study important questions concerning the human act of oral and aural communication.

Students will be expected to demonstrate their knowledge in the areas of:

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

The program will normally consist of three or more calendar years of graduate study beyond the Master's degree with the first year being devoted primarily to formal coursework and the last year to full-time research culminating in the doctoral dissertation.

The total program is a minimum of 60 semester hours, including a minimum of:
1. 24 semester hours in dissertation 600.
2. 6 semester hours in a research tool.
3. 6 semester hours in a cognate area outside the department.
4. 24 semester hours in 600-level coursework within the department of which:
   a. a minimum of 6 semester hours in the topic of major interest.
   b. a minimum of 6 semester hours in topic(s) of related interest.
   c. 2 semester hours in 611; and
   d. 3 semester hours in supervised teaching experience.
5. A comprehensive examination to demonstrate scholarly knowledge of audiology, speech and language pathology, and speech and hearing science; and advanced knowledge of the specifics of the area of concentration.
6. A final oral examination.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

404 Appraisal of Speech and Language Disorders (3) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests. Prereq: Communication Disorders, Speech Science, Clinical Practice in Speech-Language Pathology or consent of instructor.

431 Stuttering (3) Nature, appraisal and treatment. Prereq: 304 or consent of instructor.

433 Clinical Practice in Speech-Language Pathology I (1-4) Prereq: 320, 331 or consent of instructor. Enrollment for fewer than 2 hrs must have prior departmental approval. (Same as Special Education 433.)

434 Clinical Practice in Speech-Language Pathology II (1-4) Prereq: 433 and consent of instructor. Enrollment for fewer than 2 hrs must have prior departmental approval. (Same as Special Education 434.)

440 Voice Disorders (3) Etiology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 304, 306, or consent of instructor. (Same as Special Education 440.)

455 Problems in Speech Pathology (1-3) Prereq: Consent of instructor. Analysis of research in diagnosis and management of various speech disorders and associated neuromuscular symptomatology. Prereq: Consent of instructor.

461 Introduction to Language Pathology in Children (3) Nature, etiology and treatment of language retardation in children: observations of language therapy. Prereq: 393 or 394 or consent of instructor.

463 Practical Applications of Language Habilitation Techniques (3) Various methods and procedures in treating delayed/disordered preschoolers. Alternative/ augmentative systems. Prereq: 461 or consent of instructor.

465 Speech and Language of the Culturally Different Child (3) Speech and language differences of children of minority groups, of different ethnic and class membership and from different geographic regions.

473 Audiology II (3) Basic principles of clinical audiology: pure tone, speech, masking and overview of special auditory tests. Prereq: 371. (Same as Special Education 473.)

494 Introduction to Aural Rehabilitation (3) Rehabilitation of acoustically impaired hearing communication difficulties, residual hearing and other sensory modalities. Prereq: 473.

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


506 Neural Bases of Speech and Language (3) Structure and function of central and peripheral nervous systems, role in speech and language. Prereq: 306.


511 Introduction to Research in Speech and Hearing (3) Analysis of research techniques, fundamentals of statistics, application of statistics, and completion of a proposal and hypothetical pilot research project.

512 Clinical Practice in Audiology (1-4) Prereq: 473 and 494. May be repeated. Maximum 9 hrs.

513 Clinical Practice in Audiology: Off-Campus Sites. (1-4) Prereq: Consent of instructor.

514 Practicum in Verbo-Tonal Habilitation (1-4) Prereq: 494, 505, or consent of instructor. May be repeated. Maximum 6 hrs.

515 Practicum in Aural Rehabilitation (1-4) Prereq: 473 and 494. May be repeated. Maximum 6 hrs.

517 Instrumentation in Audiology and Speech Pathology (3) Principles of instrumentation in audiology and speech pathology and applications 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 Seminar in Child Language Pathology (2) Interactive seminar for the study of the normal acquisition of language and exceptionalities. Prereq: 461 or consent of instructor. May be repeated. Maximum 6 hrs.

523 Advanced Clinical Practice in Speech Language Pathology. (1-4) Prereq: 433 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.


525 Special Problems in Speech-Language Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

526 Independent Study in Speech-Language Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 10 hrs.

527 Management and Supervision for Speech and Hearing Professionals (3) Management systems, accountability, performance appraisal and research activities in field of audiology. Prereq: Consent of instructor. May be repeated. Maximum 10 hrs.

530 Clinical Practice in Audiology. (1-4) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


532-33-34 Advanced Clinical Practice in Speech-Language Pathology (1-4, 1-4, 1-4) Prereq: 433 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.

538-39-40 Advanced Clinical Practice in Speech-Language Pathology: Off-Campus Sites (1-4, 1-4, 1-4) Prereq: 100 hrs clinical experience, consent of instructor. May be repeated. Maximum 6 hrs each. Enrollment for less than 2 semester hrs must have prior departmental approval.

538 Advanced Clinical Practice in Speech-Language Pathology: Public Schools (1-4) May be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.

539 Motor Speech Disorders (3) Neuromotor organization of speech and articulation; specific treatment approaches to motor speech disorders and associated neuromuscular symptomatology; diagnosis and management of motor speech disorders. Prereq: 538.


545 Sound Measurement Techniques and Hearing Conservation (3) Techniques of measurement and analysis of sound: hearing conservation in schools and industry. Prereq: Consent of instructor.

546 Advanced Audiology (3) Theory and practice of advanced pure tone and speech audiology; instrumentation and interpretation of audiometric findings with differential diagnosis. Prereq: 473.

547 Special Problems in Audiology (1-3) Prereq: 473 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.

548 Special Study in Audiology (1-3) Special reading, consultation, and research activities in field of audiology. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

550 Seminar in Audiology (1-3) Significant research in various areas of audiology. Prereq: Consent of instructor. May be repeated. Maximum 10 hrs.

551 Advanced Auditory Assessment (3) Theoretical and applied considerations of procedures used to identify lesions in auditory mechanism: behavioral assessment, acoustic immittance and electrophysiological techniques. Prereq: 473, 507 and 546.

552 Seminar in Speech Pathology (2-3) Current significant research in speech pathology. Topics vary. Prereq: 9 hrs in speech pathology. May be repeated with consent of department. Maximum 9 hrs.


555 Special Problems in Speech-Language Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

556 Independent Study in Speech-Language Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 10 hrs.

557 Management and Supervision for Speech-Language-Hearing Professionals (3) Management systems, accountability, performance appraisal and research activities for audiological assessment, audiometric tests and speech language pathologists interested in private practice, supervisory or administrative positions.

561 Tutorial in Child Language Pathology (2) Interactions with various staff members of Pediatric Language Programs; selected topics. Prereq: 461 or consent of instructor. May be repeated. Maximum 6 hrs.

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

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

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

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

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


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

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


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


609. Seminar in Speech Science (2) Experimental areas: speech physiology, acoustic analysis, recognition, perception and intelligibility of speech, communication theory, and psycholinguistic measurement of speech and language. Topics vary. Prereq: 601 or consent of instructor. May be repeated. Maximum 8 hrs.

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

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

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

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

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


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

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


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

Aviation Systems
(UT Space Institute)

MAJOR

Aviation Systems ........................ M.S.

R. D. Kimberlin, Program Chair

Professors:

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

Associate Professors:

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

Assistant Professor:

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

The University of Tennessee Space Institute offers a program leading to the Master of Science degree with a major in Aviation Systems. The Aviation Systems Program is designed for those who possess a Bachelor's degree in engineering or science and wish to study under a "system philosophy" toward careers in research and development or administration in areas pertinent to aviation. Current emphases include flight testing, aircraft design, aviation meteorology, air traffic control, and airport management. To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science from an accredited institution, show evidence of ability to pursue and benefit from the program, and fulfill the University of Tennessee Graduate School admission procedures and grade-point standards. It is expected that the student will have a basic knowledge of computer utilization and statistics; an understanding of aerodynamic fundamentals, aircraft propulsion, and performance; and some understanding of economics. Both thesis and non-thesis programs are available. The thesis program involves a minimum of 30 semester hours credit while the non-thesis program involves a minimum of 33 semester hours credit.

THESIS OPTION

The thesis program involves satisfactory completion of the following requirements:

Research and Development Specialization

1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Six hours in industrial engineering (engineering management).
3. Six hours of electives from the major field, mathematics or engineering.
4. Six hours of Aviation Systems 500 demonstrating the ability to conduct and report on an independent investigation.

Administration Specialization

1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Three hours in industrial engineering (engineering management).
3. Three hours in economics or finance.
4. Six hours of electives selected from the major field, mathematics or engineering.
5. Six hours of Aviation Systems 500 demonstrating the ability to conduct and report on an independent investigation.

NON-THESIS OPTION

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

Research and Development Specialization

1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Six hours in industrial engineering (engineering management).
3. Twelve hours of electives in the major field, mathematics or engineering.
4. Three hours of an assigned project under Aviation Systems 510.
5. A comprehensive final written examination on all coursework submitted for the degree and defense of the project course paper.

Administration Specialization

1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Three hours in industrial engineering (engineering management).
3. Three hours in economics or finance.
4. Twelve hours of electives in the major field, mathematics or engineering.
5. Three hours of an assigned project under Aviation Systems 510.
6. A comprehensive final written examination on all coursework submitted for the degree and defense of the project course paper.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

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

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.

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

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

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

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


**Biochemistry**

(College of Liberal Arts)

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<th>MAJOR</th>
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<td>Biochemistry</td>
<td>M.S., Ph.D.</td>
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**Programs:**

**Professors:**

Churchill, Jorge E., Ph.D. Sheffiled
Koel, T., Ph.D. .................. Michigan State
Joshi, J. G., Ph.D. ................. Poona
Monty, Kenneth J., Ph.D. .......... Rochester
Salo, T. P. (Emeritus), Ph.D. ..... Michigan
Wicks, Wesley D., Ph.D. .......... Harvard

**Associate Professor:**

Koontz, John W., Ph.D. .......................... Kentucky

**Assistant Professors:**

Feinberg, R. H. (Emeritus), Ph.D. .... California
Well, Elizabeth E., Ph.D. .......... Lehigh
Roberts, Daniel M., Ph.D. ....... California (Davis)
Serpersu, Engin H., Ph.D. ........ Hatecepe

**Adjunct Faculty:**

Farkas, W., Ph.D. ........................ Duke
Georgiou, S., Ph.D. .................. Manchester
Kenneal, S., Ph.D. ................. California (San Diego)

**THE MASTER'S PROGRAM**

1. At least one year each of Introductory Organic Chemistry with laboratory* and approved physical chemistry.
2. A minimum of 8 semester hours of approved coursework beyond the introductory level and including the subject areas of genetics and physiology.
3. Biochemistry 511-12 and 515-16.
4. At least 6 hours of advanced seminar courses from the following: 601, 603, 604, 605, 606.
5. Six hours of Master's research and a thesis.
6. A final examination that covers both the thesis and subject matter of the course requirements.

**THE DOCTORAL PROGRAM**

1. Introductory Organic Chemistry*, Introductory Physics*, Differential and Integral Calculus*, approved physical chemistry, and at least 12 hours of biology beyond the introductory level including the subjects of genetics and physiology.
2. Biochemistry 511-12 and 515-16.
3. At least 3 hours of approved graduate courses in chemistry, physics, or other physical science; for example, Chemistry 550, 551, 552, Physics 521, 522, 551. No survey courses will be accepted.
4. At least 6 hours of topics offered in 521 and 621.
5. Participation in 601 and 603 during the entire period of residence.
6. Comprehensive examination, taken before the end of the third year of study.
7. A dissertation reporting the results of original and significant research carried out during the term of candidacy.
8. A final oral examination which will be concerned primarily with the student's dissertation.

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

**Petitioning for Master's Degree**

Students who have passed the comprehensive examination in the Ph.D. program and have completed at least 30 hours of approved coursework for graduate credit, at least two-thirds of which must be at or above the 500 level, may petition the department for award of a Master's degree. The additional requirements for such a degree are:

1. The preparation of a research manuscript suitable for submission for publication in a major scientific journal and oral defense of that manuscript before an examining committee of three faculty members appointed by the head of the department, at least two of whom shall be members of the department; or
2. Publication of at least one full-length paper in a major biochemical journal as senior author.

**GRADUATE COURSES**

410 Cellular and Comparative Biochemistry (4) Electrophorey behavior, chemistry and structure of proteins; enzymes, behavior and biological function, catalysis and energy capture; synthetic metabolism; nucleic acid function, protein synthesis, and biochemical genetics; regulation of biological processes. Prereq: Chemistry 350-60-69 and Biology 110-20. 3 hrs and 1 discussion. F,Sp


471-81 Biophysical Chemistry (3,3) Physicochemical principles with applications to biological systems. 471—Thermodynamics; chemical equilibrium; solution chemistry. 478—Intermolecular forces; membrane structure and function. 481—Elementary quantum chemistry; interactions of light with biological molecules; optical and magnetic spectroscopy; light scattering; case studies of selected macromolecules. Prereq: Calculus, Organic Chemistry, General Biology or consent of instructor. (Same as Chemistry 471-81). F,Sp

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

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

511 Advanced Concepts in Protein Structure, Protein Function and Intermediary Metabolism (4) Protein structure and function; enzyme activity; intermediary metabolism; membrane structure and function. Original literature and review articles. Contempormary experimental techniques. Prereq: 410, 420 or consent of instructor. 3 hrs and 1 discussion. F

512 Advanced Molecular Biology (4) Replication, repair, transcription, translation and control mechanisms. Prior knowledge in molecular and cellular biology. Prereq: 511 or Life Sciences 511. 3 lectures and discussion. (Same as Life Sciences 512.) Sp

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

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

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

525 Graduate Research Participation (3) P/NP only. E

561 Environmental Toxicology (3) Basic concepts in toxicology; molecular toxicology and detoxification; reproductive toxicology; mutagenesis, teratogenesis, carcinogenesis; pathways and changes in environmental impact. Prereq: 410, Chemistry 350-60-69 or consent of instructor. (Same as Ecology 561.) F

562 Techniques in Environmental Toxicology (1) Experimental techniques for assessment of presence, toxicity, and impacts of pollutants in global ecosystem. Laboratory exercises on analytical, biochemical, and bioassay methods in toxicological studies. Prereq: 419 or quantitative analysis. 561 and Chemistry 350-60-69. (Same as Ecology 562.) Sp

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

601 Advanced Biochemistry Seminar (1) Invited speakers. Topics in biochemistry. Required every semester in residence. S/NC only. F,Sp

603 Current Topics in Biochemistry (1) Seminars and lectures dealing with current advances in field of chemistry. Required every semester in residence. S/NC only. F,Sp

604 Current Topics in Environmental Toxicology (1) Critical reviews of research problems and methods in environmental toxicology, behavioral toxicology, biochemical and ecological effects, biostatistics and epidemiology. Presentations by students, faculty and guest lecturers from academic, industrial and governmental agencies. May be repeated with consent of department. Maximum 4 hrs. (Same as Ecology 604.) S/NC only. F,Sp

605 Current Topics in Regulation of Protein Function (1) Contemporary aspects of regulation of protein by phosphorylation-dephosphorylation allosteric interac-
current Topics in Biological Membrane Re-
tions. Prereq: 410 or equivalent. May be repeated. 
Maximum 6 hrs. S/NC only. F,Sp

666 Current Topics in Biological Membrane Re-
terstahl, Howie, Peggy, D.Sc., Harvard

606 Current Topics in Biological Membrane Re-
ations. Prereq: 410 or equivalent. May be repeated. 
Maximum 6 hrs. S/NC only. F,Sp

621 Advanced Topics (1-3) Biochemical and bio-
physical methods, mechanisms of enzyme catalysis, 
gene expression, membrane structure and function, 
metabolic regulation, physical biochemistry. Prereq: 
511-12 or consent of instructor. May be repeated. Max-
imum 9 hrs.

Biomedical Sciences

(Office of the Provost)

MAJOR DEGREES

Biomedical Sciences M.S., Ph.D.

Raymond A. Popp, Director

Professor:

Olins, Donald E., Ph.D., Rockefeller

Research Professor:

Rinchik, Eugene M., Ph.D., Duke

Research Associate Professor:

Chang, Lan-Yang, Ph.D., Vanderbilt

Research Assistant Professor:

Foote, Robert S., Ph.D., Duke

Shared Faculty:

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

Barwick, Gerald J., Ph.D., Pennsylvania

Cook, John S., Ph.D., Princeton

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

Fujimura, Robert K., Ph.D., Wisconsin

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

Hartman, Fred C., Ph.D., Tennessee

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

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

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

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

Lee, Kai-Lin, Ph.D., Tulane

Littlefield, Gayle, Ph.D., Georgia

Marchok, Ann C., Ph.D., Connecticut

Mazzur, Peter, Ph.D.

Mitra, Sankar, Ph.D., Wisconsin

Mural, Richard, Ph.D., Georgia

Niyogi, Sallik, Ph.D., Northwestern

Pop, Raymond A., Ph.D., Michigan

Preston, R. Julian, Ph.D., Reading

Richard, James D., Ph.D., Harvard

Richard, R., Ph.D., New Mexico

Rinchik, Eugene M., Ph.D., Duke

Russell, Lane B., Ph.D., Chicago

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

Shugart, Lee H., Ph.D., Tennessee

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

Solomon, A., M.D., Duke

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

Terzaghi-Howie, Peggy, D.Sc., Harvard

Vo-Dinh, Tuan, Ph.D.

Waters, Larry C., Ph.D., Georgia

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

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

The University of Tennessee-Oak Ridge
Graduate School of Biomedical Sciences, lo-
cated within the Biology Division of Oak Ridge 
National Laboratory, offers programs leading to 
the Master of Science and the Doctor of Phi-
losophy. The National Laboratory is a well-
known center of basic research. The school uti-
lizes the staff and facilities of this laboratory and 
thus brings directly into the mainstream of full-
time graduate study in the life sciences the tal-
et and experience of that staff, as well as the 
most advanced research methods and technol-
y.

The program of study, which incorporates 
a high faculty-to-student ratio, is based on inten-
sive graduate courses supplemented by tutorial 
instruction, participation in a wide variety of 
seminars, and a heavy emphasis on communica-
tion skills, research training, and independent 
study. The program encourages students to pur-
se graduate studies to the limits of their abili-
ties.

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

The concentration areas available for 
Master's thesis and Ph.D. dissertation work are 
biochemistry, biophysics, carcinogenesis, 
genetics, cellular, developmental and mam-
alian biology, and radiation biology. Included 
are such subjects as immunology, protein and 
enzyme chemistry, nuclear life sciences, cy-
tology, radiation and environmental biology, vi-
rology, developmental biology, experimental pa-
thology, microbial and mammalian genetics, 
mutagenesis, and problems of aging.

ADMISSION REQUIREMENTS

A bachelor's degree or its equivalent is re-
quired. Students with B.S., B.V.M., or M.D. 
degrees are also encouraged to apply. Com-
pleted applications, Graduate Record Examina-
tion scores and letters of reference should be 
sent to the address below. The student will need 
presentation in biology, calculus, physics, and or-
ganic and physical chemistry. A course in 
physical chemistry is offered by the school in or-
der to meet the last requirement. It is recom-
manded that deficiencies in preparation, as 
identified in the admission process, be elimi-
nated prior to entrance.

Requests for application forms, information 
on admission, financial support, and housing 
should be sent to Director, University of 
Tennessee-Oak Ridge Graduate School of Bi-
omedical Sciences, Biology Division, ORNL, 
Box 2008, Oak Ridge, Tennessee 37831-8077.

THE DOCTORAL PROGRAM

1. Satisfactory (B grade or better) comple-
tion of the following courses or their 
equivalent: Biochemistry (511); Biophysical Bio-
chemistry (514); Cell Biology (515); Molecular 
Genetics (517); Cell Biology (518-19); Com-
puting for the Life Sciences (525); and Statistics 
for Biologists (574).

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

3. Participation in at least one of the se-
minars during each term of residence after the 
first year. Students may be released for a satis-
factory completion of formal advanced courses 
in the areas of the student's interests. The 
number and nature of the required advanced 
courses will vary depending upon the student's 
background and area of specialization.

4. A dissertation resulting from original 
and significant scientific research. A 
minimum of 24 semester hours of coursework 
is required.

5. A final oral examination on the disserta-
tion.

6. A formal seminar presentation of the dis-
sertation research.

SPECIAL MASTER OF SCIENCE DEGREE 
PROGRAM

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

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

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

3. For admission to candidacy: Completion 
of any required prerequisite courses and one 
semester of graduate coursework with a B 
average. Admission to candidacy forms must be 
filed at least one full semester prior to receipt of 
degree.

4. A Master's committee of three approved 
faculty members upon admission to candidacy.

5. A thesis reporting results of original and 
significant scientific research.

6. Passing a final oral examination.

GRADUATE COURSES

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

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

507 Physical Chemistry (3) Thermodynamics; phase 
equilibria; chemical equilibrium; electrolyte force; 
surface chemistry; electrolyte solutions; kinetics; conduc-
tivity; viscosity; diffusion.

511 Biochemistry (3) Chemistry of carbohydrates, lip-
ids, proteins, and enzymes; enzyme kinetics interme-
diate metabolism and photosynthesis; biosynthesis of 

514 Biophysical Biochemistry (3) Chemistry met-
abolism and biosynthesis of purines, pyrimidines 
and nucleic acids; biosynthesis of DNA, RNA, and proteins. 
Energy levels and excited states of large molecules; 
photoreceptors; adaptations to system perturba-
tions, properties of macromolecules in solution; mo-

97
lucular solution; molecular conformations; inter- and intramolecular forces; principles of microscopy. Prereq: 511.

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

517 Molecular Genetics (2) Molecular biology of gene regulation; concepts of chemical carcinogenesis; present current research on mechanisms of gene regulation; protein synthesis; suppression of nonsense and non-sense mutation; gene defects and hereditary diseases. Prereq: 511, 514, and 515.

518 Cell Biology I (3) Structure and composition of major nuclear and cytoplasmic organelles of eukaryotic cells. Pertinent instruments and techniques, melanosis and mitosis; cell cycle; chromosome structure; nuclear RNA metabolism; nucleioli and ribosome biogenesis; survey of specialized cells. Structure of genetic transcription and translation in bacteria. Coreq: 511.

519 Cell Biology II (3) Comparative biochemical approach to cell structure and function. Membrane systems and metabolism; development and function of mitochondria, chloroplasts, peroxisomes and other organelles as related to metabolism and regulation; transport phenomena, cell cycle; cell products; interaction of cells; fever. Prereqs: 511, 517, and 518.

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

531-32-33 Biomedical Sciences Laboratory (3,3,3) Approaches and technologies in various areas of mod- ular biology. Students spend a semester in each of three laboratories conducting research in different areas of biomedicale science. Required of all first-year students. 543-46-49 Graduate Research Participation (3,6,9) Special advanced research project not related to disser- tation research. Topics chosen with consent of instruc- tor. May be repeated.

551-52-53 Special Topics in Biomedical Sciences (3,3,3) Either tutorials or formal lectures. Potential topics: X-ray diffraction and cryocrystallography; excited-state biophysics; physical chemistry or macromolecules; pathol- ogy; mammalian genetics coverage.


574 Statistics for Biologists (2) Application and inter- pretation of statistical methods in data analysis. Random variation; normal, binomial, and Poisson distribution, sta- tistical testing; confidence intervals, means, variances, and variance; confidence intervals; tests of significance for comparing samples; analysis of variance; contingency tables; Chi-square tests; correlation and association; lin- ear regression. Prereq: Statistics 201 or consent of in- structor.

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

622 Enzyme Regulation and Kinetics (3) Kinetics of catalysis: inhibition by product, substance and dead inhibitors; simulation and inhibition of allosteric enzymes, types of feedback regulation; role of sub-units in enzyme multicomponent systems. Prereq: 511, 514, and 515.

624 Chemistry and Metabolism of Lipids (2) Nomen- clature, chromatographic isolation, chemistry, physical properties, and enzymology and lipids. Hormonal action of prostaglandins and role of lipids in membranes; en- zymic expression, and nervous tissue. Lipid biochemis- try of mammals. Comparative aspects, lipid pathways in bacteria and yeast. Prereq: 511, 514.


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


641 Techniques in Cell Biology (3) Basic concepts of cell biology techniques, their application to specific re- search problems, kind of data yield, and cautions in data interpretation. Laboratory demonstrations may be ar- ranged where appropriate. Prereq: 511, 514, 518, 519.

651-52-53 Advanced Topics in Biomedical Sciences (3,3,3) Current and future research developments: pro- tein synthesis, protein chemistry and enzyme mecha- nisms; cyrobiology, and special topics. Either as tutorial or literature survey requiring substantial student prepa- ration. May be repeated.

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


Botany

(College of Liberal Arts)

MAJOR

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

Karen W. Hughes, Head

Professors:

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

Oetbsch, E. C., Ph.D. .................. Duke

DeSelm, H. R. (Emeritus), Ph.D. .......... Ohio State

Evans, A. M., Ph.D. .................. Michigan

Herndon, W. R. (Distinguished Prof.), Ph.D. .... Vanderbilt

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

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

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

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

McCormick, J. F., Ph.D. ............... Emory

Mullin, B., Ph.D. .................. NC State

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

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

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

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

Wall, R. A. (Distinguished Prof.), Ph.D. ... Texas

Associate Professors:

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

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

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

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

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

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

Lecturer:

McFarland, K., Ph.D. .................. Tennessee

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, bry- ology, cytology, ecology, genetics, lichenology, morphology, mycology, phytodiversity, physiology, cytology, and taxonomy.

Educational service is required of each graduate degree candidate and such service will include teaching or/and ancillary services performed in the department related to the instruction of courses.

For further information, contact the De- partment Head or the Graduate Coordinator.

ADMISSION REQUIREMENTS

The Botany Department requires scores from the general and subject biology portions of the Graduate Record Examination, at least three letters of recommendation or standard recommendation forms from academic or professional persons, a short statement describ- ing reasons for interest in graduate edu- cation in botany, and the following academic requirements:

1. Bachelor's degree: a B.A. or B.S. from an accredited college or university with a cumulative grade-point average of 2.5 or better (on a 4.0 scale), with evidence of ability to do work of graduate quality.

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

3. Advanced botany or closely allied bio- logical sciences: 12 semester hours.

4. Physical sciences: general inorganic chemistry: 8 semester hours; organic chemistry. Physics highly recommended.

5. College mathematics: 6 semester hours including 1 term of calculus.

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

THE MASTER'S PROGRAM

The program for the Master of Science is patterned to fit the needs of students who desire a less extensive course of study than the Ph.D. program. However, the student must be equally well prepared and display an aptitude and ability for advanced study. The M.S. includes thesis and non-thesis options.

Thesis Option

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

1. Satisfactory preparation of a written formulation and an oral defense to the student's committee of a research proposal suitable for a thesis. This must be completed before enrollment in Botany 500.

2. Successful completion of 30 hours of graduate credit, at least two-thirds of which must be at the 600 level or higher.

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


5. Presentation of a 30 minute departmental seminar.

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

Non-Thesis Option

Satisfactory completion of 34 semester hours of approved graduate courses of which 30 semester hours must be in botany including Botany 503. At least two-thirds of the hours must be at the 600 level or higher.

Satisfactory completion of two hours at the 600 level.

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

Satisfactory performance on a final written examination on all work offered for the degree. The student's committee may also require that an oral examination follow the written examination.

THE DOCTORAL PROGRAM

The Doctor of Philosophy program is patterned on training that involves independent research within the student's area of concentration. Although there is no formal program of coursework, the student's committee may require specific courses for the completion of the degree. Most students spend from three to five years working on their Ph.D.

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

1. Satisfactory presentation of a research proposal by means of a written proposal and an oral defense to the student's committee. This must be completed before enrollment in Botany 600.

2. Satisfactory performance on a written comprehensive examination.

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

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

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


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

Note: The listed requirements for the M.S. and Ph.D. degrees should be interpreted as minimal requirements. Specific stipulations or requirements such as additional foreign languages or an additional oral comprehensive examination may be required by the student's faculty committee.

GRADUATE COURSES

401-02 Field Studies in Botany (3,3) Field experience and taxonomy of special plant groups. Topics vary: botany, lichenology, pteridology, agrology, mycology, phycology, aquatic vascular plants, sylvantherology, woody plants, and botanical photography. May be repeated under different topic. Maximum 9 hrs.


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

426 Paleobotany and Palynology (3) (Same as Geology 426.)

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

451 Plant Tissue Culture (3) Methods for culture of cells, tissues, and organs; media preparation and maintenance of cultures. Prereq: 110-20 or Biology 110-20 or equivalent and Chemistry 120-30 or equivalent. Recommended prereq: 310-20, 321, 512; Microbiology 310 or 319; Ornamental Horticulture and Landscape Design 330; and Plant and Soil Science 331.

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

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

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

503 Non-Thesis Research (2) Library, field, or laboratory research under supervision of staff member. Not for thesis candidates. May be repeated. Maximum 4 hrs. E.

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

507 Biological Illustration (3) Principles and applications of photography (B/W and Color) photomicrography, drawing, graphics and video for recording and documentation for research and publication of data in pictorial and graphic form.

509 Morphology and Evolution of Basidiomycetes (4) Structure and function of sexual and asexual life cycles as applied to evolution in group. Cultures and specimens in laboratory. Prereq: 310 or equivalent.

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

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

521-22 Advanced Plant Physiology I, II (3,3) 521- Plant biochemistry and metabolism: respiration, photosynthesis, carbon partitioning, and biosynthesis of special plant groups. (F) 522- Growth and differentiation of plants at molecular, cellular and organismic levels. Hormonal regulation of development; macroecological interpretation of differentiation, dormancy, germination, flowering and senescence. Prereq: Introduction to Biochemistry 110 for 521; instructor consent for 522. F.A.

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

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

536 Plant Communities and Plant Geography (4) Plants in communities and their classification and ordination; geographic distribution and its climatic and soils relationships. Prereq: 431. (Same as Geography 536.)

537 Natural Resource Management and Environmental Assessment in Mediterranean Regions (3) (Same as Ecology 537 and Planning 535.)

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


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

556 Phytophytoplancton Ecology (3) Interaction between environment and phytoplankton. Nutrient uptake, primary production, competition, ecological theory applied to phytoplankton populations and development of populations to environment. Prereq: 310 or consent of instructor.

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

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

590 Bryophytes and Pteridophytes (4) Taxonomy, phylegy, ecology and developmental morphology; field studies and current research. Prereq: 310 or and consent of instructor. 2 hrs and 2 labs. F.A.

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

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

583 The Field Research Problem (3) Conceptualization, planning, and implementing field research. Criteria for choosing instruments, sampling methods, and selecting locations for study of populations, communities, and ecosystem. Field practice. Development and critique of formal research proposal like those required by granting agencies. Prereq: 431 or 535 or 573.

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

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

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

606-07 Advanced Topics in Botanical Sciences (1-3, 1-3) Experimental and theoretical science; chemotaxonomy, morphology and systematic of vascular plants, cryptogamic botany, cytology and cell biology, genetics, plant physiology, palynology and ecology. May be repeated. Maximum 12 hrs.
632 Ecosystems of the World (2) Characterization of world and regional ecosystems; special characteristics of ecosystem function. F, A
637 Applied Ecology (3) (Same as Ecology 637.)
662 Seminar in the History of Botany (2) History of botanical exploration and advances from early civilized to modern periods. May be repeated. Maximum 4 hrs.

Broadcasting
(College of Communications)

MAJOR DEGREES
Communications .................................. M.S., Ph.D.
Norman R. Swan, Head
Professors:
Holt, Darrel W. (Emeritus), Ph.D. ............... Northwestern
Howard, Herbert H., Ph.D. ....................... Ohio
Swan, Norman R., Ph.D. ......................... Missouri
Associate Professor:
Moore, B. A., Ph.D. ............................... Ohio
Assistant Professors:
Buchman, Joseph, Ph.D. ........................... Indiana
Manning-Miller, Carmen, Ph.D. ................. Indiana
Ziegler, Dhyana, Ph.D. ............................ Southern Illinois
Adjunct Professor:
Nelson, Lindsay, B. A. ............................. Tennessee

The Department of Broadcasting 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.

GRADUATE COURSES
410 Television News (3) Writing, reporting, performing, and producing news for television. Experience as reporter/producer for television news program. Electronic news gathering equipment and techniques, video editing. Prereq: 310. 1 hr and 4 labs. E
420 Radio-TV Sales and Promotion (3) Problems and practices of television, radio, and cable sales and promotion. Case studies in sales, sales management, pricing, rate cards, use of rating, and sales presentation. Effective station promotion techniques. Prereq: 320 F
430 Producing for Television (3) Principles of television studio and field production, both technical and creative. Writing, producing, shooting, and editing video stories and programs, 3/4" cameras, recorders, and editing system. Prereq: 330. E
490 Radio & Television Management (3) Business policies and practices of broadcast operations, departmental function, cost and income analysis, leadership styles and techniques, mid-level management. Capstone course to be taken in student's last semester. Prereq: 275, 310, 320, 330. E
560 Radio & Television Law and Regulations (3) Legal problems faced by broadcast managers. Philosophies of regulatory policy formation. Efforts at self-regulation, Sociopolitical restraints, effects of laws and regulations, and public pressure on stations, networks, cable and new technologies. Unique situation of broadcasting among media in terms of regulations. Prereq: Consent of instructor or admission to program. F
570 Radio & Television Research (3) Various techniques used by stations and consultants in broadcast research. Applied audience research. Deciding which method to use, interpreting results, and applying research to management decision making. Prereq: Communications 512 or 612, or consent of instructor. Sp
580 Seminar in Radio & Television (3) Salient issues in broadcasting. Topics vary. International broadcasting, cable television, new technologies, corporate television, educational and public broadcasting, broadcasting and society. Prereq: Consent of instructor or admission to program. F
590 Advanced Radio & Television Management (3) Financial management of broadcast operations: budgeting, financing, financial planning, accounting, and related techniques. Theoretical perspectives in broadcast management, organization and management of commercial and non-commercial operations from perspective of general manager. Prereq: 490. Sp
597 Independent Study (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
598 Internship (3) Full-time (30-40 hrs per week) work experience in news, production, or sales and management with non-university professional organization. Educational experience beyond that available at university. Final term paper. No retroactive credit for previous work experience. Prereq: Senior or graduate standing, completion of at least 1 hrs of broadcasting courses, GPA 3.0 or better, and consent of department head.

Business Administration
(College of Business Administration)

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

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

To obtain application materials, write or call: Associate Dean for Graduate Business Programs, Suite 527, Stokely Management Center, College of Business Administration, The University of Tennessee, Knoxville, TN 37996-0550, Telephone: (615) 974-5033.

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

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

THE MBA PROGRAM

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

The complete MBA program with a concentration in management or new venture analysis and entrepreneurship is offered for part-time evening students. The part-time program has the same admissions requirements, curriculum, and faculty as the full-time program. Part-time students enter in the fall semester and take approximately 4 years to complete the program. Part-time students are required to successfully complete six hours of graduate credit per semester.

The program consists of 14 MBA core courses and 5 concentration/elective courses. Each course is 3 semester hours of graduate credit with the exceptions of Business Administration 501 and 503, which are one semester hour of graduate credit each.

Admission Requirements

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

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

For admission to the MBA program, consideration is given to (1) applicant's academic record with particular attention to the last two years of undergraduate work and previous graduate studies, (2) scores on the GMAT and the Test of English as a Foreign Language (TOEFL) for those whose native language is not English, (3) work experience and other activities that demonstrate potential for leadership, and (4) recommendations from professors and work supervisors. The admission decision is based on all factors which make up the total application; therefore, there is no automatic cut-off for either grade point averages or GMAT scores.
Prerequisites

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

MBA Core

The following courses are required in each student's program. For full-time students, the sequence of core courses is:

Third semester: Economics 503, Business Administration 506.
The same courses, but in a different sequence, comprise the core for part-time students.

Concentration and Electives

A concentration area may be indicated on the MBA Program Application or this declaration may be deferred until after matriculation. In any event, selection must be made no later than completion of 18 hours of MBA program coursework. In some cases selection of an area early in the program is encouraged to facilitate proper course sequencing. Requests for changes in concentration area must be submitted for approval to the Office of Graduate Business Programs.

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

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

The remaining elective courses (1 to 2) must be in fields outside the concentration area, normally selected from MBA courses offered in other departments of the college. Courses outside the College of Business Administration as well as courses listed in the Graduate Catalog numbered below 500 may be included in this block only with written prior permission via formal petition to the Office of Graduate Business Programs.

Transfer Credits

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

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

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

Other Requirements

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

To qualify for the degree, the student must achieve a B average (3.0) or above in MBA core courses required in his/her program, a B average or higher in courses comprising the concentration area, and a B average or higher in the overall program. The student must demonstrate competency in these areas in a comprehensive exam administered in the capstone course, Business Administration 509.

BUSINESS ADMINISTRATION CONCENTRATION

For complete listing of MBA program requirements, see above.

MBA Concentration: New Venture Analysis and Entrepreneurship.

The concentration is comprised of three specific courses which are interdisciplinary in nature. This concentration strives to build a strong academic foundation for both entrepreneurial and intrapreneurial activities.

The new venture analysis and entrepreneurship concentration is offered to both the full- and part-time student in recognition of the growing trend in American business today towards new product/venture development. The new venture analysis/entrepreneurship concentration courses may be combined with two elective courses in another area (management or marketing) to achieve a dual concentration.

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

PRE-MBA PROGRAM

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

Admission requirements are higher than those normally expected of MBA applicants.

Desired qualifications include a minimum 3.4 GPA and a GMAT score of 600 or higher.

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

Upon admission, students begin MBA coursework in the fourth year and are awarded a BA degree at the end of that year. Students take 3 hours of graduate coursework during their senior year under the senior privilege rule, which requires them to notify The Graduate School in advance of the course for graduate credit. Upon successful completion of the fifth year, the student receives the MBA degree.

DUAL J.D.-MBA PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferred degrees of Doctor of Jurisprudence and the Master of Business Administration. The dual program saves the student approximately one semester over the time that would be required to earn both degrees independently.

The establishment of the dual program recognizes the increasingly complex body of knowledge necessary to the creative conduct of business and business-related law practice, the complementary nature of many aspects of the graduate programs of the College of Law and the College of Business Administration, and the intellectual benefits inherent in the concurrent study of both business and business-related law. The program is designed to accommodate the interests of students who (a) contemplate a career in public service and want to acquire the skills and perspective of the lawyer and the business-oriented manager or (c) contemplate a career as a lawyer specializing in business-related law and want to acquire the skills and perspective of the business-oriented manager.

Admission Requirements

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

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program studies be started prior to entry into the last 28 semester hours of J.D. coursework and prior to entry into the second year of the MBA program. Students interested in entering the dual degree program should submit a letter of application to the Dual Program Committee.

Upon receipt of the application, the Dual Program Committee will evaluate eligibility and assign students to advisors who will be
THE DOCTORAL PROGRAM

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

Admission Requirements

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

Under exceptional circumstances, a student may be considered for acceptance into the Ph.D. program with a Master's degree. An applicant in this situation should have an outstanding undergraduate background and should represent a deep and sincere commitment to the pursuit of a career in research and instruction.

Program of Study

The Ph.D. normally requires at least three years of intensive study and research beyond the Master's degree. The first two years of a student's program consist of coursework, writing, and research. The third year usually focuses on completion of the dissertation research and writing. It is emphasized that the Ph.D. program of study is structured for full-time students only. Upon acceptance of a student by a particular department, the student is expected to remain in that department. A dissertation has been completed and all requirements are met for completion of the Ph.D.

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

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

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

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

More detailed information concerning these specific areas is available by writing directly to each department chairperson and by referring to the appropriate fields of instruction.

Degree Requirements

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

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

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

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

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

3. Basic Core: A grade of 501 (or approved substitute) is required, except that Management 567 (or equivalent) may be substituted with prior approval.

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

5. Concentrations: The concentration is the focal point of the Ph.D. program. Students are expected to master the literature and research techniques in the concentration area and to do quality research as evidenced by the preparation of an acceptable dissertation. A minimum of 12 semester hours of coursework is required, including at least 9 hours of doctoral seminars. Graduate work taken in the concentration at other institutions is considered by the temporary doctoral advisory committee in approving the specific coursework required. Available concentrations are: accounting, finance, management (operations management and strategic management), marketing, and logistics/transportation. A related area in another school or college of the University.

Approved Dual Credit

MBA courses to be counted toward the J.D. program must include Accounting 501, 503 or a more advanced graduate accounting course and 6 semester hours approved by the College of Law. Law courses to be counted toward the MBA must be selected from those approved by the Associate Dean for Graduate Business Programs.

Awarding of Grades

Grades for graduate business courses accepted by the College of Law and grades for law courses accepted by the College of Business Administration will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college in which such grades are so converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used on a regular graded basis for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

Degree Requirements

The approval of courses is the responsibility of the Associate Dean for Graduate Business Programs. Specific majors may have prerequisites not listed above.

Admission Requirements

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

Under exceptional circumstances, a student may be considered for acceptance into the Ph.D. program with a Master's degree. An applicant in this situation should have an outstanding undergraduate background and should represent a deep and sincere commitment to the pursuit of a career in research and instruction.

Program of Study

The Ph.D. normally requires at least three years of intensive study and research beyond the Master's degree. The first two years of a student's program consist of coursework, writing, and research. The third year usually focuses on completion of the dissertation research and writing. It is emphasized that the Ph.D. program of study is structured for full-time students only. Upon acceptance of a student by a particular department, the student is expected to remain in that department. A dissertation has been completed and all requirements are met for completion of the Ph.D.

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

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

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

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

More detailed information concerning these specific areas is available by writing directly to each department chairperson and by referring to the appropriate fields of instruction.

Degree Requirements

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

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

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

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

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

3. Basic Core: A grade of 501 (or approved substitute) is required, except that Management 567 (or equivalent) may be substituted with prior approval.

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

5. Concentrations: The concentration is the focal point of the Ph.D. program. Students are expected to master the literature and research techniques in the concentration area and to do quality research as evidenced by the preparation of an acceptable dissertation. A minimum of 12 semester hours of coursework is required, including at least 9 hours of doctoral seminars. Graduate work taken in the concentration at other institutions is considered by the temporary doctoral advisory committee in approving the specific coursework required. Available concentrations are: accounting, finance, management (operations management and strategic management), marketing, and logistics/transportation. A related area in another school or college of the University.

Approved Dual Credit

MBA courses to be counted toward the J.D. program must include Accounting 501, 503 or a more advanced graduate accounting course and 6 semester hours approved by the College of Law. Law courses to be counted toward the MBA must be selected from those approved by the Associate Dean for Graduate Business Programs.

Awarding of Grades

Grades for graduate business courses accepted by the College of Law and grades for law courses accepted by the College of Business Administration will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college in which such grades are so converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used on a regular graded basis for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

Approved Dual Credit

MBA courses to be counted toward the J.D. program must include Accounting 501, 503 or a more advanced graduate accounting course and 6 semester hours approved by the College of Law. Law courses to be counted toward the MBA must be selected from those approved by the Associate Dean for Graduate Business Programs.
Comprehensive Examinations

Comprehensive written examinations over the concentration and cognate areas are required of each person seeking candidacy for the Ph.D. The concentration area examination is administered in two sessions of approximately four hours each and the cognate area examination in one session of approximately four hours. Written examinations may be supplemented with oral examinations. For a doctoral student having earned a cognate area in the College of Law, the results of only an oral examination may be deemed acceptable. Scheduling of comprehensive examinations is coordinated through the Office of Graduate Business Programs. Comprehensive examinations are generally offered during the fall and spring terms. Comprehensive examinations must be taken within five years of matriculation.

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

Doctoral Committee

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

Admission to Candidacy

Students may apply for admission to candidacy for the Ph.D. after maintaining at least a "B" average in coursework, successful completion of comprehensive examinations, and acceptance of a research proposal for the dissertation by the student's doctoral committee. Admission to candidacy must be approved by at least one full semester prior to the date the degree is conferred. (Admission in the fall permits graduation in the following spring semester.)

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

Dissertation

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

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

GRADUATE COURSES

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

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

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

510 Economics, Marketing and Management of Service Organizations (3) Unique role, pricing, marketing, and management issues created by the inability of service organizations to inventory output for later resale. Modification of traditional business concepts for organizations that manage service capacity rather than producing inventory.

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

Chemical Engineering

(College of Engineering)

MAJOR

Chemical Engineering

DEGREES

M.S., Ph.D.

Joseph J. Perona, Head

Professors:

Bogue, Donald C., Ph.D. Delaware
Byers, Charles H. (Adjunct), Ph.D. California
Edward S., Ph.D. California
Frazier, George C., Jr. (Condra Prof.), Ph.D. Northwestern
Johnson, Homer F. (Emeritus), Ph.D. Pennsylvania
Perona, Joseph J., Ph.D. Tennessee
Scott, Charles D. (Adjunct), Ph.D. Tennessee
Thomas, Carl O., Ph.D. Tennessee
Watson, Jack S., Ph.D. Tennessee

Associate Professors:

Basaran, Osman A., Ph.D. Minnesota
Bienenkowski, Paul R., Ph.D. Purdue
Blaske, Thomas W. (Research), Ph.D. Texas
Bruns, Durante D., Ph.D. Houston
Cochran, Henry A. (Adjunct), Ph.D. MIT
Counse, Robert M., Ph.D. Wisconsin
Hansen, Marion G., Ph.D. Wisconsin
Scott, Timothy C. (Adjunct), Ph.D. Wisconsin
Sheth, Atul C. (UTSI), Ph.D. Northwestern

Doctoral Committee must ensure the Master of Science.

The standard Master's program includes a thesis and leads to the Master of Science. Minimum departmental requirements are as follows:

1. A total of at least 21 hours in graduate coursework in chemical engineering and related areas excluding thesis. The minimum requirements are 15 hours in chemical engineering, 3 hours in other engineering, scientific, or business areas (as approved by the departmental faculty); and 3 optional hours from either one of these two categories.


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

4. A final oral examination covering the thesis, related fields and graduate coursework.

Under certain conditions, a candidate may apply for a non-thesis program. To be eligible, a candidate must show evidence of significant professional experience after the baccalaureate degree; at least five years of industrial experience or research publications would be examples of such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the non-thesis option are as follows:

1. A total of at least 33 hours in graduate courses in chemical engineering and related areas. The minimum requirements are 18 hours in chemical engineering; 6 hours in other engineering, scientific, or business areas (as approved by the departmental faculty), and 9 optional hours from either one of these two categories.

2. Completion of a critical review of the literature and other sources in an area related to chemical engineering (ChE 660).

3. A written comprehensive examination over the major field and an oral examination covering the review paper and related areas.

THE DOCTORAL PROGRAM

Students applying for entrance into the doctoral program must submit evidence of ability to perform and report independent research to the satisfaction of the department. The Master's thesis may be offered as such evidence. Departmental requirements consist of the satisfactory completion of:

1. Graduate courses in chemical engineering, amounting to approximately 24 semester hours, at least 9 of which must be in 600 series courses.

2. Supporting courses in related scientific and engineering fields amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These

Chemical Engineering
related fields will normally include chemistry, mathematical physics, and engineering.

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

GRADUATE COURSES

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

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

415 Computer Applications in Chemical Engineering (3) Use of existing personal computer programs. Flow sheet simulators, statistics, spreadsheets, graphics and process modeling.

440 Transport Phenomena (3) Momentum, heat and mass transport, analogies, differential and macroscopic balances, applications involving molecular diffusion, simultaneous mass transfer and chemical reaction. Prereq: 360.


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

486 Coal Processing to Liquid Fuels (3) Characterization and conversion of coal with respect to current gasification and liquefaction technologies; modeling of conversion processes and estimation of product yields and associated water, oxygen, and energy requirements; catalytic hydrogenation and reactor design consideration; economic assessments. Prereq: 485.

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

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

505 Engineering Analysis (3) Formulation and solution of problems in mathematical and materials areas, ordinary and partial differential equations; types of ODE, PDE and solution techniques; transform methods; conformal mapping; variational methods; introduction to numerical methods. (Same as Materials Science Engineering 505.)

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

507 Application of Numeric Linear Algebra in Systems and Control Engineering (3) Fundamental concepts of linear algebra to problems in systems and control areas. Geometric and physical interpretations of relevant concepts: least squares problems, LU, QR, and SVD decompositions of matrix, eigenvalue problems and similarity transformations in solving difference and differential equations. Numerical computational aspects of various algorithms. Application of linear algebra concepts in optimization studies, introduction to linear programming, computer projects. Prereq: Graduate standing or consent of instructor. (Same as Electrical and Computer Engineering 507 and Mechanical Engineering 507.)


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

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

542 Diffusive and Stagewise Mass Transfer Operations (3) Analysis of mass transfer phenomena, coupled mass transfer and reaction techniques with packed towers and agitated vessels, membrane separation. Equilibrium stage concepts applied to mass transfer operation, maximizing nonisothermal and multicomponent systems.

551 Chemical Reactor Analysis (3) Rate models for heterogeneous reactions, properties of porous cata-

561 Process Modeling and Simulation (3) Theories and structures of models and art of simulation, model development from basic principles. Model development from plant test. Use of models in operation, optimization and control. Prereq: Consent of instructor.

575 Applied Microbiology and Bioengineering (3) Crossdisciplinary course combining basic concepts in microbiology, biochemistry, reaction kinetics, and biochemical and environmental engineering. Commercial processes, biodegradations/wastewater treatment, analysis of biochemical reactor systems, biosensors, and immobilization methods. Fundamental laboratory techniques during 6-week laboratory period. (Same as Environmental Engineering 575 and Microbiology 575.)

576 Principles of Chemical Separations (3) Fundamental aspects of chemical and biochemical separation methods with emphasis on separations as unified field, separation techniques and applications from both chemical and biochemical fields; development of predictive mathematical models. (Same as Environmental Engineering 576.)

577 Modelling and Design of Bioreactor Systems (3) Discussion of different classes of models: structured, unstructured, discrete and continuous. Parameter estimation and model discrimination, methods for measurement of model parameters, indirect component balancing and stoichiometric balancing. Shuler's model, Herbst's model, stability-steady state analysis; dynamics, lag sterilization, and sterilization of fed-batch, batch and continuous commercial bioreactors. Important design considerations: analytic methods and bio-sensors, oxygen and heat transfer, growth parameters, design and operation of fed-batch, batch and continuous commercial bioreactors. Important design considerations: analytic methods and biosensors, oxygen and heat transfer, growth parameters, gene transfer and sterilization. Advanced bioreactor concepts with emphasis on continuous operation. Col-


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

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

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

60 Chemistry

691 Advanced Topics of Chemical Engineering (3) May be repeated. Maximum 6 hrs.

757 Microbial Systems Analysis (3) Identification and analysis of complex microbial systems using perturba-

780 Technical Review and Assessment (3) Preparation of critical review of literature in area related to chemical engineering. Limited to candidates in non-
Schwartz, George K. (Distinguished Prof.), Ph.D. Illinois
Smith, W. T. (Emeritus.), Ph.D. Ohio State
VanHook, W. A., Ph.D. Johns Hopkins
Wehry, E. L., Ph.D. Purdue
Williams, T. F. (Distinguished Prof.), Ph.D. London
Wood, J. H. (Emeritus), Ph.D. North Carolina
Wunderlich, B. (Distinguished Scientist), Ph.D. Northwestern

Associate Professors:
Adcock, J. L., Ph.D. Texas
Alexandratos, S. D., Ph.D. California
Bartmess, J. E., Ph.D. Northwestern
Cook, K. D., Ph.D. Wisconsin
Kovac, J. D., Ph.D. Yale
Lane, C. A., Ph.D. California
Schell, F. M., Ph.D. Indiana
Sepaniak, M. J., Ph.D. Iowa State
Woods, C., Ph.D. NC State

Assistant Professors:
Barrows, C. E., Ph.D. Stanford
Feigl, C. S., Ph.D. Colorado
Shibata, J. H., Ph.D. Washington

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

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

THE MASTER'S PROGRAM

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

The requirements for the M.S. in Chemistry consist of the satisfactory completion of:

1. Research and a thesis to give at least 24 hours of graduate credit in Chemistry 600. Registration must be continuous from the beginning of seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar. (No more than 2 hours may be applied to the course requirements.)

2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar. (No more than 2 hours may be applied to the course requirements.)

3. Prescribed remedial courses based on performance on entrance examinations.

4. Sufficient graduate coursework in chemistry including quantitative analysis.

5. Demonstration of a reading knowledge of French, German, Russian, or an alternative approved by the Chemistry faculty.

6. Eighteen additional hours in courses at the 400 level or above including at least one course above 500 and one of the following sequences: 510-11-12, 530-31-32, 550-51-52, 53-54, 570-71-72-73, and 590-94-95.

GRADUATE COURSES

430 Advanced Inorganic Chemistry (3) Atomic and molecular structure, bonding theories, descriptive chemistry of elements, kinetics and mechanism of inorganic reactions, applications of modern techniques for characterization, coordination and organometallic chemistry. Prereq. 230. Prereq. or coreq. 380 or 381. Sp

431 Radioactivity and Its Application (2) Radioactive materials in tracer applications.Radioactive decay, detection apparatus and techniques, tracer procedures, safety precautions in agriculture, biology, medicine, nutrition. Not for credit by Chemistry or physics majors or minors. Prereq. Mathematics 122 or equivalent and 1 yr of general chemistry. Sp


471-81 Biophysical Chemistry (3.3) (Same as Biochemistry 471-81.)

473-83 Physical Chemistry (3.3) Students may not receive credit for both 471 and 473 or both for 481 and 483. 473—Properties of gases; first, second, and third laws of thermodynamics; chemical equilibrium; simple phase equilibria; properties of solutions; introduction to statistical thermodynamics; 483—Kinetics of chemical reaction; introduction to quantum mechanics and applications to electronic structure of atoms and molecules; molecular spectroscopy. Prereq. General chemistry, fundamentals or elements of physics, and calculus. C

479-89 Physical Chemistry Laboratory (2,2) Experiments on topics discussed in 471-81 or 473-83. Prereq. or coreq. or preceding courses 471 or 473 or 479 or 481 or 483 for 489. 1 lab. E

484 Advanced Physical Chemistry (3) Chemical dynamics, statistical thermodynamics, quantum mechanics of atoms and molecules, crystal structure and solid state. Prereq. 481 or 483. Sp

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

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

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. Maximum 6 hrs. S/NC only.

505 Special Problems (3) Specially assigned theoretical or experimental work on problems not covered in other courses. Prereq. May be repeated. Maximum 6 hrs. S/NC only.

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

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

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

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

530 Chemical Bonding (3) Wave mechanical atom, group theory, quantum approach to molecular orbital theory, valence, ionic, and metallic bonding, ligand field theories, solid state. Prereq. 1 yr of physical chemistry.

531 Characteristics of Inorganic Compounds (3) Descriptive chemistry of elements, structure, reactions, kinetics, mechanisms, equilibria, and spectra of coordination, organometallic, biorganic compounds. Prereq. 530. Sp

532 Experimental Methods of Inorganic Chemistry (3) Electronic, infrared, Raman, microwave, NMR, ESR, nuclear quadrupole, Mossbauer, mass, and photoelectron spectroscopies for characterization of inorganic compounds. Prereq. 532. F

540 Nuclear and Radiochemistry (3) Nuclear properties, radioactivity, radioactive decay processes, nuclear structure and models, nuclear reactions, radiations and materials, radiation detection. Prereq. 1 yr of physical chemistry.

550 Structure and Reactivity in Organic Chemistry (3) Structure and bonding in organic compounds; molecular orbital theory, stereochemistry, conformational analysis, and molecular mechanics; substituent effects on acidity and reactivity; introduction to reaction mechanisms. Prereq. 360. F


552 Organic Reaction Mechanisms (3) Techniques and principles in study of organic reaction mechanisms; applications and interpretations in polar, radical, and pericyclic reactions; reactive intermediates. Prereq. 550. F

553 Spectroscopic Characterization of Organic Compounds (3) Organic structure elucidation using spectroscopic methods: nuclear magnetic resonance, infrared, ultraviolet, and mass spectrometry. Prereq. 360 or equivalent.

554 Organic Spectroscopy Laboratory (1) Use of IR, UV MS and multinuclear NMR spectrometers. Development of problem-solving ability in area of spectroscopic characterization of organic molecules. Prereq. 360 or equivalent. Coreq. 553. Sp

570 Quantum Chemistry and Spectroscopy (3) Basic principles of quantum mechanics and their applications to molecular orbital theory, molecular structure, and spectroscopy, introduction to group theory. Prereq. 1 yr of physical chemistry.
571 Advanced Quantum Chemistry and Spectroscopy (3) Prereq: 570 or consent of instructor. Sp
572 Thermodynamics and Statistical Mechanics (3) Prereq: 571. F
573 Chemical Kinetics and Transport (3) Time-dependent phenomena in chemistry: chemical kinetics, chemical dynamics, transport theory. Prereq: 1 yr of physical chemistry. F
580 Fundamental Topics in Physical Chemistry (3) Prereq: 571. F
590 Polymer Chemistry (3) Fundamentals of polymer synthesis and characterization through application of organic and physical chemical principles. Prereq: 1 yr each of organic and physical chemistry. F
595 Physical Chemistry of Polymers (3) Conformation of macromolecules, solution and bulk properties, rubber elasticity, kinetics of polymerization, polymer thermodynamics. Prereq: 590 or equivalent. Sp
600 Doctoral Research and Dissertation (3-15) P/NP only. E
601 Chemistry Research Proposal (2) Prereq: 600. F
610 Selected Topics in Analytical Chemistry (3) Topics of current significance. Prereq: 510-11-12 or consent of instructor. May be repeated. Maximum 12 hrs. F
620 Selected Topics in Inorganic Chemistry (3) Topics of current significance. Prereq: 530-31-32 or consent of instructor. May be repeated. Maximum 12 hrs. F
650 Selected Topics in Organic Chemistry (3) Topics of current significance. Prereq: Two of 5501-52 or consent of instructor. May be repeated. Maximum 12 hrs. F
651 Orbital Symmetry Control (3) Application of Woodward-Hoffmann rules and other theories to mechanism and stereochemistry of organic pericyclic reactions. Prereq: Two of 5501-52. F
652 Organic Photochemistry (3) Physical and chemical effects of electron excitation of organic molecules. Experimental and theoretical techniques of photochemical importance. Inter- and intramolecular reactions of alkenes, ketones, dienes, dianions, aromatic compounds, and other photoactive species. Prereq: Two of 5501-52. F
670 Selected Topics in Physical Chemistry (3) Topics of current significance. Prereq: 570-72-73 or consent of instructor. May be repeated. Maximum 12 hrs. F
690 Selected Topics in Polymer Chemistry (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. F

**Child and Family Studies**

(Submitted by Human Ecology)

**MAJORS**

<table>
<thead>
<tr>
<th>Degree</th>
<th>MAJOR</th>
<th>DEGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.</td>
<td>Child and Family Studies</td>
<td>Human Ecology</td>
</tr>
<tr>
<td>Ph.D.</td>
<td></td>
<td></td>
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</tbody>
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**Professors:**

- Cunningham, Jo Lynn, Ph.D. Michigan State
- Fox, Greer L., Ph.D. Michigan
- Nordquist, V. Mick, Ph.D. Tennessee
- Twardosz, Sandra, Ph.D. Kansas White, Priscilla, Ed.D. Tennessee

**Associate Professors:**

- Allen, J., Ph.D. Purdue Buehler, C., Ph.D. Minnesota
- McNinnis, Jackie H., Ph.D. Florida State

**Barber, B., Ph.D.** Brigham Young Blinn, L., Ph.D. Ohio State Catron, C., Ed.D. Vanderbilt Smith, Delores, Ph.D. Oklahoma State Tegano, D., Ph.D. Virginia Tech

**The Department of Child and Family Studies**

Encompasses two primary concentrations: child development and family studies. Integration of these two areas provides a unique perspective for the study of individuals and families. Each graduate student's program of study is carefully planned in conjunction with a faculty committee to establish a program consistent with individual goals. All programs are characterized by a broad array of coursework, varied research experiences, and opportunities for experiences in applied settings.

Because the doctoral degree is a research degree, students at this level receive substantial preparation in statistics and research methodology. Interested students should contact the department head.

**ADMISSION REQUIREMENTS**

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

Admission to the program is contingent upon faculty evaluation of GRE scores, undergradinggraduate GPA, rating forms, and work experience. Prerequisites for admission to the Master's or doctoral program are 9 semester hours of either upper division undergraduate or graduate social science.

**THE MASTER'S PROGRAM**

An individual program of study may be designed by the student in collaboration with his or her major professor and committee. The program provides for a concentration in either child development or family studies. Specializations in the child development concentration consist of early childhood education, early childhood special education, early childhood adolescence, and child development. Specializations in the family studies concentration consist of family life intervention and family science. Thesis and non-thesis options are available in both concentrations. All students in the child development concentration must enroll in CFS 510, 511, 533, and 571. At least 6 hours in a cognate area outside the department must be completed. Thesis

**THE PH.D. CONCENTRATION**

The doctoral program in Human Ecology prepares scholars in the concentration areas of child development and family studies. The strength of the doctoral program is based on three major components: the integration of child development and family studies within the context of human ecology and related areas, concentration in a more specialized area than a sequence of foundation courses; an emphasis on becoming proficient producers and consumers of research. A doctoral program that is concurrently specialized and integrative in nature reflects the complexity of the disciplinary subject matter; provides a broader context to formulate theoretical questions, and broadens the empirical literature for addressing those questions.

**Requirements include:**

1. Minimum 13 credits in child and family studies required foundation courses: 510, 511, 550, 570, 571;
2. Minimum 12 credits in 600- and 800-level courses in child development or family studies, with at least 3 credits in 600-level courses (in addition to the required courses described in #1);
3. Minimum 6 credits in a cognate area;
4. Minimum 9 credits in graduate-level statistics; with at least 3 of these credits in a more specialized area than a sequence of survey courses;
5. Minimum 3 credits of specialized research methods;
6. Pre-doctoral research project approved by student's committee;
7. College Professional Seminar, Human Ecology 610;
8. Minimum 6 credits of electives.

**GRADUATE COURSES**

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

510 Survey of Theory and Research in Child Development (3) Theoretical models and research literature in child development (conception through adolescence); application to research, interaction, and education. Prereq.: 9 hrs of either upper division undergraduate or graduate social science or consent of instructor. F,A

512 Survey of Research in Early Childhood Education (3) Current research in early childhood education. Prereq.: 510 or equivalent or consent of instructor. Sp


521 Organizational Management in Early Childhood Education (3) Designing, implementing, and evaluating physical and human resources in educational environments. Development of skills in educational organization, interpersonal leadership, and supervision of staff. Prereq.: 512 or equivalent or consent of instructor.

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

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

533 Peer Relations (3) Significance of peer context in socialization. Development of social skills and consequences of peer group environments. Prereq.: 510 or equivalent or consent of instructor.

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

550 Surveys of Theory and Research in Family Studies (3) Research issues and literature in family studies; use of theoretical and nonnormative adolescent development: physical, emotional, social, and cultural aspects. Prereq.: 510 or equivalent or consent of instructor. F

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

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

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

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

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

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

Civil Engineering (College of Engineering)

MAJORS DEGREES

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

Professors:

Burdette, Edwin G. (Fred N. Peebles Prof.), PE, Ph.D. ................. Illinois
Chatterjee, Arun, PE, Ph.D. ............... NC State
Davis, Wayne T., Ph.D. .................... Tennessee

Glous, Mirganka (Goodrich Chair of Excellence), PE, Ph.D. ............ Illinois
Goodpasture, David W., PE, Ph.D. ......... Illinois
Grecco, William L., PE, Ph.D. ............. Michigan State
Heathington, Kenneth W., PE, Ph.D. .... Northwestern
Humphreys, J., B., PE, Ph.D. .......... Texas A&M
Johnson, H. L., PE, M.S. ................. Tennessee
Miller, William A. (Granger Prof.), PE, Ph.D. ....................... Georgia Tech
Reed, Gregory D., PE, Ph.D. .............. Arkansas
Tschantz, Bruce A. (Condra Prof.), PE, Ph.D. ...... New Mexico State
Walter, C. R. (Emeritus), PE, M.S. .......... MIT
Weeter, D. W., PE, Ph.D. ................. Purdue
Wegmann, F. J., Ph.D. ................. Northwestern

Associate Professors:

Alavian, V., Ph.D. ....................... Wisconsin
Bennett, R. M., PE, Ph.D. ............... Illinois
Drumm, E. C., PE, Ph.D. ............... Arizona
Frederick, B. J., PE, B.C.E. ............... Clarkson
Hansen, J. H., Ph.D. ................. Missouri
Kressin, G. D., J.D. ...................... Tennessee
Moore, A. B., M.S. ..................... Tennessee
Robinson, R. Bruce (Fisher Prof.), PE, Ph.D. .... Iowa State
Smoot, James L., PE, Ph.D. .......... VPI
Tiry, R. F. (Emeritus), PE, B.S.S. ......... Marquette

Assistant Professor:

Kane, W. F., Ph.D. ....................... VPI

Lecturers:

Cormus, J. M., Ph.D. ..................... Illinois
Lundy, M. E., J.D. ....................... Tennessee
Wright, J. M., M.S. ..................... Tennessee

The Department of Civil Engineering offers degrees leading to the Master of Science and Doctor of Philosophy with a major in Civil Engineering concentrating in construction engineering, environmental engineering, geological/materials engineering, public works engineering, structural engineering, and transportation engineering; to the Master of Science in Environmental Engineering with concentrations in water quality, water resources, air quality, mixed waste management, and waste management.

THE MASTER'S PROGRAM

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

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

Civil Engineering

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

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

Non-Thesis Option: A minimum of 33 semester hours, including a 3-hour special

sections.
problems is required. The special problem will culminate in a written report which must be approved by the student's major professor.

**Environmental Engineering**

For a Master of Science with a major in Environmental Engineering, normally a Bachelor's degree in a field of engineering is required. For a student who does not have an engineering background, the following minimum prerequisite courses will be required: Basic Engineering or Computer Science 101; Basic Engineering 121, 131; Engineering Science and Mechanics 231, 321; Civil Engineering 390, 395, 380; Mathematics 141, 142, 231, 241; Chemistry 120, 130. In general, these must be completed before courses for graduate credit can be taken.

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

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

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

Either option must be approved by the student's major professor. A student's program must include a minimum of 12 hours of advanced engineering design courses selected from a list provided by the student's committee. Normally, the graduate program of study will be adjusted by the head of the department and the student's committee to suit the individual academic objectives.

**The Doctoral Program**

A graduate program leading to the Doctor of Philosophy is offered in Civil Engineering. Specific departmental requirements for the Ph.D. degree include the following:

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

2. A minimum of 24 semester hours of graduate courses in civil engineering, exclusive of dissertation credit, at least 6 hours of which must be 600-level courses.

3. Supporting courses in related scientific and engineering fields, amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 9 semester hours of mathematics will be required beyond the civil engineering undergraduate requirements.

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

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

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

**ACADEMIC COMMON MARKET**

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

**Civil Engineering**

**GRADUATE COURSES**

406 Legal and Ethical Aspects of Engineering (2)
Legal principles underlying engineering work; laws of contracts, torts, real property; problems of professional registration and ethics. Prereq: Senior standing.

410 Land Surveying (3) Procedures of locating properties; evaluating evidence; procedures to determine property, to create boundary lines, and to prepare plots, laws of land surveying. Prereq: 210.

421 Portland Cement and Asphaltic Concrete (3)
Aggregate properties and tests; tests of Portland cement concrete, mix design methods for concrete and asphalt, concrete admixtures, tests of asphalt and asphalt mixes, and nondestructive testing. Prereq: 321. 2 hrs and 1 lab.

451 Highway Engineering (3) Design, construction, operation, and maintenance of highway facilities; application of various engineering principles and techniques to process of planning, locating and design of highway facilities; both geometric and pavement design. Prereq: 210, 251, 352.

452 Traffic Engineering (3) Characteristics of driver, vehicle, and roadway and their interaction; traffic studies; basic considerations of traffic circulation and control, lighting, capacity analysis, roadway safety analysis and design. Prereq: 210, 251, 352.


461 Analysis of Framed Structures (3) Maximum stress due to moment, shear, and axial forces; use of influence lines; lateral forces due to earth/loads, use of information for analysis of portals, building frames, and space frames; matrix methods; use of computer in structural analysis. Prereq: Analysis of Framed Structures I.

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

474 Reinforced Concrete Design (3) Reinforced concrete continuous beams and floor slabs, columns with combined axial loads and bending, footings and retaining walls. Prereq: 471.

485 Principles of Geohydrology (3) (Same as Geological Sciences 485.)

490 Water Resources Project Design (3) Coherent development of multipurpose reservoir and dam project, data acquisition; spillway and outlet works design; earthen and gravity dam stability analyses; drains and filters; maintenance and operation principles; and dam safety concepts, dam break analyses. Prereq: 380, 395.

494 Urban Drainage Engineering (3) Design and management of stormwater conveyance and control structures. Application of hydrologic and hydraulic principles to design of detention, wet detention, and dry detention facilities. Design of inlet structures, ditches, culverts, and detention/retenion basins; application of commonly-used computer runoff models; evaluation of land-use on streamflow quantity and quality. Prereq: 390, 395.

495 Water Resources Development and Management (3) Principles of water resources projects development planning and management. Institutional framework; water law, evaluation procedures for comparing and selecting among development alternatives, multi-objective planning, principles of engineering economics, benefit-cost analysis, and cost allocation methods; environmental impact assessment procedures; decisions using risk-based methods; case studies. Prereq: Senior standing.

500 Thesis (1-15) PrN only. E

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

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

510 Urban Systems: Engineering and Management (3) Various urban systems usually under responsibility of city manager and/or city engineer: streets, lighting, water, sewerage, refuse collection. Personnel management, finance, planning and public relations. Prereq: Graduate standing.

521 Pavement Design (3) Empirical and theoretical based methods of pavement design and analysis, strengthening existing pavements, pavement distress and economical design alternative. Prereq: 321 and 330.

530 Soil Strength and Earth Slope Stability (3) Shear strength of fine grained soil from perspective of idealized, simple clay; Drained and undrained strength of cohesive and stress-strain behavior of real soils. Laboratory testing. Stability of natural and cut slopes and embankments. Prereq: 355.

531 Soil Stabilization (3) Mechanical stabilization of soils by mixing with cement and chemical stabilization of soils with admixtures, waterproofing and modifying of soils and additives. 2 hrs and 1 lab.


535 Advanced Foundations and Retaining Structures (3) Planning subsurface investigations; bearing capacity and settlement of shallow foundations on layer-embedded footings, sandy and silty soils, granular soils; loads on spread footings, pile foundations, design with pressure-meter, lateral earth pressures and design of retaining structures and shafts. Prereq: 330.


539 Geomechanics Seminar (1) Seminar topics in materials, geotechnical engineering and geomaterials. Graduate student research contributions and practical applications presented by practicing engineers from community. Prereq: Graduate standing and consent of advisor. May not apply toward degree. May be repeated. S/N only.


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

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

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

552 Traffic Engineering-Operations (3) Signs, signals and marketing; short-term operations; controllers; signal timing and phasing; system operations, identification and correction of high-accident locations and system deficiencies. Prereq: 551 or 452.

553 Geometric Design and Layout of Roadways and Community Facilities (3) Functional and geometric design of rural and urban roads of all classes; subdivision layout; configuration of urban roads of all classes; techniques for access control, freeway interchange, and street intersections, and parking. Prereq: 451 or consent of instructor.

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

555 Public Transit Planning (3) Characteristics of transit modes—conventional and paratransit; operational design of transit services; route planning and scheduling; cost analysis; mode choice models; performance evaluation; transit surveys; organization and financing. Prereq: Graduate standing. May be repeated. Consent of instructor.

556 Traffic Accident Reconstruction (3) Data collection and analysis as basis for accident prevention on control programs; roadside hardware design and crash testing. Prereq: 552 or graduate standing.

557 Transportation Planning and Operations with Micro-Computer Applications (3) Transportation system management techniques and application of micro-computer to analysis of transportation actions. Prereq: 551, 554.

558 Planning and Transportation (3) Preparation of transportation as elements of comprehensive development plans. Analysis of relationship between various transportation modes and between transportation and other community features. Use of planning process to establish existing travel patterns, modeling of demand, project evaluation, and program formulation. Prereq: Graduate standing. (Same as Planning 537.)

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

562 Analysis and Design of Plate Structures (3) Plate bending, plate buckling, plate girders, and plate slabs. Analysis of beam, bridge and building floors and structural plate components. Prereq: 361.

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

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

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

566 Structural Reliability (3) Application of probability theory and statistics to evaluating reliability of structures; development of safety factors and probability based design methods. Prereq: Consent of instructor.

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

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

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

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

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

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 589, Engineering Science and Mechanics 558, Electrical and Computer Engineering 588, Mechanical Engineering 558, and Aerospace Engineering 559.)

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Engineering Science and Mechanics 558, Electrical and Computer Engineering 588, Mechanical Engineering 558, and Aerospace Engineering 559.)

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

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

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

637 Numerical Models for Geologic Materials (3) Numerical models to represent the stress-strain/ volume relationships for soils, rock, and concrete; nonlinear elastic models; classical plasticity models; critical state and capped plasticity models; multiple surface models; determination of parameters from laboratory tests. Prereq: Consent of instructor. Prereq: 530 and Engineering Science and Mechanics 539.

639 Soil Dynamics (3) Behavior of soils and soil-structure systems under time dependent loading; wave propagation in elastic media; principles of seismic reflection techniques; effects of earthquakes and vibrating machines on soils and foundations; dynamic and cyclic soil testing and determination of soil parameters. Prereq: 335 and 565 or Engineering Science and Mechanics 431.

651 Analysis Techniques for Transportation Systems I (3) Analysis of trip generation, trip distribution, mode choice, and assignment; macro and micro models of traffic. Prereq: 554 or 558.

652 Analysis Techniques for Transportation Systems II (3) Advanced topics of application of mathematical, statistical and computer science techniques in modeling and analysis of transportation systems. Prereq: 551.

653 Water Quality and Resource Management (3) Water resource planning and management; water and wastewater systems; water and wastewater treatment systems. Prereq: 390.

655 Analysis of Water Quality (3) Water resource planning and management; water and wastewater systems; water and wastewater treatment systems. Prereq: 390.

656 Floodplain and Urban Flood Management (3) Review of national, regional, and local flood problems; state of the art flood damage reduction alternatives: structural and non-structural; institutional responses: policies, programs, organizations, regulations, and legal aspects; floodplain hydrology and hydraulics, HEC-1, HEC-2, floodway enforcement, flood hazard zone and damage potential determinations; cast studies. Prereq: Civil Engineering 390 or consent of instructor for non-majors.

660 Nuclear Reactor Theory (3) Energy sources and fission products; nuclear energy generation; nuclear fuel cycle; nuclear fission reaction. Prereq: Consent of instructor.

662 Nuclear Reactor Theory (3) Energy sources and fission products; nuclear energy generation; nuclear fuel cycle; nuclear fission reaction. Prereq: Consent of instructor.

665 Advanced Structural Reliability (3) Monte Carlo methods; structural system reliability, random processes; dynamic loads on structures. Prereq: 569.

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

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

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

Environmental Engineering

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

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

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

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

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

522 Floodplain and Urban Flood Management (3) Review of national, regional, and local flood problems; state of the art flood damage reduction alternatives: structural and non-structural; institutional responses: policies, programs, organizations, regulations, and legal aspects; floodplain hydrology and hydraulics, HEC-1, HEC-2, floodway enforcement, flood hazard zone and damage potential determinations; cast studies. Prereq: Civil Engineering 390 or consent of instructor for non-majors.

525 Sediment Transport (3) Sediment properties and measurements; principles of dynamics of suspended and bed sediment transport in erodible channels; erosion and sediment transport, and to sediment yield; principles of water erosion and sediment control theory and management practices. Local and state regulations. Prereq: Civil Engineering 395.

526 Water Resources Management (3) Approaches to stormwater management. Hydrologic components, linear and non-linear systems; integrated mathematical models of watershed response. Review and application of commonly used deterministic and parametric computer models. Prereq: 395.

539 Groundwater Hydrology (3) Dynamics of flow and contaminant transport in porous media, hydrodynamics, dispersion, anisotropy, layered soils, unsaturated flow and groundwater contaminant transport phenomena. Analytical and numerical solution of flow and transport equations. Prereq: 395 or 485 or consent of instructor.

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

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

551 Physicochemical Unit Processes (3) Theory and design of physicochemical processes; wastewater treatment. Prereq: Civil Engineering 380, and Civil Engineering 390.

552 Biological Treatment Theory (3) Theory and design applications of biological processes to treatment of wastewater and solid wastes. Prereq: Civil Engineering 380. 2 hrs and 1 lab.
553 Environmental Engineering Chemistry (3) Theoretical, applied and analytical chemistry related to generation, measurement and treatment of environmental contaminants. Prereq: Chemistry 130. 2 hrs and 1 lab.

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

556 Hazardous Waste Management (3) Analysis and design of operations and processes for hazardous waste disposal and processing; regulations; analytical; industrial applications. Prereq: Consent of instructor.

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

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

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

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

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

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

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

620 Advanced Surface Water Hydrodynamics (3) Advanced topics in surface water hydrodynamics; solutions in St. Venant equations of unsteady flow for complex channel situations; dam breach modeling. Prereq: S20.

630 Advanced Stormwater Modeling (3) Advanced topics in stormwater modeling; stormwater quality models; advanced applications of available stormwater computer models. Prereq: S30.

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


653 Pollutant Fate Modeling and Risk Assessment (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of air, water, and earth and solids in environment. Methods of assessing risk posed by presence of those chemicals. Prereq: S51.

675 Microbial Systems Analysis (3) (Same as Chemical Engineering 675.)

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

Classics

(College of Liberal Arts)

Harry G. Rutledge, Head

Professors:

Gesell, G. C., Ph.D ................. North Carolina
Rutledge, H. C., Ph.D .............. Ohio State

Associate Professors:

Craig, C. P., Ph.D ................. North Carolina
Martin, S. D., Ph.D ................. Michigan
Shelton, J. E., Ph.D ................. Vanderbilt
Tandy, D. W., Ph.D ................. Yale

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

GRADUATE COURSES


405-06 Selected Readings from Greek Literature (3,3) For advanced students in Greek, plays, historical writings, poetry of ancient Greece in original Greek. Prereq: 401-402 or consent of instructor. May be repeated. Maximum 9 hrs. SPr 411 Cicero and Techniques of Latin Prose Composition (3) For advanced students in Latin, practice in prose composition; writings of Cicero the model. Prereq: S51-52 or consent of instructor. Sp

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

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

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

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

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

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

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

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

541-42 The Latin Epic: Lucretius, Vergil (3,3) Advanced study of epic masterpieces of Lucretius and Vergil; both Georges and Aeneid of Vergil.

551 Special Topics in Classical Civilization (3) Advanced tutorial work in Greek and Roman authors in English translation; problems in cultures of Greece and Rome. May be repeated. Maximum 9 hrs.

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

Communications

(College of Communications)

MAJOR

Communication .................. M.S., Ph.D.

Professors:

Ashdown, Paul G., Ph.D .......... Bowling Green
Crook, James A., Ph.D .......... Iowa State
Everett, George A., Ph.D .......... Iowa
Holt, Darrel W. (Emeritus), Ph.D ...... Northwestern
Howard, Herbert H., Ph.D .......... Ohio
Leiter, B. Kelly, Ph.D .......... Southern Illinois
Singletary, Michael W., Ph.D .......... Southern Illinois
Swan, Norman R., Ph.D .......... Missouri

Associate Professors:

Bowles, Dorothy, Ph.D .......... Wisconsin
Hovland, Roxanne, Ph.D .......... Illinois
Miller, M. Mark, Ph.D .......... Michigan State
Moore, Barbara A., Ph.D .......... Ohio
Stankey, Michael J., Ph.D .......... Illinois
Taylor, Ronald E., Ph.D .......... Illinois

Assistant Professors:

Buchman, Joseph, Ph.D .......... Indiana
Caudill, C. Edward, Ph.D .......... North Carolina
Hoy, Maria, Ph.D .......... Oklahoma State
Manning-Miller, Carmen, Ph.D .......... Indiana
Ziegler, Dhyana, Ph.D .......... Southern Illinois

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

For application forms and other information about the M.S. and Ph.D. programs in Communications, write to: Assistant Dean for Graduate Studies, College of Communications, 98 Communications Building, The University of Tennessee, Knoxville, TN 379960313.

ADMISSION REQUIREMENTS

Applicants must meet admission requirements of The Graduate School. In addition, they must complete the Graduate Record Examination and application forms as required by the College of Communications. Minimum requirements for admission to full potential candidate status normally include a 3.0 (4.0 system) grade-point average in undergraduate studies and scores above the fiftieth percentile in verbal and quantitative aptitude on the Graduate Record Examination. All application materials are screened by admissions committee authorized by the faculty of the College of Communications.
New students normally are admitted to the programs only at the beginning of fall semester. However, under special circumstances, a student may be admitted at the beginning of spring semester in a temporary non-degree status. Applications for fall admission must be received by May 1. Applications for financial aid are due by March 1.

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

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

ACADEMIC COMMON MARKET

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

ACADEMIC STANDARDS

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

THE MASTER'S PROGRAM

The Master of Science with a major in Communications is intended for students who desire a career in the mass media with an emphasis on communications management and a deeper understanding of the communication process and social role of the mass media. The program follows a broad-based multi-media approach while allowing the student to concentrate in one of four fields: advertising, broadcasting, journalism or public relations.

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

Degree Requirements

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

1. Ten hours of core courses—Communications 510, 512, 540, and 550, the first three of which must be taken during the first two semesters of the student's program, except with written approval of the Assistant Dean for Graduate Studies for the College.
2. Twelve hours within one department of the college, at an undergraduate level of the 500 level or above. An internship, if needed, is included.
3. Three-hour elective from a list provided by the department in area of concentration.
4. Six hours of thesis work (Communications 500), including a thesis seminar.

Additional hours may be required for those who do not have academic prerequisites, and an internship may be required for those who do not have professional experience in the field they wish to study. A course in communications law is a prerequisite.

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

Students interested in subsequent entry into a doctoral program are advised to take additional courses in communications theory and research, subject to advisor's approval.

After completion of the formal program of coursework and thesis research, the student must pass an oral examination conducted by his/her graduate committee.

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

THE DOCTORAL PROGRAM

The Ph.D. with a major in Communications is intended to prepare scholars for teaching, research, administration, and service in the field of mass communications.

The program is interdisciplinary, consisting of a required core curriculum and recommended courses outside the College in the related social and behavioral sciences. The program is flexible and will accommodate a wide variety of career goals in communications. New students may be admitted to the program at any time; however, core courses begin only in the fall semester.

The Master's degree is not required for entry into or completion of the doctoral program. Program planning, however, will permit the Master's degree to be earned if desired. Students lacking academic or professional experience in communications will be required to take prerequisite courses. In general, however, the program may be completed within three academic years of full-time study beyond the Bachelor's degree. Those holding Master's degrees should anticipate two or more years of full-time study for completion of the Ph.D.

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

1. A 3.0 (4.0 system) grade-point average in undergraduate studies, or 3.5 for graduate work if applicant holds a Master's degree;
2. Above the fiftieth percentile in verbal and quantitative aptitude on the Graduate Record Examination;
3. Endorsement by at least three former teachers or professional colleagues; and
4. A statement of the applicant's goals and reasons for pursuing the doctorate. Personal interviews with members of the Ph.D. Admissions Committee are recommended and may be required. Professional experience in some field of communications is a highly desirable criterion for admission.

A minimum of 88 hours of approved graduate work is required for the Ph.D.

1. Twenty-eight hours of core courses—Communications 610, 612, 620, 640, 641; 6 hours of statistics*; and three of the following courses: Communications 622, 632, 642, 652, and 692.
2. Fifteen hours in a primary concentration (advertising, broadcasting, journalism, public relations, or speech communications).
3. Twelve hours in a second concentration (outside the College of Communications).
4. Nine hours of electives*.
5. Twenty-four hours of dissertation.

* Specific courses to be taken require the approval of the student's advising committee.

Admission to candidacy must be attained at least two semesters prior to graduation and requires successful completion of a written comprehensive examination.

Each doctoral student's progress will be reviewed annually by the Doctoral Committee of the College of Communications. Results will be reported to the student by his/her program advisor, who will convey the committee's recommendation concerning the student's remaining in the program (non-binding) and suggestions for improvement in performance.

Candidates without prior teaching experience must register for Communications 521, Tutorial in Communications Teaching.

Planned course offerings in the College of Communications for a full calendar year are published in the College newsletter the preceding November. This information is available from the Dean's Office, 302 Communications Building, 974-3631. See also courses listed under Advertising, Broadcasting, and Journalism.

GRADUATE COURSES

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

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

502 Registration for Use of Facilities (1-3) Required for the student not otherwise registered during any semester when student uses University facilities and/or during any semester when student's program involves travel in excess of 30 days. Prereq: Consent of instructor or admission to program. F/NP only. E

510 Orientation to Master's Studies (1) Degree and thesis requirements. Committee formation and program planning. Overview of research methods and informational sources. Prereq: Consent of instructor or admission to program. S/NP only. F

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

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

540 Theory for Media Management (3) Selected research hypotheses and theories in literature of mass
Comparative and Experimental Medicine

(Office of the Provost)

MAJOR

Comparative and Experimental Medicine .................. M.S., Ph.D.

L. N. D. Potgieter, Chair

Joint Graduate Coordinating Committee:

Fuhr, J. E., Ph.D., Medical Biology
Lawler, J. E., Ph.D., Psychology
Lozzio, C., M.D., Medical Biology
Potgieter, L. N. D., Ph.D., Veterinary Teaching Hospital

The Comparative and Experimental Medicine degree program (M.S. and Ph.D.) is a jointly-administered graduate program intended to prepare students for teaching and/or research careers in the health sciences. This program emphasizes the comparative approach to the study of pathology, immunopathology, aberrant metabolism, oncology, and genetic disorders. The Ph.D. program is open to approved graduate students seeking training in this area and is especially useful for individuals with professional degrees. For the student with an undergraduate biological science background, the Comparative and Experimental Medicine program provides an unusual opportunity to study disease processes common in humans and animals from a multidisciplinary perspective. The scope of this intercollegiate program, which pools faculty resources from both veterinary and human medicine, is broadened by faculty members representing animal science and numerous areas of the life sciences. The interdisciplinary training environment includes such diverse support as facilities and personnel at the Veterinary Teaching Hospital, the Oak Ridge National Laboratory, Knoxville Zoological Park, Hemophilia Clinic, Birth Defect Center, Aberrant Metabolism Laboratory, and Hematology and Oncology services. For specific course listings, see Veterinary Medicine and Medical Biology under Fields of Instruction.

ADMISSION REQUIREMENTS

General Requirements

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

Requirements for Admission to the Master of Science Degree Program

Applicants will be required to have a professional degree in one of the medical sciences (M.D., D.O., D.V.M.) or a baccalaureate degree with coursework including chemistry through organic; mathematics through calculus; one year of physics; and one year of basic biology plus an additional half-year of more advanced study in the field of biology including courses such as biochemistry, mammalian anatomy, histology, cell biology, or others that are appropriate for individuals aspiring to research careers in biomedical science.

Applicants for admission to the Master of Science program whose backgrounds include no formal training in the biomedical field beyond the baccalaureate degree will be required to present evidence of satisfactory performance on the Graduate Record Examination.

Requirements for Admission to the Doctor of Philosophy Program

Applicants will generally be expected to have a Master's degree in one of the biological sciences or a professional degree in one of the medical sciences.

Selected individuals having baccalaureate degrees with strong backgrounds in the physical and biological sciences may be admitted upon presenting evidence of satisfactory performance on the Graduate Record Examination.

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

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

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. and Ph.D. programs in Comparative and Experimental Medicine are available to residents of some states in the Southeast. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Computer Science

(College of Liberal Arts)

MAJOR

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

Jesse H. Poore, Head

Professors:

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

Associate Professors:

Case, Jeffrey D., Ph.D............. Illinois
Char, Bruce W., Ph.D............. California
Langston, Michael A., Ph.D............. Texas A&M
MacLennan, Bruce J., Ph.D............. Purdue
Pfleeger, Charles P., Ph.D............. Penn State
Whitehead, Bruce (UTSI), Ph.D............. Michigan
Assistant Professors:
Blair, J. R. S., Ph.D. .................................. Pittsburgh
Lee, Seung-Chul (UTSI), Ph.D. .......................................................................................... Florida
Mutchler, David, Ph.D. ........................................................................................................... Duke
Straight, David W., Ph.D. ......................................................................................................... Texas
Vose, M. D., Ph.D. .................................................................................................................... Texas
Zemankova, M., Ph.D. .......................... Florida State

THE MASTER'S PROGRAM

One year of college mathematics beyond algebra and trigonometry is required for admission. For the master's degree, 30 semester hours of graduate credit are required, 24 of which must be 500 level or above. 511, which cannot be counted toward the 30 semester hours, is available to students who need a stronger background in software; one course in programming in a modern recursive, high-level language is the prerequisite to 101 or 102. Graduate courses outside the department are allowed but must be approved by the Graduate Committee before enrollment.

Thesis Option

The student must reach agreement on a thesis topic with a faculty advisor and must take 6 hours of 500 Thesis. Six hours of 500 Thesis may count in the 24-hour requirement at the 500 level or above.

Non-Thesis Option

The student must take coursework in an area to prepare for the non-thesis Master's examination. The student's advisor must verify that an acceptable set of courses has been taken before the student may schedule the examination. Information concerning the examination is available in the departmental office.

Master's Minor in Computer Science

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

THE DOCTORAL PROGRAM

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

1. The student should have three letters of recommendation sent directly to the department head from individuals capable of assessing the student's potential for advanced work in computer science (for example, college teachers or employers for whom the student has worked after earning a Bachelor's degree). The department reserves the right to contact these individuals or other knowledgeable people if additional information is deemed necessary or desirable.

2. The student is expected to have taken the GRE verbal and quantitative general test within the past three years and to have these scores sent to The Graduate School.

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

Original research reported in a dissertation of high quality is emphasized. The minimum hour requirements are 24 hours of course 600 (Doctoral Research and Dissemination) and 24 hours of graduate courses beyond the equivalent of a Master's degree (beyond 30 graduate credit hours) graded A-F. The 24 hours of courses must include at least six semester hours of 600-level courses taken in computer science at UT Knoxville. The student's advisor and committee will establish the specific course requirements. The comprehensive examination consists of a departmental written examination and a subsequent oral examination conducted by the student's committee.

GRADUATE COURSES

401 Applications of Computer Graphics (3) Commercial software, techniques, hardware. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

402 Applications of Artificial Intelligence (3) Commercial software, techniques, hardware Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

403 Applications of Microcomputers (3) Microcomputers, DOS, commercial software and hardware. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

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

421 Introduction to Artificial Intelligence (3) Basic techniques in heuristic search, gaming, and theorem proving. Prereq: 200. 3 hr lab required.

422 Expert Systems (3) Production rule model and its extension into many-valued and fuzzy logics. Deriving explanations, examples of expert system tools and building expert systems. Other methodologies—frames, scripts, decision expressions. Prereq: 242. 3 hr lab required.

423 Natural Language Processing (3) Phrase-structured and slot grammars, error-correcting interfaces and semantics. Applications in database and expert systems. Prereq: 241 or 421.

424 Robotics Software (3) Software for robotic control. Prereq: 351 and Mathematics 142. 3 hr lab required.

425 Functional Languages (3) Functional, applicative and object-oriented languages, LISP and SMALLTALK, used for research applications. Prereq: 111, 112 and Mathematics 222. 3 hr lab required.

432 Computer Graphics (3) Interactive computer graphics. Transformations, perspectives, shading, vector generation. Graphics hardware, tablets and chips, with goal of understanding techniques for designing computer systems for graphics capability. Prereq: 351. 3 hr lab required.

433 Computer Systems Architecture (3) Parallel processing, memory, I/O, pipelines, specialized architectures. Prereq: 331 and 360.

434 Networks and Communications (3) ISO open system interconnection model, protocols, study of several existing wide area networks, local area networks. Prereq: 331 and 360.

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

436 Computer Systems Hardware Design (3) Computer systems hardware: bus structures, I/O devices, interrupt support hardware, direct memory access logic, timing budgets, and system considerations. Lab: construction, testing and debugging of either or both of prototyped subsystems. Prereq: based on commercially available microcomputer component devices. Prereq: 458.

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

441 Science Information Systems (3) Design of scientific data banks, document repositories, information retrieval and electronic dissemination services. Control and dissemination of scientific information at national and international level. Prereq: 340.

442 Introduction to Database Management Systems (3) File searching and organization, hierarchical, network, and relational models; relational calculus and algebra, packages and language interfaces; implementation and security considerations; performance, integrity, and reliability models; intelligent database systems. Prereq: 340 and 311.

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


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

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

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


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

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


465 Parallel Computation I (3) Examination of non-numerical algorithms for parallel computation, operating systems, design and classification of parallel processors, compilers, concurrent computation. Prereq: 453.


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

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


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

494 Special Topics in Computer Science (1-3) May be repeated. Maximum 9 hrs.
150 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. May be credited against University facilities and faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.
511 Immigration to Computer Science (5) Advanced programming techniques in high-level language; control of input/output devices; file system; machine organization; assembly language programming, data structures and analysis of algorithms. Computing laboratory. Prereq: Course in programming.
521 Artificial Intelligence (3) Heuristic search, automatic theorem proving, symbolic methods, semantic information processing, representation theory. Prereq: 511 and 513.
522 Cybernetics (3) Various functions in living systems and their actual or potential realization in computers. Prereq: 511 and 513.
523 Machine Learning (3) Algorithms whereby computers exhibit aspects of learning or inference about their environment. Supervised and unsupervised methods; data mining pattern analysis, explicit and implicit structures. Prereq: 521.
525 Software Engineering (3) Survey of key ideas in software engineering: formal methods, tools, testing, reliability, structured design and development, metrics, management and history of the field.
535 Computer Architecture (3) Parallel processing control methods, pipelining, vector processors, functional units, memory organization and control, data flow, reduced instruction sets, symbolic processors. Prereq: 511 and 513.
538 Computer Networks (3) Design and operation of networks. Hardware and software systems; communications subsystems. Prereq: 511 and 513.
544 Information Storage and Retrieval (3) Organization, storage and retrieval of bibliographic data; analysis of commercial IR system; information analysis and cataloging and information retrieval; dictionary and thesaurus construction; statistical and syntactic approaches to content analysis. Prereq: 511.
551 Pattern Analysis (3) Decision-theoretic and structural pattern analysis. Deterministic and statistical decision rules, feature extraction and representation; syntactic and semantic methods, relational models. Prereq: 513 and course in probability or statistics.
552 Image Analysis (3) Techniques of computer image processing and understanding. Prereq: 551.
562 Language Design (3) Description, structure, and design philosophies of high-level languages. Names, types, control and data structures, abstraction and modularity. Design project. Prereq: 511.
571-72 Numerical Mathematics (3) (Same as Mathematics 571-72).
573 Finite Difference Methods for Partial Differential Equations (3) (Same as Mathematics 573).
574 Finite Element Methods (3) (Same as Mathematics 574).
575 Matrix Theory and Techniques in Numerical Analysis (3) (Same as Mathematics 575).
581 Design and Analysis of Algorithms (3) Analysis of algorithms and relevance of analysis to design of efficient computer algorithms. Sorting, searching, graph algorithms, pattern matching, dynamic programming, efficient approximation algorithms.
593 Independent Study (1-15) Maximum 6 hrs toward degree requirements.
594 Special Topics in Computer Science (1-3) May be repeated. Maximum 6 hrs.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
620 Advanced Topics in Intelligent Systems (1-6) Prereq: Consent of instructor. May be repeated with consent of department.
630 Advanced Topics in Computer Systems (1-6) Prereq: Consent of instructor. May be repeated with consent of department.
640 Advanced Topics in Databases/Information Retrieval (1-6) Prereq: Consent of instructor. May be repeated with consent of department.
650 Advanced Topics in Pattern/Image Analysis (1-6) Prereq: Consent of instructor. May be repeated with consent of department.
660 Advanced Topics in Software Systems (1-6) Prereq: Consent of instructor. May be repeated with consent of department.
670 Advanced Topics in Numerical Mathematics (1-6) Prereq: Consent of instructor. May be repeated with consent of department.
680 Advanced Topics in Theory and Foundations (1-6) Prereq: Consent of instructor. May be repeated with consent of department.
690 Advanced Topics in Computer Science (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

Curriculum and Instruction
(College of Education)

MAJOR

DEGREES

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

Theodore W. Hipple, Head

Professors:

Alexander, J. E., Ed.D. .................. Kentucky
Allison, C. B., Ph.D. .................. Oklahoma
Bellon, Jerry J., Ed.D. .................. California
Blair, Kermit J., Ph.D. .................. Ohio State
Christensen, Mark A., Ph.D. .... Kansas
Davis, A. R., Ph.D. .................. Ohio State
Deardorff, Donald J., Ph.D. ........ Maryland
Doak, E. Dale, Ed.D. ................. Colorado
Frandsen, Henry, Ph.D. ............... Illinois
French, R. L., Ph.D. .................. Ohio State
Hipple, Theodore W., Ph.D. .......... Illinois
Howard, R., Ph.D. .................. Ohio State
Huff, F., Ph.D. ................ .. Ohio State
Jost, Karl J., Ed.D. .................. Oklahoma
Knight, Lester N., Ph.D. .......... Texas
Malik, Anand, Ed.D. ................. Columbia
Mays, N., Ph.D. .................. Southern Illinois
McIntyre, Lonnie D., Ed.D. ......... Indiana
Myer, M. E., Ph.D. .................. Florida
Ray, John R., Ed.D. .................. Tennessee
Roeksie, E. E., Ed.D. ................. Ohio State
Rowell, C. Glennon, Ed.D. .......... George Peabody
Sawlon, W. S., Ed.D. .................. Virginia
Terwilliger, Paul N., Ed.D. .......... Penn State
Thurman, Robert S., Ed.D. .......... George Peabody
Turner, T. N., Ed.D. ................. Penn State
Waniekski, Richard, Ed.D. .......... Wayne State

Associate Professors:

Cagle, Lynn C., Ed.D. ................. Georgia
Chance, Charles A., Ph.D. .......... Ohio State
Grant, A. D., Ph.D. ................. Wisconsin
Heathington, Betty S., Ed.D. ....... Tennessee
Hodge, R. L., Ph.D. .................. Texas
Ryan, Thomas K., Ed.D. ............. Ball State
Wiley, Patricia D., Ed.D. .......... Houston
Wright, J., Ph.D. .................. North Carolina

Assistant Professors:

Austin, R. A., Ph.D. ................. Florida State
Bennett, Kathleen, Ed.D. .......... Cincinnati
Hatch, J. Amos, Ph.D. .............. Florida
Hendricks, D. A., Ph.D. .......... Alabama

Graduate programs are designed to improve scholarship and educational competence in a number of areas leading to the Master of Science, the Specialist in Education, the Doctor of Education, and the Doctor of Philosophy with a major in Education.

THE MASTER'S PROGRAM

For the Master of Science, thesis and non-thesis options are available in the Curriculum and Instruction major with concentration in the following areas: curriculum, elementary education, English education, foreign language education, instructional media and technology, mathematics education, reading education, science education, and social science education. The non-thesis option requires the completion of 33 semester hours of coursework. The thesis option requires the completion of 30 semester hours including six hours of Thesis 500.

THE SPECIALIST PROGRAM

The Educational Specialist degree program with a major in Curriculum and Instruction encompasses concentrations in the following areas: curriculum, elementary education, English education, foreign language education, instructional media and technology, mathematics education, reading education, science education, social science education.

THE DOCTORAL PROGRAM

The Ed.D. program in Curriculum and Instruction may include concentration upon the following fields: curriculum, social foundations, educational research, elementary education,
English education, foreign language education, mathematics education, science education, social science education.

The Doctor of Philosophy with a major in Education includes concentrations and specializations as listed under Education. For further information, write the Department of Curriculum and Instruction.

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 (concentration in foreign language education only) in Curriculum and Instructor is available to residents of the state of Louisiana. Further information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

404 Problems in Improvement of Instruction (1-3) Special conferences, workshops, or in-service programs. Prereq: 3 hrs. tuition. F,Sp

421 Elementary and Middle School Science and Social Studies Instruction (3) Methods and materials for teaching science and social studies. Development of functioning effective teaching strategies in 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

429 Language Arts/Reading Instruction in Elementary and Middle Schools (3) Language and language development as applied to teaching of oracy (listening-speaking) 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 teaching education teacher education. F,Sp

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

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

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 elementary school. Prereq: Admission to teacher education. E

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

454 Teaching Strategies and Issues in Social Studies Education (3) Goals, objectives, techniques, materials, evaluation; directed observation in public schools. Preparation of teaching plans and materials; simulated teaching experiences. Prereq: Admission to Teacher Education Program.

455 Teaching of Foreign Languages, Grades 7-12 (3) Instructional methods, lesson planning, peer-teaching; materials for teaching foreign language and culture; evaluation techniques. Requires or for certification in modern foreign languages and Latin. Prereq: 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 for teaching writing, language, and literature. Prereq: 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. Prereq: Admission to Teacher Education Program.

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. F

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

486 Teaching Mathematics, Grades 7-12 (3) Preparation of teaching plans, evaluation, materials for teaching mathematics; teaching simulation and directed observation in schools. Prereq: Admission to Teacher Education Program.

486 Introduction to Instructional Computing (3) Classroom uses of computers, applications for teachers, overview of computer operation and software for teachers of all grades. F,Sp

496 Teaching Science Grades 7-12 (3) Methods, materials, recent trends in science and environmental education with emphasis on science in schools. Prereq: Admission to teacher education. F,Sp

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

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

503 Problems in Lieu of Thesis (2-3) May be repeated. Maximum 3 hrs. E

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

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

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

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


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 or other grade. E

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

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

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

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

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

523 Diagnosis and Correction of Children’s Difficulties in Learning Mathematics (3) Children’s difficulties in learning mathematics and techniques for diagnosing and classroom teacher correct difficulties. Prereq: 522 or equivalent consent of instructor. F


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

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

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

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

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

530 Teaching Reading in Elementary and Middle Schools (3) Trends in methods, materials, basic approaches, skill development and assessment procedures for teaching reading at elementary school level. Prereq: Course in teaching of reading or consent of instructor. F,Sp

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

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

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

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

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

536 Psychology of Reading (3) Reading act, relation between learning and reading, role or 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, or equivalent teaching experience, or consent of instructor. Sp,Su

538 Practicum in Diagnosis of Reading Problems (3) Theoretical and practical applications of specific reading diagnostic instruments; testing of elementary and/or secondary school students, preparing case study reports, and conducting parent conferences. Prereq: 500-level course in reading education or consent of instructor. F

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

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

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

558 Teacher-Parent-Community Relations (3) Techniques for effective relations between parents and teachers: examination of roles and expectations; parent involvement; volunteer programs; influence of community on educational process. Prereq: Consent of instructor. Sp,Su

559 Advanced Production of Audiovisual Software (3) Hard and mechanical lettering, flip picture mounting-laminating, overhead projection, audio production, TV studio production, sync-taping, multi-screen presentations, and print techniques. Text: as Library and Information Science 569. Sp,Su

573 Utilization of Educational Television and Radio (3) Television and radio as instructional and training media. Selection or evaluating Instructional training video and audio tapes. F

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

578 Teaching English as a Second Language (3) Instructional methods. Utilization of assessment procedures to diagnose English linguistic proficiency; materials for non-native speaker in K-12 classroom. Required for Tennessee ESL (K-12) certification. Prereq: Consent of instructor.

579 Career Development: Workshop (1-6) E

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

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

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


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

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

587 Teaching Foreign Languages in Secondary Schools (3) Advanced instructional techniques and evaluation procedures: materials analysis and preparation; tests, issues, and research in modern foreign languages and Latin. Prereq: Consent of instructor.

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

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

592 Linguistics and the Teaching of English (3) Grammar, usage, semantics, dialectology, history of language, and lexicography. Su

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

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

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

596 Teaching of Natural Science and Environmental Education (3) Strategies, laboratory techniques, assessment, current programs and professional guidelines for middle, junior and senior high schools, and community colleges. Prereq: Consent of instructor. F

597 Teaching Drama Grades 7-12 (3) Strategies and materials for teaching creative dramatics, enacting and writing of plays, reading of scripts. Sp

598 Developing Speaking and Listening Skills, Grades 7-12 (3) Teaching approaches to nonverbal communication, interpersonal and group communication, public address and listening. Review of test and materials. F

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

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

601 Studies in English Education (3) Issues and research in teaching of English. Sp

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

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

606 Research in Elementary Education (3) Analysis of research in elementary education with application to classroom teaching. Prereq: research course. Su

607 Seminar in Philosophy of Education (3) Selected philosophical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. E

621 Seminar in Social Studies Research and Theory (2) Status of research and theory. Needed research, related research from other fields, and application of research. Prereq: Recent course in teaching of social studies or consent of instructor. May be repeated. Maximum 4 hrs. E

623 Programs for Curriculum Improvement (3) Research methodology; application to descriptive, diagnostic, prescriptive instructional materials. Critical reading of research, methodology, and development in descriptive and ethnographic areas. Sp
625 Seminar in History of Education (3) Selected historical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. Sp

629 Advanced Studies in Elementary School Science (2) Current research in elementary school science as applied to classroom practice. Prereq: Graduate course in science education or equivalent or consent of instructor. May be repeated. Maximum 4 hrs. E

635 Teacher Education in America (3) For students preparing to enter teacher education. Brief historical development, program analysis and evaluation, current issues, and future directions. F

640 The Dynamics of Educational Change (3) Interdisciplinary approach to change process in education. Prereq: Consent of instructor. Sp

648 Topics in Sociology of Education (3) May be repeated. Sp

650 Advanced Studies in Early Childhood Education (3) Prereq: 2 graduate courses in early childhood education and consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

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

652 Advanced Studies in Educational Anthropology and/or Sociology (3) Ethnographic methods applied to formal and non-formal educational settings. Analysis of selected research in field. Prereq: 451, 2 courses in cultural anthropology, or consent of instructor. Sp

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

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

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


683 Advanced Studies in Elementary School Mathematics (2) Research in elementary school mathematics. Prereq: Graduate course in mathematics education or consent of instructor. Sp

685 Educational Leadership: Theory and Practice (3) Theories of leadership applied to variety of educational settings. Prereq: Consent of instructor. F,Su

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

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

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

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

696 Advanced Studies in Secondary Science and Environmental Education (3) Trends in science and environmental programs, materials methods and research for middle, junior and senior high schools, and community responsibilities. Prereq: 596 or equivalent and consent of instructor. Sp

Ecology

(College of Liberal Arts)

MAJOR

DEGREES

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

Dewey L. Bunting, Director

J. Larry Wilson, Associate Director

Paul A. Decourt, Associate Director

Shared Faculty:

Amundsen, C. C., Ph.D., Botany
Bartell, Steve, Ph.D., ORNL
Bislock, B. G., Ph.D., ORNL
Boake, Christine R. B., Ph.D., Zoology
Buckner, E. R., Ph.D., Forestry, Wildlife & Fisheries
Bunting, Dewey L., Ph.D., Zoology
Burghardt, G. M., Ph.D., Psychology
Carter, James R., Ph.D., Geography
Clebsch, E. E. C., Ph.D., Botany
Courtant, C. C., Ph.D., ORNL
DeAngelis, D. L., Ph.D., ORNL
Deardorff, B. L., Ph.D., Forestry, Wildlife & Fisheries
Delcourt, Hazel, Ph.D., Geology
Delcourt, Paul A., Ph.D., Geology
Dimmock, Ralph W., Ph.D., Forestry, Wildlife & Fisheries
Drake, James A., Ph.D., Zoology
Etchennard, Arthur C., Ph.D., Zoology
Ewold, J. W., Ph.D., ORNL
Etnier, D. A., Ph.D., Zoology
Evans, A. M., Ph.D., Botany
Farkas, Walter, Ph.D., Environmental Practice
Fibbrough, Henry A., Ph.D., Plant & Soil Science
Gardner, R. H., Ph.D., ORNL
Gehr, C. W., Ph.D., ORNL
Gist, C. S., Ph.D., ORAU
Gittleman, John L., Ph.D., Zoology
Goss, L. Barry, Ph.D., Science Appl.
Greenburg, Neil, Ph.D., Zoology
Gross, L. J., Ph.D., Mathematics
Hallam, Thomas G., Ph.D., Mathematics
Hammit, W. E., Ph.D., Forestry, Wildlife & Fisheries
Hansen, J. H., Ph.D., UTSI
Harden, Carol P., Ph.D., Geography
Hay, R. L., Ph.D., Forestry, Wildlife & Fisheries
Herbes, S. E., Ph.D., ORNL
Hildebrand, S. G., Ph.D., ORNL
Hilty, J. W., Ph.D., Entomology & Plant Pathology
Horn, Sally P., Ph.D., Geography
Houston, M., Ph.D., ORNL
Kelly, J. M., Ph.D., TVA
Kimmel, B. L., Ph.D., ORNL
McCarthy, J. F., Ph.D., ORNL
McCormick, J. Frank, Ph.D., Botany
McCracken, G. F., Ph.D., Zoology
McKinney, M. L., Ph.D., Geology
McLaughlin, S. B., Ph.D., ORNL
Mulholland, P.J., Ph.D., ORNL
Nodvin, Stephen C., Ph.D., CPSU
Olson, J. J., Ph.D., ORNL
O'Neil, R. V., Ph.D., ORNL
Pagni, R. M., Ph.D., Chemistry
Pelton, Michael R., Ph.D., Forestry, Wildlife & Fisheries
Pimm, S. L., Ph.D., Zoology
Pless, C. D., Ph.D., Entomology & Plant Pathology
Post, W., Ph.D., ORNL
Reed, R. M., Ph.D., ORNL
Rehder, J. B., Ph.D., Geography
Reischle, D. E., Ph.D., ORNL
Rennie, J. C., Ph.D., Forestry, Wildlife & Fisheries
Reynolds, John H., Ph.D., Plant & Soil Science
Riechert, Susan E., Ph.D., Zoology
Sayler, Gary S., Ph.D., Microbiology
Schraub, S. E., Ph.D., Forestry, Wildlife & Fisheries
Smith, W. O., Ph.D., Botany
Stacey, G., Ph.D., Microbiology
Stewart, A., Ph.D., ORNL
Strange, R. J., Ph.D., Forestry, Wildlife & Fisheries
Van Hook, R. I., Ph.D., ORNL
VanWinkle, W., Ph.D., ORNL
Vaughn, G., Ph.D., Zoology
Walton, B. T., Ph.D., ORNL
Wehry, E. L., Ph.D., Chemistry
West, D. C., Ph.D., ORNL
White, David C., Ph.D., Microbiology
Wilson, J. L., Ph.D., Forestry, Wildlife & Fisheries
Witherspoon, J. P., Ph.D., ORNL
Woods, F. W., Ph.D., Forestry, Wildlife & Fisheries

The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This interdepartmental program provides advanced courses in contemporary ecology for students from undergraduate programs in basic and applied biology, social sciences, mathematics, and engineering. Research opportunities in both fundamental and applied ecology are intended to prepare students for academic careers as well as professional positions in industry or government. The Environmental Sciences Division of the Oak Ridge National Laboratory, the national Park Service, and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography. TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

ADMISSION REQUIREMENTS

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

Application forms for admission should be obtained from The Graduate School and the Ecology Program. Inquiries concerning the admission requirements should be addressed to the Director, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37966-1610.

THE MASTER'S PROGRAM

Within the minimum requirements of The Graduate School, the program of study must include Ecology 573 and 574 or an approved equivalent and one course from an approved list of quantitative methods offerings. The list is available from the ecology office and is updated.
552 Development Planning in the Third World (3) (Same as Planning 552.)
555 Environmental Planning (3) (Same as Planning 555.)
561 Environmental Toxicology (3) (Same as Biochemistry 561.)
562 Techniques in Environmental Toxicology (1) (Same as Biochemistry 562.)
573 Population Biology (3) (Same as Zoology 573 and Botany 573.)
574 Communities and Ecosystems (3) Patterns underlying principles between short and long term community and ecosystem organization, dynamics, energetics, and nutrient cycling.
600 Doctoral Research and Dissertation (1-15) P/NP only.
604 Current Topics in Environmental Toxicology (3) (Same as Biochemistry 604.)
610 Special Topics in Ecology (3) Seminars on advanced topics and recent developments. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
620 Seminar in Ecology (2) May be repeated. Maximum 12 hrs.
637 Applied Ecology (3) Review of contemporary and historical issues. Analysis of scientific basis of environmental assessment and natural resource management. Analysis of career and career planning in applied ecology. Prereq: 573-74 or equivalent or consent of instructor. (Same as Botany 637.)

Economics
(College of Business Administration)

MAJORS

DEGREES

Economics ........................................... M.A., Ph.D.
Business Administration ................................ NBA

Anne Mayhew, Head

Professors:
Bohn, Robert A., Ph.D. Washington (St. Louis)
Bowley, Roger L., Ph.D. ...................... Texas
Carrol, Sidney L., Ph.D. ................ ...... Harvard
Chang, Hui S., Ph.D. ................ .......... Vanderbilt
Cole, William E., Ph.D. ................ ...... Texas
Davidson, Paul (J. Fred Holly Chair), Ph.D. .... Pennsylvania

Feiwell, George R. (Distinguished Prof.), Ph.D. ................. McGill
Fox, William F., Ph.D. ................ ...... Ohio State
Garrison, Charles B., Ph.D. .................. Kentucky
Herzog, Henry W., Ph.D. .................... Maryland
Jensen, Hans E., Ph.D. ...................... Texas
Lee, Feng-Yao, Ph.D. ................ ...... Michigan State
Mayhew, Anne, Ph.D. ................ ...... Texas
Moore, John R. (Distinguished Prof.), Ph.D. ...................... Cornell
Neale, Walter C., Ph.D. ..................... London
Quindry, K. E. (Emeritus), Ph.D. .......... Kentucky
Schlottman, Alan M., Ph.D. ............... Washington
Spiva, George A., Ph.D. ..................... Texas

Associate Professors:
Clark, Don P., Ph.D. ................ ...... Michigan State
Glustof, Errol, Ph.D. ................ ...... Stanford
Mayo, John W., Ph.D. ................ ...... Washington
Phillips, Keith E., Ph.D. ...................... Washington

Assistant Professors:
Gauger, Jean A., Ph.D. ...................... Iowa State
Kunkin, Matthew, Ph.D. ..................... Wisconsin
Mandy, David M., Ph.D. ..................... Illinois
Murray, M. N., Ph.D. ................ ...... Syracuse

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

ACADEMIC STANDARDS

A graduate student in the College of Business Administration whose grade-point average falls below 3.0 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 established by the degree program for full-time students and the next two semester's coursework as established by the degree program for part-time students.

THE MASTER'S PROGRAM

Admission to the M.A. program is based on undergraduate academic performance and on scores from the general portion of the GRE or on scores from the GMAT. The student may choose either the thesis or non-thesis option. The non-thesis option requires 30 hours of coursework at the 400 level or above. Of these, at least 24 hours (at least 18 hours of which are in economics) must be at the 500 level or above. Of the minimum of 18 hours in economics at the 500 level or above, 12 hours must consist of 511, 512 and 513, 514, and the remaining 6 hours must be in one field of economics. Of the 30 hours, a maximum of 9 hours in courses approved by the department may be taken in fields other than economics. Students electing the non-thesis option are required to pass a final comprehensive examination.

THE DOCTORAL PROGRAM

Admission to the Ph.D. program is based on promise of outstanding scholarship as demonstrated by previous academic performance and by scores achieved on the general portion of the GRE or on the GMAT. Requirements for successful completion of the program consist of the four components listed below.

1. Students are required to complete the following core requirements:
a. Economic Theory: Microeconomic theory by comprehensive examination or by completion of 511, 512 with a B+ average or higher, and macroeconomic theory by comprehensive examination or by completion of 513, 514 with a B+ average or higher.


c. Mathematical and Quantitative Economics: 581, 582. The 582 requirement may be waived for students completing 681, 682.

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

2. Students are required to demonstrate their competence by comprehensive examination in two fields of specialization with the approval of the department, at least one of which must be selected from the following: comparative systems, economic development, economic history, economics of labor and human resources, institutional organization, international trade and finance, and regional and urban economics.

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

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

BUSINESS ADMINISTRATION CONCENTRATION

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

MBA Concentration: Economics

Minimum course requirements are as approved by the area MBA faculty advisor.

GRADUATE COURSES

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

413 Macroeconomic Fluctuations (3) Analysis of historical data, methods of analyzing macro-economic fluctuations, theoretical explanations of cycles, and role of monetary and fiscal policies in aggregate economy. Prereq: Intermediate Macroeconomics or consent of instructor.

415 History of Economics (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. Prereq: 201 or equivalent and consent of instructor.

424 Political Economy of World Development (3) Topics vary: Latin America, Asia, Soviet Union and Eastern Europe. Analysis of major economic strategies, policies, and problems. Prereq: 201. This course includes a major writing requirement. May be repeated when topic varies. Maximum 9 hrs.


511-12 Microeconomic Theory (3,3) Theory of consumer choice and demand, theory of revealed preference, attributes of goods and implicit prices, market demand, labor supply, individual behavior under uncertainty, theory of firm, theory of production and cost, market structures, derived demand and factor pricing, introduction to welfare economics, market failure and theory of saving of best, pure exchange.

513-14 Macroeconomic Theory (3,3) Determination of national income, prices, and employment. Results using Keynesian, non-market-clearing, monetarist, and rational expectations paradigms.


525 Economic History of Europe (3) Nature and functioning of economic systems and policies in history of Western civilization, major issues of method and interpretation. Prereq: Graduate standing in economics or consent of instructor.

526 Economic History of the U.S. (3) Interpretation of American economic structure and policies from colonial times. Prereq: Graduate standing in economics or consent of instructor.

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


600 Doctoral Research and Dissertation (3-15) PNP only. E

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

613 Advanced Macroeconomic Theory (3) Prereq: 513 or equivalent.


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

624 Economic Development: Western Impact on Asia and Africa (3) Studies of consequences of contact between developed world and developing countries of Asia and Africa. Prereq: Undergraduate social science or consent of instructor.


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

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

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

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

552 Topics in Monetary Theory (3) Advanced monetary theory, issues in money and the monetary theory and policy. Student participation. Prereq: 615.

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

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

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


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

681-82 Econometric Methods (3,3) Theory and techniques of statistical testing of economic hypotheses and
The Department of Educational and Counseling Psychology offers graduate programs leading to the following: Master of Science with a major in Educational Psychology, concentrations in educational psychology and community agency counseling; Master of Science with a major in Guidance, concentrations in community agency counseling, educational psychology, school psychology, and school counseling; and Doctor of Education with a major in Educational Psychology, concentrations in counselor education and educational psychology. The department also participates in the college-wide Ph.D. program with a major in Education. The concentration area is theories and practice of educational and personal adjustment with specializations in counselor education, counseling psychology, educational psychology, and school psychology.

Several programs in the department are accredited. The Ed.D. counselor education concentration is accredited by the Council for Accreditation of Counseling and Related Educa-

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**Education**

*(College of Education)*

**MAJOR**

**DEGREE**

Education ........................................ Ph.D.

**THE DOCTORAL PROGRAM**

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

The program requirements, concentrations and specializations are:

- **Requirements**
- **Minimum Hours**

<table>
<thead>
<tr>
<th>Research Area</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign or Computer Language (demonstrate proficiency)</td>
<td>6</td>
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</tbody>
</table>

**General Core Requirements**

Courses in history of education, philosophy of education (two areas must be represented)

Courses in learning theory, curriculum theory, and administrative theory (three areas must be represented)

Trans-college seminar—three consecutive semesters (including summer)

**Alternative Core Requirements**

Courses in philosophy of science

Trans-college Seminar—three consecutive semesters (including summer)

Seminar in area of specialization

Courses in learning theory/group or independent study

**Concentrations**

Primary Concentration—A minimum of 16 hours normally selected from one or two specializations within the primary concentration

Supporting Specialization—A minimum of 9 hours selected from a specialization in a concentration other than the primary concentration

Cognate

A minimum of 6 hours selected from outside the college in addition to the designated research courses

**Dissertation**

24

**CONCENTRATIONS**

**Administrative Theory and Practice**

Specializations:

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

**Theories of Curriculum Development and Foundations of Education**

Specializations:

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

**Instructional Theory and Practice**

Specializations:

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

**Theories and Practice of Educational and Personal Adjustment**

Specializations:

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

**Foundations of Human Movement**

Specializations:

1. Exercise Science: Adapted Physical Education
   Exercise Physiology/fitness
2. Motor Behavior:
   Motor Control
   Motor Learning
   Psychology of Sport
3. Socio-Cultural Foundations of Sport:
   History
   Philosophy
   Sociology

**Health Education**

Specializations:

1. Public health
2. Safety

**ACADEMIC COMMON MARKET**

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

See College of Education for additional departmental listings.

**GRADUATE COURSES**

601 Trans-College Seminar (1) Introduction to Ph.D. program in Education: research requirements, meaning of scholarship in academic and issues/problems in education. Minimum of two consecutive semesters preceded or followed by summer term required of all Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. Maximum 3 hrs. May not be used to meet 600 requirement. S/NC only.
tional Programs; counseling psychology by the American Psychological Association; and school psychology by the National Association for School Psychology. Also, the school counseling and school psychology programs have the approval of the National Council for Accreditation of Teacher Education. The Community agency counseling and guidance programs are accredited by the Council for Accreditation of Counseling and Related Educational Programs.

The application deadline for admission to the doctoral programs is February 1, and to the Ed.S. and M.S. programs, February 1 and November 15. For information about the various programs of study and admissions, write the departmental admissions secretary.

THE MASTER'S PROGRAMS

Admission requirements include up-to-date scores from the GRE, the departmental admissions application form and letters of recommendation. All programs include thesis and non-thesis options. The programs in educational psychology and school psychology each require a year-long counseling practicum sequence and the equivalent of a year's full-time work as an intern in an appropriate counseling setting. The concentrations/specializations in educational psychology and counselor education also require a year of full-time experience in classroom teaching. All doctoral students take written comprehensive examinations in the program concentration, supporting specialization and cognate areas. The guidelines for each program concentration may be consulted for further requirements.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

410 Sex Role Development: Implications for Education (3) Theories and research concerning the function of gender role behavior and its relevance in educational and counseling settings. E

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

432 The Disadvantaged Student: Psychoeducational Perspectives (3) Theory and research regarding etiology, psychosocial behavior and appropriate interventions. E

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

493 Independent Study (1-15) Independent investigation of psychological and educational psychology. May be repeated. Maximum 15 hrs. S/NC or letter grade. 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 part of his/her degree program. May be repeated. S/NC only. E

503 Problems in Lieu of Thesis (1-3) May be repeated. Maximum 12 hrs. S/NC only. E

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

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

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

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

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

518 Educational Specialist Research and Thesis (1-9) May be repeated. Maximum 90 hrs. S/NC only. E

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

521 Statistics and Research Design: Application (3) Data collection and analysis. Descriptive techniques, estimation, logic of hypothesis testing and selected parametric and nonparametric tests. For Master's students conducting thesis and beginning doctoral students. Use of computer statistical packages. F, Su

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

526 Informal Methods of Assessment (3) Development and use of rating scales, check-lists, observation, test scores and case reports in assessment and counseling of children and adults. Prereq: 525. Sp

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

541 Psychoeducational Assessment (3) Direct, psychometric and naturalistic assessment methods in learning environments. Prereq: 549 or consent of instructor. S/NC only. Sp

542 Practicum in Psychoeducational Assessment (3) Application of assessment skills to clients in learning environments. Coreq: 541 or consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. F, Sp

545 Psychoeducational Consultation (3) Use of two and three-person models of consultation in educational and therapeutic settings. Prereq: 549 or consent of instructor. S/NC only. F, Sp

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

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

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

551 Theory and Practice of Counseling (3) Philosophical bases of helping relationships, development of counselor and client self-awareness: counseling theory and techniques. F
655 Practicum in Counseling (3) Supervised practice and application of counseling skills with clients. Prereq: Admission to counselor education program and consent of instructor. May be repeated. Maximum 6 hrs. E

659 Internship in Counselor Education (1-9) Supervised employment in departmentally approved internship sites in counselor education. May be repeated. Maximum 12 hrs. S/NC only. E

660 Seminar in Educational Psychology (1) Major professional issues, role and scope of educational psychology as field of study and practice. Prereq: Admission to doctoral program in educational psychology. May be repeated. Maximum 2 hrs. S/NC only. E

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


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

664 Cognitive Interventions with Psychoeducational Problems (3) Cognitive approaches applied to coping strategies, instruction, cognitive restructuring, symbolic and social modeling and belief systems. F

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

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

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


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

672 Psychological Dysfunction (3) Classification methods, dynamics and treatments of dysfunctional individuals in counseling. Prereq: 625 and consent in abnormal psychology, or consent of instructor. Sp

673 Advanced Theory and Practice in Group Counseling (3) Theories and supervised practice. Prereq: 554, 655, and consent of Instructor. Sp

674 Practicum in Counseling Psychology (3) Supervised practice of individual counseling. Minimum 155 clock hrs required each semester. Prereq: Admission to counseling psychology doctoral program, 555, and consent of instructor. May be repeated. Maximum 6 hrs. E

678 Theory and Practice of Counseling Supervision (3) Theories and practice of supervision. Prereq: 665, or 674; or consent of instructor. S/NC only. Sp

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

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


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

784 A Study of the Doctoral Program (1) Examination of problems, procedures, and practices affecting the doctoral program. May be repeated. Maximum 6 hrs. E

999 Program of Independent Study (1-15) Independent investigation of problems not otherwise provided for. May be repeated. Maximum 30 hrs. S/NC only. E

MG 100 College Success Seminar (1) Basic skills for college success. E

MG 103 Math Success (2) Basic skills for college success. F, Sp

MG 104 Writing Success (2) Basic skills for college success. F, Sp

MG 105 Reading Success (2) Basic skills for college success. F, Sp

MG 107 Study Skills (1) Basic skills for college success. F, Sp

MG 120 College 101 (2) Basic skills for college success. F, Sp

MG 125 Career Exploration (1) Basic skills for college success. F, Sp

MG 126 Career Preparation (2) Basic skills for college success. F, Sp

MG 130 Career Readiness (3) Basic skills for college success. F, Sp
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. Application deadlines are February 1, July 1, and October 1.

THE MASTER'S PROGRAM IN EDUCATIONAL ADMINISTRATION AND SUPERVISION

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

Non-Thesis Option
A minimum of 36 credit hours is required with a minimum of 18 hours in the major. An internship is highly recommended but not required. A final written comprehensive examination is required with an oral exam at the option of the committee.

THE MASTER'S PROGRAM IN COLLEGE STUDENT PERSONNEL

This program is designed for individuals interested in entering the field of student personnel administration in colleges and universities and in community or junior colleges. The program has both a thesis and non-thesis option. A minimum of 39 hours, which includes 6 hours of practicum experience, is required in either option.

Students entering any of the M.S. options must complete the introductory core consisting of Educational Administration and Supervision 513, 515, 516, and 535 or a demonstrated computer proficiency. The courses are prerequisites to other courses in the department.

THE EDUCATIONAL SPECIALIST PROGRAM

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

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

THE DOCTORAL PROGRAM

For the Ed.D. program, the minimum hours are determined by the student's doctoral committee. Six to 9 hours must be in a cognate area within the college and 8-9 hours outside the college unless the student has a Master's degree in a field outside the College of Education. Two consecutive semesters of 604 must be taken during residency. An internship is highly recommended but not required. A foreign language requirement is at the discretion of the committee. A written comprehensive examination is given as well as an oral exam over the dissertation.

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

Educational Administration and Supervision

GRADUATE COURSES

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated: S/NC only. E
503 Problems in Lieu of Thesis (3-6) May be repeated: S/NC only. E
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, intergroup relations, supportive work climates, personnel motivation, conflict management skills, and role of values, attitudes, and expectations in administration. F,Su
516 Research for School Administrators (3) Descriptive, experimental, and quasi-experimental designs to help students without quantitative backgrounds to read and understand technical professional literature. Introduction to inferential statistical techniques, evaluation procedures. Sp,Su
518 Educational Specialist Research and Thesis (3) May be repeated. Maximum 6 hrs. P/NP only. E
529 Politics of Education and Educational Environments (3) School/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 administrator. Financial and logical management tasks and procedures in individual school setting. Prereq: M.S. Introductory core or consent of instructor. F,Su
547 Educational Facility Planning (3) Concepts and skills for development, evaluation, construction, renovation, maintenance, and operations of quality educational environments and facilities. Prereq: M.S. Introductory core or consent of instructor. Sp,Su
548 Introductory Supervision and Personnel (3) Basic supervisory and personnel concepts and related competencies; building (or micro-organizational) level; interviewing, personnel planning, collecting and maintaining employee information, supervision of instructional and non-instructional personnel, clinical supervision, staff evaluation, and staff development. Prereq: Introductory M.S. core or consent of instructor. Sp,Su
553 Strategies of Educational Planning (3) Processes for improving educational function through use of both quantitative and qualitative planning techniques. Policy analysis, CPM, PERT, Delphi. Prereq: Introductory M.S. core or consent of instructor. F,Su
554 School Law (3) Logical arrangement of case and statutory materials for public school administrators and teachers; problems concerning law and public education. Prereq: M.S. introductory core or consent of instructor. F,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. F,Su
583 Educational Leadership--Principalship (3) Knowledge, skills and relationships for principal to be effective instructional leader. Simulation materials and field-based activities. Culminating course with internship and problems paper. At end of planned program of study. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F,Su
590 Special Topics (3) May be repeated. E
592 Field Problems in Educational Administration and Supervision (3) Topic to be assigned. May be repeated. S/NC or letter grade. E
593 Independent Study in Educational Administration (3) Prereq: Consent of instructor. May be repeated. E
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 elementary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F,Su
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 administra- tors. Prereq: Presently middle school administrator or consent of instructor. May be repeated. S/NC or letter grade. F,Su
597 Secondary Administrator Seminar (1-3) For in-service training of secondary school administrators. Development, problems, programs, and trends of secondary schools and management skills of secondary school administrators. Prereq: Presently secondary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F,Su
600 Doctoral Research and Dissertation (3-15) P/NP only. E
604 Seminar in Educational Administration and Supervision (1) Current educational issues, problems and research. Required two consecutive semesters during doctoral residency. May be repeated. S/NC only. E
610 Internship in Educational Administration (3) Opportunity for doctoral students to gain experience in performance of critical tasks of educational administration under supervision of practitioner and University representative. May be repeated at discretion of student's committee. Maximum 12 hrs. S/NC only. E
611 Current Issues in Educational Administration (1-3) Current topics for practicing school administrators, selected topics as deemed by the guest instructor. Prereq: Presently school supervisor or administrator, or consent of instructor. May be repeated. S/NC or letter grade. E
Higher Education

Graduate Courses

455 Seminar in Student Leadership (1) Knowledge and skills in leadership roles for resident assistants, student government leaders, student activities, and other student organizations. Topics to be assigned. May be repeated. E

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

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

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

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

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. F

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

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

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

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

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

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

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

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

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

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

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

698 Seminar in Higher Education (3) Analysis of administrative and organizational structure, theory and practice in management of American colleges and universities. Prereq: 543 or consent of instructor. Su
The Electrical and Computer Engineering Department has a graduate committee to administer, promote, and advance the general well-being of the graduate program. The Department of Electrical and Computer Engineering and the Department of Nuclear Engineering jointly offer a Master's degree program in Fusion Energy. Students may have the opportunity to do their Master's thesis at the Fusion Energy Division of the Oak Ridge National Laboratory or at the Plasma Science laboratory, affiliated with the Electrical and Computer Engineering Department. A limited number of Graduate Research Assistantships are available at each location. Further information about this program is available from the department.

THE MASTER'S PROGRAM

Graduate work leading to the Master of Science with a major in Electrical Engineering may be obtained during one academic year of full-time study, or the degree may be obtained in two or three years of study in the evening. Graduate assistantships are available for outstanding students, who may obtain the Master's degree in one calendar year.

Admission Requirements

Students applying for admission to the Master of Science program and who hold a B.S. in Electrical Engineering are considered for admission on an individual basis. The minimum expectation is an undergraduate cumulative grade-point average of 3.0 out of 4.0 and a GPA of 3.0 for the senior year. A TOEFL score of 580 is required for international students.

Students who hold the B.S. or B.A. in a field other than electrical engineering are also expected to have a minimum cumulative grade-point average of 3.0 and a minimum senior year average of 3.0 in that field. These students should also have a background equivalent to that obtained by earning credit with a minimum 3.0 grade-point average in the Electrical Engineering courses normally taken at the 200 and 300 levels in the Bachelor's program in this department, and two senior electrical and computer engineering courses (and any labs associated with them) in the student's area of interest. Students from fields other than electrical engineering who have met the admission standards except for this background will be admitted only as non-degree students until they have completed coursework to provide this background.

Master's Degree Requirements

Specific degree requirements which must be met include:

1. Electrical and Computer Engineering 503 and 504.
2. Six semester hours of graduate credit in mathematics consisting of mathematics courses of 400 level or higher which have been approved by the E.C.E. Graduate Committee.
3. An additional 12 semester hours of 400-level work in electrical and computer engineering courses or 6 semester hours of 500-level work in one area of electrical and computer engineering courses and 6 semester hours of 500-level work in another area approved by the student's Master's committee. The 500-level work in electrical and computer engineering courses must include at least 6 hours in the student's major area.
5. A final oral examination covering the thesis and related coursework.

THE DOCTORAL PROGRAM

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

Applicants must submit scores on the Graduate Record Exam. Specific departmental requirements for the Ph.D. include the following:

1. A Master of Science or Master of Engineering degree.
   a. A minimum of 24 semester hours of work in electrical and computer engineering courses at the 500 and 600 levels.
   b. A minimum of 9 semester hours of 600-level coursework. At least 3 semester hours of this work must be in an area other than the student's major area.
   c. A minimum of 12 hours of mathematics courses approved by the Electrical and Computer Engineering Graduate Committee. All 12 hours must be 600-level or above, and at least 6 hours must be at 500-level or above.
3. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.
4. Satisfactory performance on both a qualifying and comprehensive examination. The qualifying examination is prepared by the electrical and computer engineering faculty and consists of a 3-hour written examination in each of four areas. Areas (1) mathematics and transform methods, and (2) basic electrical network analysis, are required of all Ph.D. students. Areas (3) and (4) are usually chosen from two of the graduate course divisions in the department and cover material from undergraduate courses and first year graduate courses. A student who fails the qualifying examination must take and pass the examination the next time it is offered to remain in the Ph.D. program. The qualifying examination is normally taken after the completion of 24 hours of graduate coursework or immediately after completion of a Master's degree. A minimum of 18 hours of graduate coursework must be completed after the student has taken the qualifying examination the first time.
5. The comprehensive examination is prepared by the student's doctoral committee and consists of a 3-hour written examination in the student's major area, a 2-hour written examination in a related area, and an oral examination. The comprehensive examination is normally taken at least six months after passing the qualifying examination. Part of the comprehensive oral examination will be a defense of a formal written dissertation proposal. The comprehensive examination must be passed and the dissertation proposal accepted by the student's doctoral committee before the student is reported as ready for admission to candidacy for the Ph.D.
6. Participation in departmental seminars.

Many of the electrical and computer engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in the department's graduate program. Departmental graduate programs are also available at the Space Institute, Tullahoma. Departmental actions regarding a graduate student may be appealed in writing, first to the Department Graduate Committee and then to the Department Faculty.

GRADUATE COURSES

Courses required in the Electrical and Computer Engineering curriculum cannot be used in either the M.S. or Ph.D. programs. No 400-level course may be used toward a graduate degree in Electrical and Computer Engineering except when required by the program.

405 Digital Signal Processing and Filter Design (3) Discrete-time signal processing, sampled, discrete Fourier transforms, analog filter characteristics, non-recursive and recursive filter design, and CAD tools for filter design. Coreq: 409.

409 Digital Signal Processing and Filter Design Laboratory (2) Experiments and projects demonstrating digital signal processing and filter design discussed in 405. Coreq: 405.


413 Passive and Active Network Synthesis (3) Review of network analysis techniques, passive network driving point synthesis, transfer function synthesis, approximations theory, topics in active network synthesis. Prereq: 312.


426 Machines Lab (1) Experiments and projects demonstrating machines. Coreq: 422.

429 Power Electronics Lab (1) Experiments and projects demonstrating power electronics. Coreq: 425.

431 Digital and Analog Integrated Electronics (4) Basic processing and fabrication of active and passive components for monolithic integrated circuits; characteristics of bipolar, MOS, and JFET transistors, analog and digital integrated circuit designs; standard
digital logic circuits including TTL, ECL, Schottky, NMOS, CMOS, and GaAs gates and arrays; design concepts of the CMOS process; the CMOS process model; MAP and TOP. Material from ISO standards, Draft International Standards and Working Papers, IEEE standards, SIA's 9300, and when appropriate, laboratory work on experimental MAP and TOP network. Programming in C language. Prerequisite: Introduction to Logic Design of Digital Systems. Corequisite: MAP Specification and TOP Specification as demonstrated by understanding of material included in The C Workshop or consent of instructor.

458 Microprocessor Laboratory (0) Experiments and projects demonstrating digital systems. Coreq: 451.

459 Digital System Design Laboratory (0) Experiments and projects demonstrating digital systems. Coreq: 452.

460 Data Acquisition Systems Laboratory (0) Experiments and projects demonstrating digital communications. Coreq: 453.

461 Plasma Magnetohydrodynamic Engineering (3) MHD approximation; MHD waves and instabilities; MHD in static and dynamic systems; MHD in pulsed and steady-state power generation. Applications to fusion energy, industry, and astrophysics. Prereq: 361.

462 Plasma Kinetic Theory Engineering (3) Kinetic theory; beam-plasma system; driven waves in plasma; transition from kinetic to fluid systems; Vlasov and Landau theory; microwave generation in plasmas and traveling wave tubes; free electron lasers in circular and linear geometries; gyrokinetics. Prereq: 361; 461 or consent of instructor.

463 Introduction to Fusion Energy I (3) High temperature plasma physics relevant to fusion plasmas, principles and phenomenology of tokamaks, alternative magnetic confinement concepts, advanced fusion reactors, fusion technology, plasma engineering, and plasma reactor design studies. Project which integrates material in 463 and 464. Prereq: 463 or consent of instructor. (Same as Nuclear Engineering 463.)

464 Introduction to Fusion Energy II (3) Continuation of 463. Principles and phenomenology of tokamak reactors, alternative magnetic confinement concepts, advanced fusion reactors, fusion technology, plasma engineering, and plasma reactor design studies. Project which integrates material in 463 and 464. Prereq: 464 or consent of instructor. (Same as Nuclear Engineering 464.)

465 Plasma Laboratory (1) Experiments and design projects for 461, 462, 463, and 464.

471 Introduction to Pattern Recognition (3) Design of learning and adaptive machines. Elementary decision theory, perception algorithm, Bayes classification rule, learning algorithms, elements of syntactic pattern recognition. Prerequisite: Communications Systems I, Numerical Techniques and Statistics for Scientists and Engineers, FORTRAN.

472 Introduction to Digital Image Processing (3) Basic methods for digitizing, storing, processing, and displaying images. Digital techniques for image enhancement, restoration, coding, and segmentation. Prerequisite: Communications Systems I, Numerical Techniques and Statistics for Scientists and Engineers, FORTRAN.


489 Electro-Optics I Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 481.

489 Electro-Optics II Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 482.

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

458 Registration for Use of Facilities (3) 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 Modern Transform Methods (3) Fourier and Laplace transform and complex variables theory. 2-transform, difference equations and distributed parameter systems.

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

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

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


511 Linear Systems Theory (3) State space models of linear dynamical systems, linear algebra, state transition map, matrix exponential, controllability, observability, realizations, delay theory, and stability theory. Corequisite: Numerical linear algebra and spectral analysis as applied to response of systems to random signals.

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

515 Adaptive Control and System Identification (3) Adaptive control of linear deterministic and stochastic systems, adaptive filtering and prediction, parameter estimation for deterministic and stochastic systems. Prerequisite: 511-2 or 518-9.

516 Passive and Active Network Analysis and Synthesis I (3) Frequency and time domain techniques for network analysis, network reliability, synthesis algorithms.

517 Passive and Active Network Analysis and Synthesis II (3) Frequency and time domain techniques for network analysis, approximation theory, active network models, digital signal processing.

518 Control Systems Design I (3) Analysis and design of continuous and discrete time control systems, feedback theory, stability, steady-state performance, computer implementation. Prerequisite: 514.

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

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

522 Power Systems Analysis II (3) Operation and control of interconnected power systems, transient and dynamic stability. Formulating and solving problems in matrix-vector form with application to large scale power systems. Prerequisite: 521.

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

524 High Voltage Systems (3) Phenomena, generation, measurement practices and insulation in high voltage circuit tests. Testing, surge and arc control, shielding, reliability. Prerequisite: 421.

528 Advanced Electrical Machines I (3) Fundamental principles of electric energy models;
application in conventional devices. Differential equations for rotating machinery. Prereq: 422 or equivalent.

529 Advanced Electrical Machines II (3) (Park's transformation for isolated and interconnected rotating machines. Prereq: 528.

531 Advanced Analog Electronics I (3) Physical operation of modern electronic devices; second-order devices: diodes, bipolar transistors, J-FETS, and MOS-FETS. Small-signal equivalent circuits and noise models of active devices. Project laboratory. Prereq: 451, 432, 433, or consent of instructor.


543 Information Systems I (3) Mathematical treatment of information transmission in communication systems; modern digital signal processing; discrete and analog systems. System performance with noise and bandwidth constraints, sampling theorem. Quantization effects; digital systems for analysis and real and real frequency; digital signal processing. Prereq: 504.


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


551 Digital System Design I (3) Design considerations for combinational and sequential circuits. Iterative network faults. Diagnostics of logic circuits.

552 Digital System Design II (3) State identification and structure realization of sequential machines. Digital system architecture design: microprogramming and interrupt control. Prereq: 551.

561 Plasma Diagnostics I (3) Principles of active, passive, perturbing and nonperturbing diagnostic methods used in low temperature plasmas, and high temperature plasmas of interest in fusion research. Laboratory safety, data reduction and presentation, microprocessor based data handling and analysis, and reduction of time series data. Prereq: 461, 463, or consent of instructor. (Same as Nuclear Engineering 561.)

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

563 Plasma Engineering (3) (Same as Nuclear Engineering 563.)

564 Fusion Technology (3) (Same as Nuclear Engineering 564.)

565 Industrial Plasma Engineering I (3) Low temperature processes and equipment for industrial applications. Kinetic theory, particle dynamics in electric and magnetic fields, gaseous discharges, and electron, ion, and plasma sources. Prereq: Graduate standing or consent of instructor.

566 Industrial Plasma Engineering II (3) Continuation of 565 to industrial applications: ion implantation in solids, plasma deposition and etching, space propulsion systems, plasma chemistry, plasma lighting devices, insulating dielectrics and breakdown, materials processing with plasma arcs, and related topics. Prereq: 565 or consent of instructor.

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


573 Vision and Sensing for Robotics and Automation I (3) Acquisition, processing, integration, and interpretation of a wide range of vision and non-vision sensing modalities as applied to autonomous and teleoperated systems, including guidance and position control. Prereq: Permission of instructor.


588 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 588, Mechanical Engineering 588, and Aerospace Engineering 588.)

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

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

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

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


612 Advanced Systems Theory (3) Game theory, dual control problem, hierarchical systems, and information structures. Prereq: 561.


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

615 Analysis of Nonlinear Networks and Systems (3) Stability and bifurcation analysis of nonlinear electric circuits. Network elements and equation, linear systems, nonlinear O.D.E.'s, geometric analysis and numerical techniques. Prereq: Graduate standing or consent of instructor.

616 Active Network Synthesis (3) Theory and design of active analog filters and practical RC realizations. Prereq: Consent of instructor.

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

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

621 Modern Techniques for Electric Energy Systems I (3) Analysis of electric energy systems. Prereq: Consent of instructor.


631 Advanced Topics in Electronic Instrumentation I (3) Based on particular interests of students. Fundamental physical processes in instrumentation transducers, microelectronic, microwave, and quantum-mechanical devices. Prereq: 531-52 and consent of instructor.

632 Advanced Topics in Electronic Instrumentation II (3) Design of modern electronic instruments used in modern electronic instrumentation. Prereq: 631.

641 Electromagnetic Diffraction and Scattering (3) Diffraction of electromagnetic waves by spheres, corners and cylinders; ground wave propagation, modem approximate methods; creeping waves, leaky waves. Prereq: Consent of instructor.

642 Asymptotic Techniques in Wave Propagation (3) Electromagnetic waves with spatial and temporal dispersive media, fluctuation theory, and scattering theory of electromagnetic waves, supported by results from canonical approximations of geometrical optics and physical optics. Fields around a sphere. Diffraction, scattering radiative transport in tenuous particulate media; multiple scattering theory; coherence and mode spread. Fluctuation due to turbulence; rough surface scattering. Prereq: Consent of instructor.

643 Advanced Topics in Information Science I (3) Detection theory; coding theory; system identification; Signals with unknown parameters; optimal filter synthesis; adaptive systems; sequential detection; suboptimal detection. Prereq: 504 or consent of instructor.

644 Advanced Topics in Information Science II (3) Structure of algebraic and probabilistic codes; linear codes, convolutional codes, error-correcting codes, decoding methods. Identification schemes; deterministic, stochastic, and hybrid schemes. Prereq: 643.

645 Advanced Topics in Microwave Networks (3) Multipactor scattering and transfer representations. Narrow band and wide band synthesis of networks containing lumped and distributed components; interstage matching and response equalization. Low noise, low distortion and high power designs of amplifiers and oscillators. Prereq: Consent of instructor.

646 Advanced Topics in Microwave Networks (3) Reciprocal and nonreciprocal devices, directional devices, high frequency switches and multiplexers, optimization of distortion and noise in linear active circuits in modern electronic systems. Project laboratory. Consent of instructor and integration of measured data with design procedures. Prereq: Consent of instructor.
651 Computer-Aided Design of VLSI Systems I (3) Fabrication of microelectronic devices; computer architecture design; algorithmic state machines; partitioning; structured design methodology. Prereq: 551-2 or consent of instructor.

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

663 Advanced Plasma Physics I (3) Basic concepts of high temperature plasma physics. Magnetohydrodynamics and kinetic descriptions of plasma, plasma transport, plasma waves, equilibrium, and stability. Prereq: Physics 541-2, 481-2 or 563-4, or consent of instructor. (Same as Physics 663.)

664 Advanced Plasma Physics II (3) Plasma heating and radiation phenomena. Advanced topics of current interest. Must be taken in sequence. Prereq: 663. (Same as Physics 664.)

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

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

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

681-82 Quantum Electronics (3,3) Prereq: Consent of instructor.

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

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

**Engineering Science and Mechanics**

(= College of Engineering) **MAJOR DEGREES**

Jerry E. Stoneking, Head

Professors:

Antar, B. (UTSI), Ph.D. ................. Texas
Baker, A. J., PE, Ph.D. ................. New York
Carley, T. G., PE, Ph.D. ................. Illinois
Forrester, J. H., PE, Ph.D. ................. Iowa State
Forney, J. W., PE, Ph.D. ................. Doctorate
Doctorate: Toulouse (France)
Frost, W. (UTSI), Ph.D. ................. Washington
Jendrucko, R. J., PE, Ph.D. ................. Virginia
Keefar, D. R. (UTSI), Ph.D. ................. Florida
Kim, K. H., Ph.D. ................. NC State
Krieg, R. D., Ph.D. ................. New Mexico
Lancaster, J. D., PE, Ph.D. ................. Lehigh
Lee, C. W. (Emeritus), Ph.D. ................. Illinois IT
Lyday, W. A., M.S. ................. Tennessee
McCay, T. D. (UTSI), Ph.D. ................. Auburn
Phib, H., PE, Ph.D. ................. Illinois IT
Remenyik, C. J., Ph.D. ................. Johns Hopkins
Reed, D. W. (UTSI), Ph.D. ................. AFIT
Scott, W. E., Ph.D. ................. Johns Hopkins
Shahroki, F. (UTSI), Ph.D. ................. Oklahoma
Shobe, L. R. (Emeritus), PE, M.S. ................. Kansas State

Snyder, W. T., Ph.D. ................. Northwestern
Soliman, O., PE, Ph.D. ................. Tennessee
Stoneking, J. E., PE, Ph.D. ................. Illinois
Wasserman, J., PE, Ph.D. ................. Cincinnati
Weitsman, Y. J., Ph.D. ................. Rensselaer

Research Professor:

Morarty, T. F., PE, Ph.D. ................. Illinois

Associate Professors:

Boulet, J. A. M., Ph.D. ................. Stanford
Caruthers, J. E. (UTSI), Ph.D. ................. Georgia Tech
Engles, R. C. (UTSI), Ph.D. ................. VPI
Mathews, A., PE, Ph.D. ................. Illinois
McCay, M. H. (UTSI), Ph.D. ................. Florida
Steinhoff, J. S. (UTSI), Ph.D. ................. Chicago

Assistant Professor:

Brooks, G. N., Ph.D. ................. Stanford

Instructor:

Foster, S., M.S. ................. Tennessee

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program concentrations include solid mechanics, biomedical engineering, and optical engineering (UTSI only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. Each applicant is advised as to any prerequisite courses before entering a program; the student's program of study must be approved by his/her advisory committee, and must comply with the requirements of The Graduate School. The student's major professor may be selected from a department other than the Department of Engineering Science and Mechanics; however, at least one member of the student's graduate advisory committee must be on the faculty of the Department of Engineering Science and Mechanics.

A departmental application is required in addition to The Graduate School application. The names and addresses of four references must be included with the departmental application. The flexibility and interdisciplinary aspect of the program concentrations are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering or can best be met by interdisciplinary study in engineering. The department's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics or in related interdisciplinary studies such as biomechanics.

**THE MASTER'S PROGRAM**

Two M.S. options are offered: option I requires a thesis, while option II does not. The second plan is restricted to those students who have had significant engineering professional work experience.

In option I, a minimum of 30 semester hours including the thesis is required. In option II, a minimum of 33 hours is required. The requirements include the following:

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<th>Hours</th>
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<td>12</td>
<td>18</td>
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**Mathematics**

Engineering courses (Major concentration may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.)

<table>
<thead>
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<th>Hours</th>
<th>Credit</th>
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<tr>
<td>6</td>
<td>9</td>
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</table>

**Thesis**

<table>
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<th>Hours</th>
<th>Credit</th>
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<td>6</td>
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*Engineering courses under option II may include advanced laboratory work or special problem work for example, Engineering Science and Mechanics 581 or analogous courses in other departments.*

A final examination is required under both options covering graduate coursework and the thesis.

**THE DOCTORAL PROGRAM**

Specific departmental requirements for the Ph.D. include:

1. A minimum of 72 semester hours beyond the Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

2. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of the student's advisory committee.

3. A minimum of 12 semester hours in mathematics or computer science in courses numbered 400 and above, exclusive of a first course in ordinary differential equations.

4. Attendance and participation in graduate seminars and colloquia.

5. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering Science.

After being admitted as a potential candidate for the Ph.D., a qualifying examination must be taken at the first offering after the student has either completed a Master's degree or completed 24 semester hours of graduate credit. The purposes of qualifying examinations are:

a. To determine the qualifications of the student to continue the Ph.D. program, and

b. To identify the areas of strengths and weaknesses to guide the student's graduate coursework and research.

The qualifying examination will be administered by the Department's Graduate Studies Committee. The examination will be written and will cover at least four graduate level subject areas. One subject area will be mathematics, and the others will be designated by the student.
subject to the approval of the department's Graduate Studies Committee.

The comprehensive examination is to be taken by students within 6 credit hours of completion of graduate coursework required for the Ph.D. degree. This examination is to be administered by the student's advisory committee and shall consist of both a written and an oral portion.

6. After successfully passing the qualifying and comprehensive examinations, the student must present the Ph.D. dissertation research proposal to the student's advisory committee and receive committee approval of the proposal before being admitted to candidacy for the Ph.D.

7. A final examination on the student's dissertation and related fields will be taken by the student after completion of the Ph.D. dissertation and course requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on in-state tuition basis. The Ph.D. program in Engineering Sciences and Mechanics is subject to the approval of the department's Graduate Admissions and Records.

GRADUATE CREDIT FOR 400-LEVEL COURSES

Four hundred-level courses in engineering may be used for graduate credit at the discretion of the Graduate Admissions 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.

GRADUATE COURSES

421 Materials of Engineering (3) Mechanical properties of engineering materials; data collection and processing; time dependent and cyclic dependent properties. Prereq: 321, Materials Science and Engineering 201, 3 hrs or 2 hrs and 1 lab.


431 Fundamentals of Vibrations (3) Free and forced vibrations of damped and undamped lumped parameter systems; energy methods; free vibration of continuous bodies. Prereq: 321, Mathematics 231.

432 Dynamic Systems (3) Three dimensional dynamics of particles and rigid bodies; gyroscopes; variable mass systems; central force motion. Lagrange's equations; stability; transfer functions. Prereq: Dynamics.

455 Advanced Mechanics of Materials (3,3) Three-dimensional transformations for stress and strain, unsymmetrical bending, energy methods, thick-walled pressure vessels, beams on elastic foundation, beam columns, introduction to elementary theory of elasticity. Prereq: 551, Mathematics 231.

456 Stress Analysis (3) Theory, techniques, and instrumentation of resistance strain gauges; theory and techniques of brittle coating method; introduction to finite element method. Prereq: 321, Electrical and Computer Engineering 301. 2 hrs and 1 lab.

463 Photomechanics (3) Introduction to photoelasticity, photomechanics, Moiré methods, interferometry, and holography. Prereq: 321, Physics 232. 2 hrs and 1 lab.

465 Dynamic Data Acquisition (3) Use and calibration of instrumentation for measuring and recording dynamic events; Fourier analysis; transfer function analysis, digital signal processing, transduction, experimental parameter estimation with applications to modal vibration analysis. Prereq: 451, Electrical and Computer Engineering 301. 2 hrs and 1 lab.

471 Clinical Engineering and Bioinstrumentation (3) Function and characteristics of health care delivery systems; hospital organization and healthcare economics; development and management principles for hospital-based clinical engineering program. Biomedical instrumentation; characteristics of medical devices; performance of transducers, signal conditioning, data readout and storage devices; evaluation of commercially available systems and procurement methods for custom-designed system, equipment maintenance and central control programs for hospitals. Ethical issues and professionalism in clinical engineering. Prereq: Biomedical engineering. Introduction to Pattern Recognition.

473 biomechanics (3) Mechanical properties of living tissues; biomechanics of injury; mechanics of prostheses; material compatibility of prosthetic devices; biomechanical problems related to impact. Prereq: 321.

475 Design of Artificial Internal Organs (3) Design, development and evaluation of artificial internal organs; analysis of transport processes in therapeutic devices for design optimization; review of currently available devices; federal regulation and ethical considerations. Prereq: 341, Mathematics 231.


494-95 Special Engineering Science Topics (3) Problems related to recent developments and practice. Open to juniors or seniors. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

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


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, plane strain and plane strain in rectangular and polar coordinates. Thermal stresses in beams, rings, plates, and shells; thermal buckling problems. E

525 Theory of Plates (3) Classical bending theory of thin plates; thick plates; buckling and deflection problems. Prereq: 525 or 323.

526 Mechanics of Composite Materials (3) Mechanics analysis of fiber-reinforced composite materials. Lamina stress-strain relations, engineering constants, classical

Engineering Science and Mechanics 85


536 Advanced Engineering Acoustics (3) Introduction to theory and application of acoustic analysis, vibration of continuous systems, plane and spherical waves, transmission, reflection, diffraction and scattering. Resonators, filters, absorption mechanisms, microphones, ultrasonics, sonar transducers. Prereq: 541 or 435.

539 Continuum Mechanics (3) Cartesian tensors, transformation laws, basic continuum 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 fluids. Development of rate deformation tensor, mechanical 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, Introduction to turbulent transport processes, free turbulence, wall turbulence; use of engineering turbulence closure models; examination of modern numerical and experimental methods. Prereq: 541.


plates and shells; use of representative computer programs in networked mini-computers/workstation environment for design, graphic models, solid models, data base management. Prereq: 551.
557 Computational Mechanics Seminar (1) Current developments in computational fluid-thermal/structural/mechanics. For departmental thesis students only. May be repeated.
559 Computational Mechanics Laboratory (1) Introduction to networked computer/engineering workstation environment for graphics/engineering numerical analysis. Coreq: 551.
561 Photoelasticity (3) Polarized light; basic principles of photoelasticity; experimental techniques and equipment; numerical methods in photoelastic stress analysis; three-dimensional photoelasticity; applications. Prereq: Mathematics 431. 2 hrs and 1 lab.
566 Optical Engineering I (4) Wave optics; scalar diffraction theory; introduction to Fourier optics; ray or geometric optics; lens, mirror, gratings, paraxial design methods; introduction to aberrations.
567 Optical Engineering Laboratory I (2) Laboratory in support of Optical Engineering I (556). Prereq or coreq: 556.
568 Optical Engineering II (4) Statistical optics; spontaneous and induced emission; black and gray body radiation; incoherent, partial and totally coherent radiation; mutual coherence function; detectors; radiation safety. Prereq: 566.
569 Optical Engineering Laboratory II (2) Prereq: 557. Coreq: 568.
581 Special Topics in Engineering Mechanics (3) Mechanics problems related to recent developments. Prereq: Consent of instructor. May be repeated with consent of the instructor.
588 Measurement Science I (3) (Same as Nuclear Engineering 588). Chemical Engineering 588, Civil Engineering 588, Electrical and Computer Engineering 588, Aerospace Engineering 588, and Mechanical Engineering 588.)
589 Measurement Science II (3) (Same as Nuclear Engineering 589). Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Aerospace Engineering 589, and Mechanical Engineering 589.)
600 Doctoral Research and Dissertation (3-15) P/NP only. E.
621 Analysis and Design of Thin Shell Structures (3) Geometry of surfaces, derivation of thin shell theory for arbitrary shell geometry; selected applications of theory in structural engineering. Prereq: 525 or Civil Engineering 553.
625 Theory of Plasticity (3) Yield conditions; strain hardening; general constitutive equations; plastic potential; uniqueness theorems; extremum and variational principles. Problems in perfectly plastic solids; finite plastic deformations; piecewise linear plasticity. Applications. Prereq: 523.
641 Advanced Topics in Fluid Mechanics and Convective Heat Transfer (3) Convective momentum, heat and mass transfer, boundary layer analysis, stability, transition, turbulence, closure models; Navier-Stokes equations, closure procedures; time- and space-averaging, large scale structures; high speed flow, reacting, nonreacting, excitation, ionization. Applications in propulsion, laser engineering. Prereq: 545.
646 Theory of Turbulence (3) Mathematical description 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.)
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, discontinuity; two- and three-dimensional, compressible viscous and inviscid flows; potential, Euler and complete Navier-Stokes equations; numerical techniques for; hyperbolic systems; and adaptive grids; steady flows, including second-order turbulence closure. Thin layer and parabolic Navier-Stokes equations; multi-dimensional, turbulent and reacting flows. Computer project. Prereq. 552.
653-54 Advanced Topics in Computational Solid Mechanics (3,3) Fracture mechanics; singularity solutions; smooth and discontinuous, two- and three-dimensional, compressible viscous and inviscid flows; potential, Euler and complete Navier-Stokes equations; numerical techniques for; hyperbolic systems; and adaptive grids; steady flows, including second-order turbulence closure. Thin layer and parabolic Navier-Stokes equations; multi-dimensional, turbulent and reacting flows. Computer project. Prereq. 553.
557 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.

English
(College of Liberal Arts)

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<th>MAJOR</th>
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<td>English</td>
<td>M.A., Ph.D.</td>
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Dorothy M. Scoura, Head

Professors:
- Armistead, Jack M., Ph.D. .................. Duke
- Bratton, Edward W., Ph.D. ............... Illinois
- Carroll, D. Allen, Ph.D. .................. North Carolina
- Cox, Don R., Ph.D. ....................... Missouri
- Drake, Robert Y., Jr., Ph.D. .............. Yale
- Dukarm, William (Adjunct), B.A. ....... Northwestern
- Finneran, Richard J. (Hodges Chair of Excellence), Ph.D. .............. North Carolina

Fitzgerald, Mary (Adjunct), Ph.D. .......... Princeton
Goslee, Nancy M., Ph.D. ................... Yale
Helfman, Thomas J., Ph.D. ............... Cambridge
Kelly, Richard M. (Lindsay Young Prof.), Ph.D. ........ Duke
Leggett, B. J. (Distinguished Prof.), Ph.D. .......... Florida
Lofaro, Michael A., Ph.D. .................. Maryland
Miller, R. Baxter, Ph.D. ................... Brown
Pennek, A. Richard, Ph.D. ................. Colorado
Reese, Jack E., Ph.D. ...................... Kentucky
Sanderson, Norman J. (Lindsay Young Prof.), Ph.D. .......... Shakespeare Institute
Schneider, Daniel (Distinguished Prof.), Ph.D. .......... Northwestern
Shurr, William (Distinguished Prof.), Ph.D. .......... North Carolina
White, Jon M. (Lindsay Young Prof.), M.A. .......... Cambridge

Associate Professors:
- Dumas, Bethany K., Ph.D. ................. Arkansas
- Gill, J. E., Ph.D. ......................... North Carolina
- Goslee, David F., Ph.D. ................... Yale
- Hutchinson, George, Ph.D. ............... Indiana
- Kallett, Marilyn, Ph.D. ................... Rutgers
- Keene, Michael, Ph.D. .................... Texas
- Leki, Iona, Ph.D. .......................... Illinois
- Maland, Charles J., Ph.D. ................. Michigan
- Robinson, Frank K., Ph.D. ............... Texas
- Stillman, Robert, Ph.D. ................... Pennsylvania
- Thomas, Joyce Carol, M.A. ............... Stanford

Assistant Professors:
- Atwill, Janet, Ph.D. ....................... Purdue
- Barton, Ken, Ph.D. ........................ Texas Christian
- Bensel-Myers, Linda D., Ph.D. .......... Oregon
- Dunn, Allen, Ph.D. ........................ Washington
- Hammontree, Patsy G., M.A. ............. Tennessee
- Hubbard, Dolan, Ph.D. .................... Illinois
- Jennings, La Vinia, Ph.D. ............... North Carolina
- Papke, Mary E., Ph.D. ................... McGill
- Smith, Arthur, Ph.D. ..................... Houston
- Wallace, Ray, D.A. ........................ Illinois State
- Zomchick, John, Ph.D. .................... Columbia

The Department of English offers the Master of Arts and the Doctor of Philosophy degrees with a major in English. Thesis and non-thesis options are available for the M.A. as well as a special concentration in writing. Detailed information about the Master's and doctoral programs, and about individual graduate courses, may be obtained by writing the Director of Graduate Studies in English, 306 McCullough Tower.

THE MASTER'S PROGRAM

Requirements

Coursework: A minimum of 24 semester hours in English beyond the B.A., to include 6 hours at the 600 level; 12 additional hours at the 500-600 level (Only 3 hours of 593 Independent Study may be applied toward the M.A.); and 6 hours for graduate credit at any level, including the 400 level. In this coursework, students must maintain at least a 3.0 GPA.

Thesis Option: Written under the direction of a faculty member of the department and

86 English
approved by a committee of two other faculty members. Six semester hours of credit will be given.

Non-Thesis Option: Six hours of additional courses at the 500-600 level, making a total of 30 hours of required coursework.

Language Requirement: Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
1. Completion of the second year of a language at college level with a grade of C or better.
2. Completion of French 302 or German 332 at UT Knoxville with a grade of B or better.
3. Passing of the regular Ph.D. foreign language examination as currently administered at UT Knoxville.

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

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

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

WRITING CONCENTRATION

The Master's program with writing concentration is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry. Students who go on to complete the Ph.D. may also find the Master's with writing concentration helpful when they are seeking teaching positions.

Requirements

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

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

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

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

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

THE DOCTORAL PROGRAM

Requirements

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

Coursework: At least 57 semester hours beyond the B.A. to include at least 24 semester hours at the 600 level; at least 15 semester hours at the 500 level or above (Only 3 hours of 593 Independent Study may be applied toward the M.A. and 3 after the M.A.); a special course in teaching composition; and 15 additional hours at any level, including the 400 level. Up to 6 of these additional hours may be taken in some cognate field or fields such as history, philosophy, French. These courses may be drawn from those approved for graduate credit. All other coursework must be in the English department. In this coursework, students must normally maintain a 3.5 GPA.

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

Language Requirement: A language requirement met in one of the following ways:
1. Two languages approved by the Director of Graduate Studies in English. The requirement for such language may be fulfilled by (a) completion of French 302 or German 332 with a grade of B or better; (b) completion at UT Knoxville of any two courses on the 300 level or above in the foreign language or literature with at least a grade of B in each course; or (c) passing of the regular Ph.D. foreign language examination as currently administered at UT Knoxville.
2. One modern language approved by the Director of Graduate Studies in English. This requirement must be fulfilled by passing a passing grade on the language examination given by UT Knoxville and completion of two courses given in the foreign language at the 400 level or above, at least one course to be at the 500 or 600 level. A minimum grade of B must be received in each course.
3. One modern language approved by the Director of Graduate Studies in English and intensive study of the English language. This requirement must be fulfilled by completion of (a), (b), or (c) in option 1. for one foreign language, and completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509, History of the English Language. For the other 3 hours, the student must either complete the history of the language sequence or choose one other course in language taught in the Department of English at the 500 or 600 level and approved by the Director of Graduate Studies in English. These courses will not count toward the minimum number of courses for the Ph.D., and anyone electing this language option may not take the comprehensive examination in linguistics.

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

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

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

GRADUATE COURSES

401 Medieval Literature (3) Reading and analysis of selected medieval literary masterpieces in modern English.
402 Chaucer (3) Reading and analysis of Canterbury Tales and Troilus and Criseyde in Middle English.
404 Shakespeare I: Early Plays (3) Shakespeare's dramatic achievement before 1601. Reading and discussion of selected plays from romantic comedies, including Twelfth Night, English histories, including Henry IV, and early tragedy, including Hamlet.
405 Shakespeare II: Later Plays (3) Shakespeare's dramatic achievement between 1601 and 1613. Reading and discussion of selected plays from great tragedies, including Othello; problem plays, including Measure for Measure; and dramatic romances, including The Tempest.
406 Renaissance Drama (3) English theatre between 1560 and 1640 through reading of representative plays by Shakespeare's contemporaries: Marlowe, Webster, Jonson.
409 Spenser and his Contemporaries (3) Principal achievements in prose and poetry of sixteenth century authors; Spenser, Wyatt, Marlowe, More, Sidney, and Bacon.
410 Milton, Donne and their Contemporaries (3) Principal achievements in prose and poetry of seventeenth century authors: Milton, Donne, Marvell; and prose of Browne, Bacon, Walton.
411 Restoration and Eighteenth-Century Poetry and Prose (3) Dryden, Swift, Pope, Johnson, and their contemporaries; major works: Mac Flecknoe, Rape of the Lock, Gulliver's Travels, and Rasselas.
412 British Drama from 1660 to 1800 (3) Playwrights from Dryden and Wycherley to Goldsmith and Sheridan; formal developments: heroic play, satirical comedy, affective tragedy, and exemplary drama.
413 The Eighteenth-Century British Novel (3) Defoe to Austen.
414 Romantic Poetry and Prose (3) Wordsworth, Coleridge, and Blake; readings from Lamb, De Quincey, and other prose writers.
415 Romantic Poetry and Prose II (3) Keats, Shelley and Byron; readings from Hazlitt, Peacock, and other prose writers.
416 Victorian Poetry and Prose I (3) Tennyson, Pre-Raphaelites, Carlyle, Newman, and Mill.
419 Victorian Poetry and Prose II (3) Browning, Arnold, Hopkins, Hardy, Ruskin, Darwin, and Wilde.
420 The Nineteenth-Century British Novel (3) Scott to Hardy.
Entomology and Plant Pathology

(College of Agriculture)

MAJOR

Entomology and Plant Pathology ............. M.S.

Carroll J. Southards, Head

Professors:

Bernard, Ernest C., Ph.D. ...............Georgia
Gerhardt, Reid R., Ph.D. ...............NC State
Hilty, James W., Ph.D. .................Ohio State
Johnson, Leander F. (Emeritus). ........Louisiana State

Ph.D.,..............VPI

Ph.D.,..............Clemson
Reddick, Bradford B., Ph.D. ..............Clemson
Southards, Carroll J., Ph.D. .............NC State

Assistant Professors:

Grant, Jerome F., Ph.D. .................Clemson
Gwin, Kimberly D., Ph.D. ...............NC State
Windham, Mark T., Ph.D. ...............NC State

The Department of Entomology and Plant Pathology offers a graduate program leading to the Master of Science with a concentration in entomology or plant pathology. Students in entomology may specialize in crop entomology, medical and veterinary entomology, insect biology, insect pest management, or biological control. Students in plant pathology may specialize in foliar and stem fungus diseases, soil-borne diseases, plant nematology, or virology. For specific information, contact the department head.

THE MASTER'S PROGRAM

Admission Requirements

For admission to the M.S. degree program, a student must meet all requirements of The University of Tennessee Graduate School and must have completed (1) general botany or biology, 8 hours; (2) advanced biological sciences, 8 hours; (3) general inorganic chemistry, 6-8 hours; (4) organic chemistry, 3 hours. In addition, three completed rating forms and a written statement of career goals and interest in entomology or plant pathology are required.

Degree Requirements

The program requires a written thesis based on original research and the completion of a minimum of 24 hours of coursework for graduate credit, approved by the student's advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be passed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include at least 6 hours and not more than 10 hours of graduate-level credit in the minor department. The student's committee shall include a member of the faculty from the minor department to assist in designating courses required for the minor.

GRADUATE COURSES

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

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

510 Plant Disease Fungi (4) Morphology, taxonomy, biology, and genetics of plant pathogenic fungi; isolation and identification of plant pathogenic fungi. Prereq: 313 or consent of instructor. 2 hrs and 1 lab. F,A

511 Plant Disease Diagnosis (3) Diagnosis of plant diseases, disease symptoms, and identification of causal agents and control measures. Prereq: 510 or consent of instructor, 1 hr and 2 labs. Su,A

512 Soil-Borne Plant Diseases (3) Causal agents, host-plant-soil-environment interactions, epidemiology, and control of soil-borne plant diseases. Prereq: 313. 2 hrs and 1 lab. F,A

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

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

521 Plant Virology (3) Symptomatology, epidemiology, and management of virus infection; structure, morphol-

ogy, replication, transmission, purification, characterization, and classification of plant viruses; serology; plant pathogenic viroids, mycoplasmas and viroplasmas. Prereq: 313 or consent of instructor. 2 hrs and 1 lab. Sp,A

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

525 Medical and Veterinary Entomology (3) Morphology, taxonomy, ecology, and management of arthropods and vectors of human and animal diseases. Ecology and behavior of vectors in relation to pathogen transmission and control. Prereq: 321 or 325, or Zoology 380, or consent of instructor. 2 hrs and 1 lab. Sp,A

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

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

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

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

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

(College of Business Administration)

MAJOR DEGREES
Business Administration MBA, Ph.D.

Harold A. Black, Head

Professors:
Black, Harold A., Ph.D. Ohio State
Dotterweich, William W. Wm. Voight, Ph.D.
Pennsylvania
Goolsby, G. C., Ph.D. Wisconsin (Milwaukee)
Hillard, Jimmy E. (Clayton Prof. of Excellence), Ph.D.
Tennessee
Philippatos, G. C. (Distinguished Prof.), Ph.D. New York
Shrieve, Ronald E. (Faculty Scholar), Ph.D.

Associate Professors:
Auxier, A. L., Ph.D. Iowa
Beohm, T. P., Ph.D. Washington (St. Louis)
Wachowicz, J. M., Jr., CPA, Ph.D. Illinois
Wansley, James W., Ph.D. South Carolina

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

MBA Concentration: Finance.

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

Minimum course requirements are three courses: Finance 521, plus two courses from the following: 511, 512, 522, 531, 532, 581, or 582. A fourth finance course of the student's choice is strongly advised. Courses selected must be approved by the Finance Department, MBA advisor.

Ph.D. Concentration: Finance.

Minimum course requirements are finance seminars 641, 642, 651, 652.

GRADUATE COURSES


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

511 Contemporary Issues in Corporate Finance (3) Selected topics in financial management, recent developments that have significant impact on strategic issues in financial management. Capital budgeting, financial and ownership structure, dividend policy and corporate growth and control. Prereq. 501.

512 Problems in Financial Management (3) Readings and cases that apply finance theory to real world investment, financing, and asset management problems. Prereq. 501.


599 Special Topics in Finance (1-3) Topics vary. Prereq. 501 or consent of instructor. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) PhD only. E


642 Seminar in Finance II: Theory of the Firm (3) Financial theory of firm and financial decision making under conditions of uncertainty, equilibrium models of firm. Option pricing, agency theory, capital structure, economics of information, and dividend policy.

651 Advanced Seminar in Finance I (3) Recent theoretical and empirical developments in micro-finance literature. Topics vary. May be repeated. Maximum 6 hrs.

652 Advanced Seminar in Finance II (3) Recent theoretical and empirical developments in macro-finance literature. Topics vary. May be repeated. Maximum 6 hrs.

Food Technology and Science

(College of Agriculture)

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

Hugh O. Jaynes, Head

Associates:

Professors:
Collins, J. L., Ph.D. Maryland
Davidson, P. M., Ph.D. Washington State
Drughon, F. A., Ph.D. Georgia
Jaynes, H. O., Ph.D. Illinois
Melton, S. L., Ph.D. Tennessee
Miles, J. T. (Emeritus), Ph.D. Wisconsin
Overcast, W. W. (Emeritus), Ph.D. Iowa State
Penfield, M. P., Ph.D. Tennessee

Associate Professors:
Demott, B. J., Ph.D. Michigan State
Loveday, H. D., Ph.D. Kansas State
Mount, J. R., Ph.D. Ohio State
Riemann, M. J., Ph.D. Kansas State

Assistant Professors:
Biwald, R. N., Ph.D. Massachusetts
Christen, G. E., Ph.D. Missouri
3. A minimum of 72 hours beyond the Bachelor's degree, excluding credit for the Master's thesis, is required. Of this, 24 semester hours must be 600 Doctoral Research and Dissertation.
4. At least 24 hours of coursework numbered above 500 are required exclusive of doctoral research and dissertation. At least 6 of the 24 hours must be courses numbered above 600.
5. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Technology and Science.
6. All candidates must complete 601 (2 hrs.), and are expected to attend 601 during their Ph.D. program.
7. Each candidate must pass both written and oral comprehensive examinations prior to admission to candidacy. Major professors will advise candidates on competencies expected. A final oral examination is required that includes a defense of the dissertation and subject matter that the student's committee considers appropriate.

GRADUATE COURSES
410 Food Chemistry I (3) Reactions of proteins, enzymes, and additives in foods. Physicochemical interactions of food materials. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. F
411 Food Chemistry II (3) Reactions of inorganic compounds, carbohydrates, lipids and vitamins in foods. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. Sp
420 Food Microbiology (2) Physical, chemical and environmental factors moderating growth and survival of foodborne microorganisms, pathogenic and spoilage microorganisms affecting quality of foods and their control. Prereq: Microbiology 210. Coreq: 429. F
430 Sensory Evaluation of Food (3) Principles and methods of sensory evaluation of foods. Prereq: Basic statistics. 2 hrs and 1 lab. F
440 Preservation of Food (3) Prevention of deterioration spoilage of foods. Methods of preservation. Prereq: Agricultural Engineering Technology 422. 2 hrs and 1 lab. Sp
450 Dairy Products I (3) Procurement, processing and distribution of fluid milk. Manufacture of butter, frozen and condensed dairy products. Prereq: 140 or consent of instructor. 2 hrs and 1 lab. F
451 Dairy Products II (3) Manufacture of cheese and specialized dairy products. Market standards and grades, product defects, scoring of dairy products. Prereq: 140 or consent of instructor. 2 hrs and 1 lab. F
460 Meat Products Technology (4) Processing methods for making cured, smoked, fresh, flaked and formed products. Effect of processing methods on product characteristics. Prereq: 360 or consent of instructor. 3 hrs and 1 lab. Sp
470 Food Crop Products (3) Food products from plant foods. Manufacturing systems, quality attributes and utility. Prereq: 3 hrs biological science. 2 hrs and 1 lab. Sp
480 Cereal Science and Bakery Products (3) Chemistry and technology of developing cereal grains, reactions of ingredients during production and storage of baked products. Prereq: 410 or 411 or equivalent. 2 hrs and 1 lab. F,A
500 Thesis (1-15) P/NP only. E
501 Seminar (1) Individual reports and discussion on topics from current literature. May be repeated. Maximum 3 hrs. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
510 Instrumental Analysis of Food (3) Modern instrumental methods for control of food manufacturing processes. Prereq: 410-11. 2 hrs and 1 lab. F
511 Color and Flavor of Foods (3) Chemical basis, measurements, and reactions involved in color and flavor changes in foods. Manufacture and application of materials used to modify color and flavor. Prereq: 410-11. 2 hrs and 1 lab. F
520 Food and Industrial Fermentations (3) Microbiology, biochemistry and technology of food-related fermentations involving dairy products, meat, cereals, fruits and vegetables. Production of food ingredients and by product utilization. Prereq: 420-29, 440. Biochemistry 410 or equivalent. 2 hrs and 1 lab. Sp
521 Advanced Food Microbiology (3) Microorganisms in foods, their identification, characterization and relationship to food processing. Isolation of microorganisms from foods and plant equipment. Prereq: 420-29, 1 hr and 2 labs. Sp
540 Food Product Development (3) Art, science and technology of developing and marketing new food products. Prereq: 440. 2 hrs and 1 lab. Sp
550 Advanced Meat Science (3) Physical and chemical changes that occur in conversion of muscle to meat; effect of postmortem treatments on meat quality, composition and palatability, packaging, preservation and quality control. Prereq: 450. 2 hrs and 1 lab. Sp
550 Oilseed Products (3) Chemistry and technology of foods and food ingredients produced from oilseeds. Prereq: 410-11 or equivalent. 2 hrs and 1 lab. Sp
550 Special Topics in Food Technology and Science (1) Critical reviews of current research and production concerns of food industry. May be repeated. Maximum 3 hrs. F,Sp
593 Directed Studies (1-15) Research on non-thesis topics chosen by student and major professor. Supervised experience in food industry or governmental laboratories. May be repeated. Maximum 6 hrs. E
600 Doctoral Research and Dissertation (3-15) P/NP only. E
601 Seminar (1) Reports and directed discussion on research topics from current literature. May be repeated. Maximum 3 hrs. F,Sp
620 Food Toxicology (2) Basic and applied concepts in food toxicology and development of treated foods. Mode of action, prevention and control of food toxicants in food supply. Prereq: 410-11, 521, or consent of instructor. F
640 Advanced Food Processing (3) Role of processing treatments in modification of food properties: texture, flavor and color characteristics. Prereq: 440, 510, 511 or consent of instructor. Sp,A

Forestry, Wildlife and Fisheries
(College of Agriculture)

MAJORS
FORESTRY
WILDLIFE AND FISHERIES SCIENCE

DEGREES
M.S.

MAJORS
FORESTRY
WILDLIFE AND FISHERIES SCIENCE

DEGREES
M.S.

George T. Weaver, Head

Professors:

Associate Professors:

Assistant Professors:
King, M. M., Ph.D. ......................... Iowa State Winstorfcr, P. M., Ph.D. ................ Iowa State

Graduate study leading to the Master of Science with majors in Forestry and in Wildlife and Fisheries Science is offered by the Department of Forestry, Wildlife and Fisheries. The Master of Business Administration, with a concentration in forest industries management, is available for qualified students. This degree program is offered by the College of Business Administration with participation by the Department of Forestry, Wildlife and Fisheries. The Doctor of Philosophy degree is available in forest biology, wildlife science, or fisheries science and can be achieved through the University's intercollegiate graduate program in Ecology.

THE MASTER'S PROGRAMS
Both thesis and non-thesis options are available for the major in Forestry; a thesis is required in Wildlife and Fisheries Science. For admission, the student must have a Bachelor's degree from an accredited institution in forestry, wildlife, fisheries, or other natural resource area. Applicants must also have taken the general Graduate Record Examination (GRE). Graduate School rating forms or letters of recommendation from three individuals familiar with the applicant's academic ability are required. The department also has an application that must be submitted at the time of application to The Graduate School.

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

3. All students are required to include Forestry 512 or Wildlife and Fisheries 512, Seminar, in their programs. This is required of each graduate student in residence fall semester.

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

Non-Thesis Option (Forestry only)

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

Forestry

GRADUATE COURSES

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

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

423 Forest Recreation Planning and Management (3) Planning processes, master and site planning, site design projects, management strategies, methods of visitor and recreation site management, case studies. Weekend fieldtrips. Prereq: 321, 323, Ornamental Horticulture and Landscape Design 280, or consent of instructor. 2 hrs and 1 lab. F

431 Solid Wood Processing (3) Production processes for solid wood products: sawmilling, secondary machining, drying and preservation. Prereq: 331 and 332, or consent of instructor. 2 hrs and 1 lab. Sp

432 Wood Composites and Gluing (3) Principles of adhesion; wood adhesives; fundamentals of plywood; adhesion; wood adhesives; fundamentals of plywood and particleboard; hybridization; tree cytology and tissue culture; genetic variability; experimental design and conducting forest research. Prereq: Silvicultural methods and Biology 220 or consent of instructor. Sp

450 Genetics in Forestry (3) Genetic improvement of forest trees; selection of superior clones; field testing for genetic variability; tree breeding; development of seed orchards; hybridization; tree cytology and tissue culture; use of genetic variability; planning and conducting forest research. Prereq: Silvicultural methods and Biology 220 or consent of instructor. Sp

520 Advanced Forest Tree Biology (3) Growth, reproduction, and physiology of trees; forest ecology; variability and taxonomy of forest trees. Prereq: Graduates standing in forestry or biological science, or consent of instructor. Sp, A

530 Advanced Forest Resource Management (3) Identification and analysis of problems in public and private forests. Forest organization and computerized regulation systems; financial and economic analysis. Prereq: 431, 433 and 332, or consent of instructor. F, A

540 Genetics in Forestry (3) Genetic improvement of forest trees; selection of superior clones; field testing for genetic variability; tree breeding; development of seed orchards; hybridization; tree cytology and tissue culture; use of genetic variability; planning and conducting forest research. Prereq: Silvicultural methods and Biology 220 or consent of instructor. Sp

550 Forest Recreation Research Methods (3) Evaluation of research methodologies through readings and case studies; techniques of recreation resource monitoring and research management for planning and implementing land in wildland recreation. Prereq: 321 or equivalent and statistics. F, A

560 Industrial Forestry I (3) Economic structure of forest products industry; identification and analysis of industry structure and markets, domestic and foreign. Current trends in markets and industrial structure: impact on short term and strategic planning. Prereq: Senior-level forest management or consent of instructor. F, A

565 Industrial Forestry II (3) Evaluation of alternative strategies for forest management. Role of timber and forestland in integrated forest from standpoint of financial and strategic evaluations for different levels of self-sufficiency for forest products and energy. Prereq: Senior-level forest management or consent of instructor. F, A

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

580 Advanced Silviculture (3) Silvicultural characteristics, silvicultural practices and systems applied to commercial important insecticides and herbicides. In-depth analyses of silvicultural principles involved and tools used, prescribed fire, pesticides, in generation and management of uneven-aged and under with forest management and institutional arrangements affecting forest management and marketing strategies for private, industrial firms. Prereq: Senior-level forest management or consent of instructor. Sp, A

590 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory; fixed and variable plot sampling; list sampling; Poisson sampling; regression estimators; multiple and multivariate sampling; growth and yield predictors for even-aged and uneven-aged forests. Prereq: 325 or consent of instructor. F, A

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

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

Forestry, Wildlife & Fisheries

GRADUATE COURSES

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

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

Wildlife and Fisheries Science

GRADUATE COURSES

441 Wildlife and Fisheries Techniques (3) Capturing and handling fish and wildlife; population restoration; food habit sampling; wildlife damage control; marking techniques; fish culture systems; track and sign identification. Prereq: Forestry, Wildlife and Fisheries 317. 1 hr and 2 tabs or field. One weekend field trip required. F

443 Fisheries Science (3) Quantification and management of fish populations: population estimation, age and growth, biological assessment, and strategies concerning wise use of fishery resources. Prereq: Forestry, Wildlife and Fisheries 317 or Biology 230, and 6 hrs of mathematics. 2 hrs and 1 lab. Sp

445 Ecology and Management of Wild Birds (3) Biological and ecological characteristics of game and nongame birds; wild birds, and avian pests. Current principles and practices of wild bird management. Prereq: Forestry, Wildlife and Fisheries 317 or Biology 230. 2 hrs and 1 lab. One weekend field trip required. F

447 Wildlife and Fisheries 317 or Biology 230. 2 hrs and 1 lab. One weekend field trip required. 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

512 Seminar in Wildlife and Fisheries Science (1) Conducted by senior wildlife and fisheries science. Prereq: Consent of all graduate students in residence in fall. May be repeated. Maximum 2 hrs. S/NC only. F

520 Planning and Administration of Fisheries and Wildlife Programs (2) Factors influencing policy and
program planning activities of fisheries and wildlife agencies. Decision-making policies, case histories. Sp.A

530 Wildlife Diseases (2) Necropsy of birds and mammals. Recognition of various diseases and methods of preparing pathological materials in field and lab. Investigative procedures concerning wildlife diseases. Prereq: 1 yr biology. 444 or 445, or consent of instructor. F.A

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

550 Fish Physiology (3) Mechanisms of circulation, excitation, osmoregulation, and neural and hormonal control of these systems in fishes. Practical applications of fish physiology in water pollution assessment, fish culture and management. Prereq: Senior or graduate standing in biological sciences. Sp.A

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

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

French

See Romance Languages

Geography

(College of Liberal Arts)

MAJOR DEGREES

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

Sidney R. Jumper, Head

Professors:

Aiken, Charles S., Ph.D.........................Georgia
Bell, Thomas L., Ph.D.........................Iowa
Hammond, E. H. (Emeritus), Ph.D..................California
Jumper, Sidney R., Ph.D.........................Tennessee
Long, G. (Emeritus), Ph.D.........................Northwestern
Minkel, C. W., Ph.D.........................Syracuse
Paludan, C. T. (UTSI), Ph.D.........................Denver
Rakoton, B., Ph.D.........................Northwestern
Schmudder, T. H., Ph.D.........................Wisconsin
Wilbanks, T. J. (Adjunct), Ph.D.........................Syracuse

Associate Professors:

Blasing, T. J. (Adjunct), Ph.D.........................Wisconsin
Brinkman, L. W., Jr., Ph.D.........................Wisconsin
Brown, Marilyn (Adjunct), Ph.D.........................Ohio State
Carter, James R., Ph.D.........................Georgia
Foresta, R., Ph.D.........................Georgia
Pulsipher, L., Ph.D.........................Southern Illinois
Rheder, J. B., Ph.D.........................Louisiana State

Assistant Professors:

Harden, Carol P., Ph.D.........................Colorado
Horn, Sally P., Ph.D.........................California

The department offers the Master of Science and Doctor of Philosophy degrees. The Master's degree emphasizes development of professional competence as a geographer and offers opportunities to gain substantial depth in a concentration or a major technique. An emphasis in geographic information systems is available for students who have appropriate background in mathematics and computer science. The doctoral program is for those who have demonstrated proficiency in conducting independent research. The department is particularly well-qualified to direct research in geography of the natural environment (biogeography, biological conservation, geomorphology), spatial analysis (especially transportation and location analysis), Latin America, and the American South. Graduate concentrations include nonmetropolitan areas, land use, urban geography, transportation geography, geography of resources, geography of development, and regional and historical geography of the United States.

THE MASTER'S PROGRAM

The department offers the thesis and nonthesis options for the Master of Science. Both options require a minimum of 30 semester hours beyond the completion of a sound undergraduate major program. At least two-thirds of the total hours in the degree program must be at or above the 500 level and must include 501 (at each offering during residency). 504 and 3 semester hours at the 600 level. In the thesis option, 6 hours must be Thesis 500. A final examination is required in both programs.

THE DOCTORAL PROGRAM

The doctorate is a research degree and is granted only to those who demonstrate proficiency in conducting independent research. Students must have achieved the equivalent of a comprehensive Master's program before they will be admitted to the doctoral program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program of study must include sufficient coursework within the department, but outside the areas of specialization to provide a broad foundation and understanding of the discipline. The program must include 504, 515, 599, and (at each offering during residency) 501. A minimum of 12 hours must be earned in related fields outside the discipline. Departmental research, current research literature, and prescriptive procedures concerning wildlife diseases. Prereq: 101-02 or 141 or 340 or consent of instructor. Maxim 6 hrs. E

411 Computer Mapping and Geographic Information Systems (3) Concepts, management, and presentation of digital data for spatial analysis: cartographic data structures. Prereq: 310 and knowledge of computer language or consent of instructor. 2 hrs and 1 2-hr lab.

412 Cartography (3) Cartographic techniques applied to design, compilation, and representation of maps and other graphics. Prereq: 310 or consent of instructor. 2hrs and 1 2-hr lab.

413 Remote Sensing: Types and Applications (3) Principles and uses of remote sensing imagery, digital data, and spectral data: geographic interpretation and mapping techniques. Prereq: 310 or consent of instructor.

415 Quantitative Methods in Geography (3) Geographical application of statistical techniques, point pattern analysis, and analysis of areal units. Prereq: Mathematics 115 or two semesters of calculus or consent of instructor.

421 Geography of Folk Societies (3) Geographical study of folk culture, traditional material culture and rural settlement, examples from eastern North America and selected foreign areas. Prereq: 101-02 or 320 or consent of instructor.

425 Historical Geography of the United States (3) Survey of changing human geography of United States during four centuries of settlement and development. Changing population patterns, development of agricultural regions, and patterns of urban-industrial development. Prereq: 361 or consent of instructor.

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

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

435 Biogeography (3) Changing distribution patterns of plants and animals on variety of spatial and temporal scales. Effects of continental drift, Pleistocene climatic change, and human activity on world biota. Prereq: Geography of natural environment or consent of instructor.

436 Water Resources (3) Global water resources and hydrologic processes: water availability, flooding, and water quality issues from physical and economic geographical perspectives. Prereq: Introduction to Geography or consent of instructor.

441 Urban Geography (3) Concepts and theories concerning development and significance of systems of cities and small and medium urban centers. Prereq: 101-02 or 141 or 340 or consent of instructor. (Same as Urban Studies 441.)

443 Rural Geography (3) Geographical appraisal of rural areas of United States: small towns and urban fringes. Problems and potentials of rural America. Prereq: 101-02 or 141 or 340 or consent of instructor.

445 Geography of Resources (3) Study of factors related to variations in resource availability from time to time and place to place; energy and metallic resources. Prereq: 101-02 or 141 or 340 or consent of instructor.

449 Geography of Transportation (3) Examinations of transportation systems, their effects on trade patterns, land use, location problems, and development. Prereq: 141 or 340 or consent of instructor.

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

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

501 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration required of resident graduate students whenever offered. May be repeated. Maximum 4 hrs. May be applied toward graduate degree. S. NC only.
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or facilities time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

504 Research Design (3) Geographical research from selection of topic and development of research design through field work and final report.

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

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

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

512 Topics in Cartography (3) Trends, concepts, problems and methods in cartography. Prereq: 411 and 412 or written consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

513 Topics in Remote Sensing (3) Applied research using imagery for interpretation and mapping of geographic data. Prereq: 512 or written consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

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

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

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

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

524 Topics in Political Geography (3) Geographic consequences of public decisions; understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

525 Topics in Historical Geography (3) Examination of trends, concepts, and methods in historical geography. Prereq: 425 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

533 Topics in Physical Geography (3) Examination of trends, problems, and methods in physical geography. Prereq: 435 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

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

536 Plant Communities and Plant Geography (4) (Same as Botany 536)

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

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

550 Regional Geomorphology (3) (Same as Geology 550)
470 Applied Geophysics (3) Basic principles and applications of seismic, gravity, magnetic, and electrical prospecting methods. Prerequisites: Mathematics 141-142 and Physics 131. 2 hrs and 1 lab.

480 Principles of Economic Geology (4) Ore-forming processes, clastic and diagenetic terrigenous clastic rocks; economic geology. Prerequisites: 310 and 330 or equivalents. Recommended prerequisite: 420. 3 hrs and 1 hr lab.

485 Principles of Geohydrology (3) Principles governing flow of water through rock systems. Applications to groundwater contamination, ore-forming hydrothermal fluids, and paleohydrology. General geology, general chemistry, and calculus. (Same as Civil Engineering 485.)

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

502 Registration for Use of Facilities (3-15) Required registration in 590 is required during the first year of residence. 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.

GRADUATE COURSES

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

420 Paleocology (4) Principles of ecological analysis as applied to geologic problems: data collection and interpretation. Laboratory designed around preparation of scientific reports based on field and laboratory analysis. Writing emphasis courses. 3 hrs and 1 lab.

421 Invertebrate Paleontology I (3) Survey of preservational processes and geologically important representatives of Protista, Porifera, Cnidaria, Bryozoa, and Brachiopoda. Functional analysis of morphology, skeletal structures, ecology, and stratigraphic distribution. Prerequisite: 320 or consent of instructor. 2 hrs and 1 1/2 hr lab.

422 Invertebrate Paleontology II (3) Survey of “higher invertebrates”: Annelida and other worms, Mollusca, Arthropoda, Echinodermata, Graptolida, and Brachiopoda. Functional analysis of morphology, skeletal structures, ecology, and stratigraphic distribution. Prerequisite: 320 or consent of instructor. 2 hrs and 1 1/2 hr lab.

425 Evolution and Geologic Record (3) Evolution of life viewed from fossil record. Extinction, macroevolution, and evolutionary rates. Prerequisite: 320. 2 hrs and 1 seminar.

426 Paleobotany and Palynology (3) Evolutionary history of terrestrial vegetation; fossil plants. Characteristics of major groups of fossil record of macrobotanical remains, spores, and pollen. Origin and diversification of Gymnosperms and Angiosperms. Changes in floristic provinces through geologic time. Prerequisite: 102: Botany 310-20 or consent of instructor. (Same as Botany 426.) 3 hrs and 1 lab.

440 Field Geology (6) Summer field course for advanced undergraduate geology majors and first-year graduate students in geology. Taught off-campus at Geology Field Station 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.

445 Regional Geology of the United States (3) Evolution of geologic processes within U.S.: Integration of several types of geologic data. Prerequisite: 330, 340, 370.

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 1/2 hr lab.

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

460 Principles of Geochemistry (3) Application of chemical principles of crystals, crystallography, and relation between basic atomic structure and distribution and behavior of elements in earth's crust. Prerequisite: Chemistry 120-30. Recommended prerequisite: 330. 3 hrs and 1 lab.

475 Quaternary Geology of the United States (4) Evolutionary development of orogenic belts in context of newest aspects of plate tectonic theory; current literature and ongoing research for both modern and ancient examples. Prerequisite: 370 or consent of instructor. 3 hrs and 1 seminar.

480 Regional Geomorphology (3) Integrative approach to study of natural geomorphological regions stressing links and similarities across boundaries, unique characteristics of major divisions, provinces, sections, and districts. May be repeated with consent of instructor. Max credit: 6 hrs. (Same as botany 555 and Zoology 555.)

485 Quaternary Paleoecology (3) Evolutionary development of flora and fauna. Distribution and abundance of Quaternary species. Perturbation, processes, and pattern within Quaternary ecosystems; climatic change and vegetational responses during last 2.5 million years. Prerequisite: Consent of instructor.

490 Physical Geochemistry (3) Theory and practice of thermodynamic as applied to geologic situations: phase equilibria, kinetics, geothermometry, geobarometry, elemental partitioning. Prerequisite: 330. Recommended prerequisite: 450.

491 Aqueous Geochemistry (4) Introduction to and applications of equilibrium thermodynamics to earth surface environments; geochemistry of natural water, weathering reactions, and early sediment diagenesis. Prerequisite: Chemistry 120-30. 3 hrs and 1 lab or seminar.


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

499 Experimental Geochemistry Laboratory (1-3) Independent lab study of problems in geochemistry using experimental and analytical techniques. Prerequisite: Consent of instructor.

500 Advanced Structural Geology (4) Current topics in structural geology and tectonics of mountain belts; recent literature. Prerequisite: 310 or consent of instructor. 3 hrs and 1 lab or seminar.

501 Regional Tectonics and Structural Geology (3) Major subdivisions of earth's crust and processes that form them. Comparison of internal structure of mountain chains and how they function in increasing continental crust. Examples from different parts of world. Prerequisite: Structural geology or consent of instructor.

505 Plate Tectonics and Orogeny (4) Tectonic development of oceanic belts in context of newest aspects of plate tectonic theory; current literature and ongoing research for both modern and ancient examples. Prerequisite: 370 or consent of instructor. 3 hrs and 1 seminar.

506 Reflection Seismology (3) Interpretation of geo- logic structure and stratigraphy using seismic data, effects of velocity anomalies, multiples and complex reflector geometry. Application of seismic interpretation. Prerequisite: Stratigraphy and sedimentation, structural geology, and 470 or consent of instructor.


508 Ore Petrology (3) Detailed study of selected ore deposits: petrology of ore-gangue assemblages. Prerequisite: 480 or consent of instructor. 2 hrs and 1 1/2 hr lab.

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

510 Geology of the Tropics (3) Geology of tropical regions. Evolution and diversity of tropical environments. Prerequisite: 310 or 330. 3 hrs and 1 lab.

515 Seminar in Quaternary Studies (3) Interdisciplinary examination of contemporary issues in the dynamics of pattern and process in Quaternary landscapes; responses of plant and animal populations to environmental changes during glacial/interglacial cycles. Prerequisite: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Botany 555 and Zoology 555.)

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

526 Sedimentary Petrology (3) Examination of principles of stratigraphy and biostratigraphy through selected case histories. 1 hr and 1 1/2 hr seminar.

529 Seminar in Paleontology (1) Examination of principles of stratigraphy and biostratigraphy through selected case histories. 1 hr plus fieldtrips.

530 Petrogenesis of Crystalline Rocks (4) Origin and properties of igneous and metamorphic rocks, magmatic and subsolidus processes and physical conditions. Laboratory involves petrographic study of crystalline rocks in thin section. Prerequisite: 410. 3 hrs and 1 lab.

530 Seminar in Local Geology (1) Introduction of geology of Southern Appalachian. 1 hr plus fieldtrips.

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

540 Seminar in Geology of the Tropics (3) Geology of tropical regions. Evolution and diversity of tropical environments. Prerequisite: 310 or 330. 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, sections, and districts. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Botany 555 and Zoology 555.)

555 Seminar in Quaternary Studies (3) Interdisciplinary examination of contemporary issues in the dynamics of pattern and process in Quaternary landscapes; responses of plant and animal populations to environmental changes during glacial/interglacial cycles. Prerequisite: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Botany 555 and Zoology 555.)

556 Quaternary Geology of North America (3) Interpretation of geomorphic, stratigraphic, and sedimentologic sequences in glaciated, periglacial, and nonglacial regions of North America; correlation of major episodes of North American glacial with paleo-oceanographic changes in Atlantic and Pacific Oceans. Prerequisite: 101 or consent of instructor.

557 Quaternary Geology (3) Perturbation, processes, and patterns within Quaternary environments: climatic change and vegetational responses during last 2.5 million years. Prerequisite: Consent of instructor.
Germanic and Slavic Languages

(College of Liberal Arts)

MAJORS

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

David E. Lee, Head

Professors:
Falen, James E., Ph.D. .......... Pennsylvania
Fiere, Donald M., Ph.D. ......... Indiana
Fuller, H. W. (Emeritus), Ph.D. ...... Wisconsin
Kratz, Henry, Ph.D. ............... Ohio State
Osborne, J. C., Ph.D. ............. Northwestern
Rice, Martin P., Ph.D. .......... Vanderbilt
Ritzenhoff, Ursula C., Ph.D. ..... Connecticut

Associate Professors:
Hodges, Carolyn R., Ph.D. ....... Chicago
Lauckner, Nancy A., Ph.D. .......... Wisconsin
Lee, David E., Ph.D. ............... Stanford
Mellor, C. J., Ph.D. ............... Chicago

Assistant Professor:
Kolodziej, J. I., Ph.D. .......... Indiana

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

THE MASTER'S PROGRAM

The department requires a minimum of 30 semester hours including 15 hours of course-work 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 Languages and requires advanced training in at least two foreign languages.
German to New High German. Internal and external linguistic history of German speech. Prereq: 6 hrs of upper division German language courses (excluding courses in translation or graduate reading courses). (Same as Linguistics 436.)

405 Business German (3) Survey of German used in fields of business, government, administration, and economics. Preparation of German-language division. German, excluding courses in translation and 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/N/C 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.

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 a waiver by department.

520 Proseminar (3) Bibliography; methods, illustrative problems; preparation of papers.

521 Works of Dostoevsky in English Translation (3) Crime and Punishment, Brothers Karamazov, and other works. No foreign language credit.

522 Works of Tolstoy in English Translation (3) War and Peace, Anna Karenina, and other works. No foreign language credit.

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 Language 1890-1945 (3) Content varies. May be repeated. Maximum 6 hrs.

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

560 German Literary Theory and Criticism (3) 561-62 Directed Readings in German Language and Literature (3,3)

571-72 Old Norse Language and Literature (3,3)

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

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

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

600 Doctoral Research and Dissertation (3-15) 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.

612 Old Saxon (3) Phonology, morphology, and syntax of Old Saxon. Representative readings.

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

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

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Russian

GRADUATE COURSES

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 426, German 426, Spanish 426, and Linguistics 426.)

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.

520 Proseminar (3) Bibliography; methods, illustrative problems; preparation of papers.

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

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

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Health, Leisure, and Safety

(College of Education)

MAJORS

DEGREES

Public Health

M.P.H.

Recreation and Leisure Studies

M.S.

Safety Education and Service

M.S., Ed.S.

School Health Education

M.S.

Health Education

Ed.D.

Ph.D.

Charles B. Hamilton, Head

Professors:

Gorski, June, Dr.P.H. UCLA

Hamilton, Charles B., Dr.P.H. Oklahoma

Hayes, Gene E., Ph.D. North Texas State

Kirk, Robert H., H.S.D. Indiana

Neutens, James, Ph.D. Illinois

Wallace, Bill C., Ed.D. Northern Colorado

Associate Professors:

Krick, Ken L., Re.D. Indiana

Pursley, R. Jack, Ph.D. Iowa

Rockett, Ian R., Ph.D. Brown

Thompson, A. F., Ph.D. Michigan State

Assistant Professors:

Aldrich, Tim E. (Adjunct), Ph.D. California (San Francisco

Pressly, Velma W., Ed.D. Tennessee

Putnam, Sandra L. (Adjunct), Ph.D. Brown

Duffy, Mary, M.D. Pennsylvania

The Department of Health, Leisure, and Safety offers graduate programs leading to the Master of Science, the Master of Public Health, the Specialist in Education, the Doctor of Education, and the Doctor of Philosophy with a major in Education. Inquiries should be directed to the department head.

Health

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

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

The Doctor of Philosophy with a major in Education offers a concentration in health education and choice of supporting specializations from public health or safety as listed under Education.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at 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 Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

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

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

406 Death, Dying and Bereavement (3) Aspects of dying, death and handling trauma of loss. Medical, financial, physical, legal and social implications of death. F,Sp

414 Physical Activity and Fitness (3) (Same as Physical Education 414.)

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

428 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 Studies 428.) E

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

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

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

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

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

510 Trends and Issues in Health Education (3) Comprehensive study and analysis of history, philosophy, principles, problems and trends of and in health education. F,Sp
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 Curriculum Development for Health Education Programs (3) Analysis of current health education curricula for elementary and secondary schools, community, and health care settings. Sp.


560 Graduate Workshop (1-3) Specific health/wellness or health promotion issues. Special health problems in concentrated period of time. May be repeated. Maximum 12 hrs.

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

590 Research Methods in Health (3) Basic research techniques with emphasis on the development of research skills and problem identification for research topic. (Same as Public Health 590) F.

593 Directed Independent Studies (1-3) Individual investigation of health/wellness or health promotion problem/issue. Specific proposal to instructor before registration. May be repeated. Maximum 12 hrs. E.

600 Doctoral Research and Dissertation (3-19) F/NC only. E.

601 Internship/Research In Safety and Health (3-6) (Same as Safety 501.)

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: Ph.D. F.

650 Health Aspects of Gerontology (3) Knowledge and understanding of biological, psychological and social levels of aging. Development of health/wellness or health promotion as related to the aging process and aging of individual. (Same as Public Health 650.) Su.

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

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


Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Three professional preparation concentrations are available: community health education, health planning/administration, and occupational/environmental health and safety. 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. Appropriate forms are available from the department's program in Public Health. Preferential consideration for admission to degree status shall be given to those with a minimum undergraduate grade-point average of 2.8 and with at least one year of professional experience in a health-related occupation.

THE MASTER'S PROGRAM

The M.P.H. is a non-thesis program requiring completion of 38 semester hours of coursework including 9 weeks of field practice. 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 a realistic 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.

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, Florida, Kentucky, Louisiana, Mississippi, or Virginia. Additional information may be obtained from the Registrar's Office or Graduate Admissions and Records.

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 related to work setting, 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.

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

493 Directed Independent Study (1-3) Individual investigation of health/wellness or health promotion problem/issue. May be repeated. Maximum 6 hrs. E.

502 Registration for Use of Facilities (3-19) Required before registration. May be repeated. Maximum 9 hrs.

505 Continuing Education in Public Health (1-3) Selected learning activities and experiences in specialized areas of public health utilizing workshop format. May be repeated. Maximum 9 hrs.

509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health as discipline and its interrelation with many other academic and professional disciplines. Speakers both internal and external. May be repeated. Maximum 4 hrs. (Same as Nursing 509, Nutrition and Food Science 505, Physical Education 509, and Social Work 509.) F/NC only. E.

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

511 Fundamentals of Industrial Hygiene (3) Occupational health and safety: recognition, evaluation and control of workplace health hazards. Pertinent workplace problems and situations. F.


513 Industrial Hygiene Instrumentation and Sampling (3) Instruments and methods for evaluating industrial environment for personal exposure to chemical and physical stresses associated with occupational activities. Demonstration, and lab. Prereq: 511 or consent of instructor. 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 concepts in non-traditional health care facilities, with emphasis on supervision and management of domiciliary health services programs. Management and operation of health care facilities and organizations which provide health services in settings which provide activities of daily living and special psychosocial environmental needs. Programs for home health services, continuing care retirement centers, nursing homes, congregate living centers and similar type 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, financing, rate setting, financial planning and control. Opportunities to apply techniques. Prereq: 520 or consent of instructor. Sp.

530 Biostatistics (3) Application of descriptive and inferential statistical and experimental design techniques. 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.


542 Advanced Epidemiologic Methods (3) Both cohort and case-comparison study designs; conduct and interpretation of study, and general attention to calculation and presentation. Professional literature, contemporary perspective of epidemiologic approaches to problems and potential for formulation in public health. Prereq: 540 or consent of instructor. Sp.

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

552 Community Health Problem Solving (4) Dynamics of community organization, community needs assessment, health problems and strategy formulation 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, issues in planning; primary elements of planning: formulation and conceptualization
Recreation and Leisure Studies

Graduate study with a major in Recreation and Leisure Studies leads to the Master of Science. Professional preparation concentrations are available in therapeutic recreation, general recreation, and sport administration/management. The third concentration is an interdisciplinary program with the department of Human Performance and Sport Studies.

The M.S. with thesis and non-thesis options, requires completion of 32 semester hours. The following retention policy applies to graduate students seeking the M.S. with a concentration in sport administration/management:

1. Graduate students are required to maintain an overall 3.0 GPA.
2. Any student who falls below this standard will be advised in writing by the department head of the need to discuss the matter with his/her advisor.
3. If a student's overall GPA remains below 3.0 for a second semester, the student will have 30 days to either withdraw or register for a second semester. Failure to do so results in academic dismissal. Valid driver's license required. 2 hrs and 2 tabs. F.Su

Graduate programs are available leading to the Master of Science with a major in Safety Education and Service (thesis and non-thesis options) and to the Specialist in Education with a major in Safety Education and Service.
**History**

(College of Liberal Arts)

**MAJOR**

<table>
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<tr>
<th>DEGREES</th>
<th>M.A., Ph.D.</th>
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**History**

John Muldowny, Head

Professors:

Bergeron, Paul H., Ph.D. ....... Vanderbilt
Chmielowski, Edward V., Ph.D. ....... Harvard
Cobb, James C., Ph.D. ....... Georgia
Finger, John R., Ph.D. ....... Washington
Graf, Leroy P. (Emeritus) (Distinguished Prof.), Ph.D. ....... Harvard
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
McDonald, Michael J., Ph.D. ....... Pennsylvania
Utley, Jonathan G., Ph.D. ....... Illinois
Muldowny, John, Ph.D. ....... Yale
Pinckney, Paul J., Ph.D. ....... Vanderbilt
Wheeler, W. Bruce, Ph.D. ....... Virginia

Associate Professors:

Becker, Susan D., Ph.D. ....... Case Western
Bing, J. Daniel, Ph.D. ....... Indiana
Bohstedt, John, Ph.D. ....... Harvard
Farris, W. Wayne, Ph.D. ....... Harvard
Fleming, Cynthia G., Ph.D. ....... Duke
Johnson, Charles W., Ph.D. ....... Michigan
Muldowny, John, Ph.D. ....... Yale
Pinckney, Paul J., Ph.D. ....... Vanderbilt
Utley, Jonathan G., Ph.D. ....... Illinois

Assistant Professors:

Brummett, Palmira R., Ph.D. ....... Chicago
Diacon, Todd A., Ph.D. ....... Wisconsin
Gavitt, Philip R., Ph.D. ....... Michigan
Lansing, Carol L., Ph.D. ....... Michigan
Matson, Cathy D., Ph.D. ....... Columbia
Plummer, Betty L., Ph.D. ....... Maryland

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy. The M.A. program includes a thesis and non-thesis option and also offers a non-thesis concentration in historic preservation.

The doctoral program has concentrations in regional/local American, military/foreign relations, and socioeconomic history. Detailed information may be obtained from the Director of Graduate Studies.

**THE MASTER'S PROGRAM**

**Admission Requirements**

1. Successful completion of a baccalaureate degree, preferably with a major in History.
2. Acceptable scores on the Graduate Record Examination (general and subject history).

**Academic Standards**

A 3.0 overall GPA is required of graduate students to remain in good standing. The Graduate Awards and Review Committee monitors the progress of all graduate students each semester.

**Thesis Option**

Twenty-four hours of coursework and 6 hours of Thesis 500 for a total of 30 hours are required. The student must complete 510, 3 hours of reading courses (521) and 3 hours of a 600-level seminar. A two-hour oral examination covering both the thesis and the general field in which the thesis is written is given at the end of the program.

**Non-Thesis Option**

A total of 30 hours of coursework is required. A student must complete 510, 6 hours of reading courses (521) and 6 hours of 600-level seminars. A two-hour written examination on one field and a one-hour oral examination on the second field are given at the end of the program. As many as 9 related hours may be taken in courses outside the department for either option.

**Concentration in Historic Preservation**

This option is a non-thesis program requiring 33 total hours: 18 hours outside the history department, and 15 hours within. Required courses are 6 hours of 521, 3 in historic preservation and 3 in either early American or recent American history.

Students will be examined in two fields: historic preservation and either early American or recent American history.

**THE DOCTORAL PROGRAM**

**Admission Requirements**

1. Acceptable scores on the Graduate Record Examination (general and subject history).
2. Successful completion of the M.A.

**Residence and Coursework**

Students are required to complete a minimum of 50 hours in coursework beyond the Bachelor's degree. Students must take 510 or its equivalent. Students transferring from another institution may count up to 24 hours of coursework toward the required 50 hours. All students pursuing the Ph.D. must take a minimum of 6 related hours outside the department. No fewer than 3 semesters of the 6 semesters of residence work (2 of which must be consecutive semesters) shall be under the supervision of the staff of UT Knoxville.

**Language Requirements**

Candidates must possess a reading knowledge of one foreign language and such additional languages as may be determined by the student's committee. Under normal circumstances, those concentrating in European history will need two languages. The committee may also specify any other research tools, such as statistics, essential for the student's preparation. Upon student petition, the committee may accept in place of a language a B or better performance in an appropriate statistical course and History 526.

The foreign language requirements may be satisfied in one of two ways:

1. By examination. When the student is ready to take a language examination, he/she should consult with an advisor. The appropriate forms and the time of the examination may be obtained from The Graduate School.
2. By coursework. Upon consultation with the advisor, a student may elect to complete an appropriate sequence in a language department (or an intermediate sequence in a language in which no appropriate sequence is available). Satisfactory completion requires that a student must have at least a B in the final semester.

**Comprehensive Examination**

The comprehensive examination which will be both written and oral must be taken after all coursework is completed, language requirements fulfilled, and at least nine months before the degree is expected. This exam should normally be taken before beginning the sixth semester of work toward the doctorate. The candidate must present two fields, one from group I and one from group II.

**Group I**

- Premodern Europe
- Modern Europe
- Early American
- Recent United States

**Group II**

- Socio-economic
- Military/Foreign Relations
- Regional/Local (U.S.)
- National/Regional (U.S.)

**Dissertation and Defense**

Original research forms the basis for the dissertation. After the dissertation has been completed, a final oral examination will be given on the dissertation in its historical context.

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>Thesis (1-15)</td>
<td>P/NP only</td>
<td>E.</td>
</tr>
<tr>
<td>502</td>
<td>Registration for Use of Facilities (3-15)</td>
<td>Required</td>
<td>For the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.</td>
</tr>
<tr>
<td>510</td>
<td>Foundations to Graduate Study in History (3)</td>
<td></td>
<td>Assumptions and methods of historians. Required of all candidates for advanced degrees. F.</td>
</tr>
<tr>
<td>532</td>
<td>Topics in Modern Europe (3)</td>
<td>Reading seminar: secondary sources on movements and trends that are multinational in focus. Focus varies. May be repeated. Maximum 15 hrs.</td>
<td></td>
</tr>
<tr>
<td>533</td>
<td>Topics in European National History (3)</td>
<td>Reading seminar: secondary sources on intra-national topics, usually British, Russian, German or French. Focus varies. May be repeated. Maximum 15 hrs.</td>
<td></td>
</tr>
<tr>
<td>541</td>
<td>Topics in Early American History (3)</td>
<td>Reading seminar: secondary sources on early North American history. Focus varies. May be repeated. Maximum 15 hrs.</td>
<td></td>
</tr>
<tr>
<td>542</td>
<td>Topics in 19th- and 20th-Century United States (3)</td>
<td>Reading seminar: secondary sources on 19th- and 20th-century United States. Focus varies. May be repeated. Maximum 15 hrs.</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Notes**

- All courses are offered on the University campus.
- Some courses may require special permissions or prerequisites.
- Consult the Graduate School for the most current information.
Home Economics

(The College of Human Ecology)

MAJOR

DEGREE

Home Economics ........................................ M.S.

The Master of Science with a major in Home Economics 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 home economics/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.

ADMISSION REQUIREMENTS

A completed file for review includes a College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section, and completion of three Graduate School Rating Forms by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean’s Office, College of Human Ecology. The M.S. in Home Economics requires an under-graduate degree in Home Economics.

THE MASTER’S PROGRAM

The M.S. in Home Economics is designed to meet graduate study needs of professionals who work in programs encompassing all areas of home economics. Thesis (33 hours) and non-thesis (36 hours) options are offered. The program includes 3-6 hours in research methodology, 6-9 hours in program planning and implementation (agricultural extension, home economics education, other areas of education), 3 hours in the integrative nature of home economics, and 12-15 (thesis) to 15-18 (non-thesis) hours in the College of Human Ecology. At least one course is to be from each department in the college. The non-thesis option requires a practicum and a comprehensive examination will be administered at the end of the program.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs without restriction. This M.S. program in Home Economics is available to residents of the state of South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Home Economics Education

(College of Human Ecology)

Students pursuing graduate study in home economics education or extension are encouraged to enroll in the multidisciplinary Master’s degree in Home Economics. Home Economics Education courses may be selected to meet requirements of that program. Home economics teachers may choose courses within this area for updating and certification renewal. Graduate coursework in Home Economics Education may also be selected for development of a concentration or minor within other areas of specialization.

GRADUATE COURSES

510 Curriculum in Home Economics (3) Development of home economics educational materials and instruction. Prereq: 420 or equivalent or consent of instructor.

515 Evaluation in Home Economics Education (3) Assessment of programs and pupil progress; techniques, methods and purposes. Prereq: 420 or equivalent.

520 Supervision of Home Economics in the Public Schools (3) Program planning, organization and administration of vocational home economics education. Supervision of pre-service and in-service home economics professionals. Prereq: Classroom teaching experience.

525 Home Economics Adult Education (3) Development and administration of community-based home economics programs for adults. Prereq: Consent of instructor.

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

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

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

Human Ecology

(College of Human Ecology)

MAJOR

DEGREE

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

Graduate study leading to the Doctor of Philosophy with a major in Human Ecology is available in the Departments of Child and Family Studies, Nutrition and Food Sciences, and Textiles, Merchandising and Design. Concentrations areas are child development, family studies, food science, nutrition science, and textiles and apparel. 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 improvement of
individual and family well being. For example, the physiological chemist may study metabolic-dietary interrelationships and psychologists may study child behavior. But, it is within human ecology that the nutrient needs of the growing child are considered along with the factors that affect the child's acceptance of different foods. Within the College of Human Ecology, research from one discipline is enhanced by encompassing and utilizing the findings of research from other disciplines.

ADMISSION REQUIREMENTS

A completed file for review includes a College of Human Ecology application, Graduate School Rating Forms by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology.

THE DOCTORAL PROGRAM

The doctorate 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);
3. College Professional Seminar in Human Ecology 610;
4. Minimum of 9 semester hours of 600-level coursework (not including dissertation);
5. Successful completion of written/oral comprehensive examinations as provided by each department's procedures and the student's doctoral committee;
6. Original research project, which culminates in a dissertation; 24 semester hours of credit are required for dissertation;
7. Defense of the dissertation. The doctoral committee shall determine whether a reading knowledge of a foreign language is required.

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

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, Arkansas, Kentucky, Louisiana, Mississippi, South Carolina, Virginia or West Virginia. Additional information may be obtained from the Residence Assistant 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 beyond base fees 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

515 Issues and Trends in Human Ecology (1-3) Research and theory related to current issues. Prereq: Consent of instructor. E

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

525 Practicum in Home Economics (1-6) Field based experiences. Prereq: Consent of instructor. 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 UTK. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. Same as Educational and Counseling Psychology 585, Nursing 585, Physical Education 585, Public Health 585, Psychology 585, Social Work 585, and Sociology 585. S/N only.

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 futures thinking in human ecology. Sp

Human Performance and Sport Studies

(College of Education)

MAJORS

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

Joan Paul, Head

Professors:

Capon, Edward K. (Emeritus), Ph.D. .......... Iowa
Howley, Edward T., Ph.D. ....................... Wisconsin
Kozar, Andrew J., Ph.D. ......................... Michigan
Lay, Nancy E., Ph.D. ............................... Florida State
Liemohn, W. P., Ph.D. ............................. Iowa
Paul, Joan, Ed.D. .................................... Alabama
Phillips, Madge M. (Emeritus), Ph.D. .... Iowa
Watson, Helen B. (Emeritus), Ph.D. .... Michigan
Wrisberg, C. A., Ph.D. ............................. Michigan

Associate Professors:

Beitel, Patricia A., Ed.D. ..................... North Carolina (Greensboro)
Bond, Venita J., Ed.D. ......................... Tennessee
Croskey, R. J., M.F.A ............................. Southern Methodist
DeSensi, J. T., Ed.D. .............................. North Carolina (Greensboro)
Jones, Ralph E., Ph.D. ......................... Toledo

Mead, B. J., Ph.D. ................................. Purdue
Morgan, W. J., Ph.D. .............................. Minnesota

Assistant Professors:

Bassett, David R., Jr., Ph.D. .......... Wisconsin
Borovik, Patricia C., M.S. ................. Tennessee
Kelley, D. R., Ed.D. .............................. Georgia State
Lewis, J. L., Ed.D. ................................ Tennessee
McCutchen, M. G., Ed.D. ................. North Carolina (Greensboro)

Adjunct Faculty:

Acker, J. E., M.D. .............................. Tennessee
Buckles, Tina M., Ph.D. ..................... Tennessee
Namey, Thomas, M.D. .................... Washington (St. Louis)
O'Connell, D. G., Ph.D. ............. Toledo

THE MASTER'S PROGRAM

The Department of Human Performance and Sport Studies offers the Master of Science with a major in Physical Education with the following concentrations:

Adapted Physical Education
Exercise Physiology and Fitness
Motor Behavior
Pedagogy in Physical Education
Philosophical and Sociological Foundations of Sport
Sport Administration/Management (an interdisciplinary concentration with Health, Leisure, and Safety)

The Master of Science program permits the student to select a thesis or non-thesis option. The thesis option requires a minimum of 30 hours. The non-thesis option requires 32 hours, including a project. All M.S. students must complete a course in research design or statistics and register for two credits of Physical Education 601.

THE DOCTORAL PROGRAM

The Doctor of Education with a major in Physical Education is available with concentrations in the following areas:

Adapted Physical Education
Exercise Physiology and Fitness
Motor Behavior
Philosophical and Sociological Foundations of Sport

The Doctor of Philosophy with a major in Education includes the concentrations and specializations listed under Education.

ADMISSION REQUIREMENTS

Applicants are required to complete the departmental application which will be sent to all persons upon their initial inquiry about the program. Specific questions about these programs should be directed to the head of the Department of Human Performance and Sport Studies.

The following retention policy applies to all graduate students seeking a degree in the Department of Human Performance and Sport Studies:

1. Graduate students are required to maintain an overall 3.0 GPA

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

GRADUATE ASSISTANTSHIPS

A limited number of graduate assistantships are available for qualified women and men who are graduates of accredited colleges or universities. These assistantships are open to students in the Master's and doctoral programs. Students interested in these opportunities should file their applications before February. Letters should be addressed to Graduate Assistantships Coordinator, Department of Human Performance and Physical Education, The University of Tennessee, Knoxville, TN 37996-2700.

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 Physical Education is available to residents of the state of Texas. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Physical Education

**GRADUATE COURSES**

405 Sociology of Sport (3) (Same as Sociology 405.)

411 Adapted Physical Education (3) Developmental disabilities or physical handicap and their impact on the teaching and learning in physical education (Same as Health 509.)

414 Physical Activity and Fitness (2) Relationship of exercise to cardiorespiratory function, body composition, healthy low back, and stress. Prereq: Human physiology. Recommended coreq: 415. (Same as Health 414.)


423 Readings in Physical Education (2) Review of current and classic literature in physical education.

480 Physiology of Exercise (3) Functions of body in muscular work: physiological aspects of fatigue, training and adaptation to environment. Prereq: Human Physiology or general physiology. 2 hrs and 1 lab. (Same as Zoology 480.)

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

501 Special Project (3) Culminating experience for nonthesis major. Research study suitable for publication, or practicum requiring special written work. Prereq: 532.


511 Administrative/Supervisory Processes in Physical Education (3) Organizational concepts, management strategies, and supervisory techniques related to physical education programs at all levels.

512 Application of Theory to Curricular/Methodological Decision in Physical Education (3) Application of curricular principles and theories to educational situations for development of curricula and lessons in physical education. Various methodological approaches.

514 Advanced Philosophy of Sport (3) Major philosophical theories of sport: existential, conceptual, moral, aesthetic, and social-political issues.

515 Social Theories of Sport (3) Liberal, democratic and Marxist social theories of sport. (Same as Sociology 594.)

528 Motor Behavior: A Theoretical Perspective (3) Motor behavior from information processing perspective: overview of current research that supports theoretical bases. Prereq: Undergraduate course in general psychology or consent of instructor.

531 Biomechanics of Human Performance (3) Human movement: teaching, coaching and sports medicine. Prereq: 422 or equivalent.

532 Seminar in Research Techniques in Physical Education (3) Evaluate, compare, and contrast research techniques in physical education with consideration for and experiences in appropriate review, design, and analysis procedures, and proposal development.

533 Psychology of Sport (3) Social psychological factors influencing sport and physical activity. Prereq: General psychology course or consent of instructor.

534 Motor Behavior and Skill Acquisition (3) Topical explanation and application of principles of human movement behavior to acquisition and performance of skills; discussion and methodology. Prereq: 533 or consent of instructor.

535 Sport Administration (3) Development of knowledge and analytic skills desirable for middle and upper level managers/administrators in sport business/organization.

541 Special Topics (1-3) Advanced study in selected disciplinary or professional areas of physical education and/or sport. May be repeated.

542 Sociological Aspects of Sport and Physical Education (3) Social and cultural factors influencing sport and physical education. Pertinent issues and research applications. Prereq: Consent of instructor. (Same as Sociology 542.)

543 Human Motor Development (3) Changes in selected motor performance in related attribute areas during critical developmental periods within context of perceptual-motor development theories and explanations of factors affecting motor behavior.

544 Theories of Physical/Movement Education (3) Integration of various theoretical approaches to physical education/movement education within cultural context; research and field work.

553 Advanced Adapted Physical Education (2) Curriculum development and teaching methodologies in programming for child with special education needs. Prereq: 411 or consent of instructor. Coreq: 554.

554 Advanced Adapted Physical Education Prac- (1) Curricula and methodologies implemented in lab in school for handicapped. Coreq: 553.

555 Motor Assessment and Programming for the Child with Special Education Needs (3) Criterion and norm-referenced tests used in development of individualized education programs for child with special physical education/motor development needs. Testing protocols which purport to get at basis of dysfunction; those which just measure symptoms of dysfunction; efficiency of remediation theories based or related to testing protocols; Evaluation of motor skill in exceptional children and development of remedial programs for children assessed appropriate for school/placement needs.

556 Laboratory Techniques in Exercise Physiology (2) Laboratory course in experimental methodology and instrumentation: respiratory and metabolic measurements, blood chemistry, and gas analysis. Prereq: Zoology 480. S/N only.

557 Advanced Physiology of Exercise (3) Quantitative approach to current and classical questions in exercise physiology. Prereq: Zoology 480 and 593.


569 Fitness Testing, Programming, and Leadership for Diverse Populations (3) Clinical experience in selecting, administering, and evaluating exercise tolerance tests on cycle ergometer and treadmill. Individual fitness programs for diverse populations. Practice in leading variety of activities aimed at improved fitness. Prereq: Zoology 480 and 414/415. Coreq: 568. (Same as Public Health 569.)

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

593 Directed Independent Studies (1-3) May be repeated. Prereq: 532 or consent of instructor. S/N or letter grade.

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

601 Research Seminar in Physical Education (1) Research topics in different aspects of physical education and sport, and human movement. May be repeated. S/N only.

622 Directed Independent Research (3-6) Prereq: Doctoral student or consent of instructor. May be repeated. S/N or letter grade.

633 Advanced Motor Behavior (1-3) In-depth analysis, synthesis, and discussion of contemporary theories and topics; research and development: motor control learning, sport psychology, motor development.

651 Seminar in Exercise and Applied Physiology (1) Selected topics in exercise and environmental physiology. Prereq: 563 and 565. May be repeated with consent of instructor.

664 Research Participation in Applied Physiology (1-6) Participation in research with faculty member whose interests coincide with those of student. S/N only.

681 Practicum (1-3) Intern experience in areas of major interest. May be repeated.

Dance

**GRADUATE COURSES**

410 Ballet: Level III (2) Instruction and practice in advanced classical ballet techniques. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.

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

420 Jazz: Level III (2) Instruction and practice in advanced jazz and musical theater dance styles and techniques. Prereq: Dance majors and minors and consent of instructor. May be repeated. Maximum 16 hrs.

430 Modern: Level III (2) Instruction and practice in advanced modern dance techniques. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.

450 Composition III (3) Application of choreographic and production skills culminating in presentation of two works. Prereq: 250.

460 Rhythmic Analysis (3) Basic nature and principles of music, rhythm, and rhythmic notation; correlation with dance movement and composition. Prereq: Consent of instructor.

465 Dance Notation (3) Fundamentals of movement notation; notation and reading of elementary movement studies.

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

481 History of Dance II (3) Development of dance in theatre, recreation and education during 20th century.

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

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**Industrial and Organizational Psychology**

(Chair of Business Administration and College of Liberal Arts)

**MAJOR DEGREES**

**Psychology** M.S., Ph.D.

Michael Rush, Director

Committee:

Dewhirst, H. Dudley, Management
Dobbins, Gregory H., Management
Fowler, Oscar S., Management
James, Lawrence R., Management
Jenkins, Roger L., Business Administration
Ladd, R. T., Management
Larsen, John M., Jr. (Emeritus), Management
Lounsbury, John W., Psychology
Polio, Howard R., Psychology
Russell, J. E. A., Management
Schumann, David W., Marketing
Sundstrom, Eric, Psychology

(For complete Faculty Listing, 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 program emphasizes a scientistic/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 Vice Provost and Dean of The Graduate School on recommendation from the two department heads.

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 The Graduate School and the Director, Industrial and Organizational Psychology Program, 408 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 March 1.

**General Requirements**

At least one year of college mathematics and one course in statistics are 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) and the Subject GRE (Psychology-81) 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 Subject GRE (Psychology-81) score will be used in making admission decisions, although special consideration will be given in the case of non-psychology majors.

**THE MASTER’S PROGRAM**

Note: Curriculum under review and subject to change effective Fall 1991.

A thesis is required with 6 semester hours of Management or Psychology 500. 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: Management 567, 568 or Psychology 517-18
- Psychology 557, Statistics 537, 538

-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 dissertation may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 650.

-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 650 (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.

**THE DOCTORAL PROGRAM**

Note: Curriculum under review and subject to change effective Fall 1991.

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
-Management 557, Statistics 537-38
-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 677 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 650.

-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 650 (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. and Ph.D. programs in Industrial and Organizational Psychology are available to residents of the states of South Carolina or Virginia. The Ph.D. program is also available to residents of Arkansas or Kentucky.

Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.
Industrial Engineering

(College of Engineering)

MAJOR DEGREE
Industrial Engineering

John N. Snider, Head

Professors:
Bontadelli, J. A., Ph.D. Ohio State
Claycombe, W. W., Ph. D., PE. Ph.D. VPI
DePorter, Elden L., Ph. D. VPI
Doulet, Dan C., PE. M.S. Tennessee
Emerson, H. P. (Emeritus), Ph. D., S.B. MIT
Garrison, G. (UTSI), Ph. D. NC State
LaForge, R. M. (Emeritus), Ph. D. Georgia Tech
Loveless, Howard L. (Emeritus), Ph. D., M.S. VPI

Major Assistants:
Hungerford, J. C., Ph.D. Ohio State
Hailey, M. L. (UTSI), PE, Ph.D. Texas Tech
Aikens, Charles H., PE, Ph.D. Tennessee

Associate Professors:
Mitchell, James T. (UTSI), Ph.D. Vanderbilt
Loveless, Howard L. (Emeritus), PE, LaForge, R. M. (Emeritus), PE, Doulet, Dan C., PE, M.S. Tennessee
DePorter, Elden L., Ph. D. VPI

Lecturers:
Douglass, S. Ph. D. Tennessee
Fortney, W. B., M.S. Purdue
Greenwood, T. G., M.S. Tennessee

THE MASTER'S PROGRAM

A graduate program leading to the degree of Master of Science is open to graduates of A.B.E.T.-accredited undergraduate curricula in industrial engineering or to graduates of other technical curricula who take prerequisite coursework depending on their academic background. These courses will be determined by the graduate committee. The thesis program requires 24 hours of coursework and 6 hours of Thesis. A non-thesis option with 30 hours of coursework depending on their academic background is also available.

Graduate work in Industrial Engineering provides for concentrations in operations research, engineering management, manufacturing systems, human factors engineering, information systems, reliability and quality control, and traditional industrial engineering. Either one or two minors can be elected in engineering, mathematics, psychology, business, computer science, statistics or economics.

Any 400-level course required in the Bachelor of Science in Industrical Engineering program at The University of Tennessee may not be used for graduate credit in the M.S. graduate program in Industrial Engineering.

GRADUATE COURSES


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


403 Production Facilities Design and Material Handling (3) Design of production facilities: plant layout, analysis and planning for overall moving, packaging and storage of materials. Office layout and service areas. Design of facilities for such diverse groups as hospitals, banking, industry. Prereq: 400.

405 Engineering Economy (2) 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 precedence diagramming methods. Resource allocation and time-cost trade-off algorithms, multi-project control, computer applications, and PERT methods of handling uncertainty in activity time estimates.

413 Research Methods in Industrial Engineering (3) Methods to collect and analyze data. Process control, statistical modeling of processes, behavioral sampling, single subject experimental designs, classical experimental design methods, and time series models of experiments. Validity and reliability concepts as related to measurement and collection of data. Strategies to control rival hypotheses: randomization, matching, yoking, controlling variables, and building extraneous variables into experiments. Application of OR techniques to production and inventory management problems. Prereq: 300 and senior standing. Statist 251.


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

501 Design Project (1-3) Enrolled to limited industrial engineering students in non-thesis program. May be repeated. Maximum 6 hrs. S/N/C only.

502 Registration for Use of Facilities (3-16) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E

510 Advanced Research in Project Management (3) Advanced work design, analysis and implementation of project management systems. Application of learning curves, queuing theory and wage incentive systems. Characteristics of predetermined systems and the application to formula construction. MTM systems. Prereq: 302.

511 Facilities Planning and Design (3) Modern materials handling techniques, computer-aided layout techniques, application of operation research models, and use of these to design manufacturing facilities. Prereq: Production facilities planning or consent of instructor.

512 Advanced Engineering Economy (3) Financing and investment functions of firms: deterministic analysis of after-tax cash flow projections; separation theorems and basic horizon models; stochastic analysis of capital budgeting problems; Monte Carlo simulation techniques; multiple attribute decision analysis. Prereq: Statistics 251.

513 Reliability Engineering (3) Consideration of uncertainties in activity time estimates. Management support systems, decision support systems, and integrated support systems.


518 Advanced Engineering Economy (3) Financing and investment functions of firms: deterministic analysis of after-tax cash flow projections; separation theorems and basic horizon models; stochastic analysis of capital budgeting problems; Monte Carlo simulation techniques; multiple attribute decision analysis. Prereq: Statistics 251.


521 Human Factors Engineering Methodology (3) Background in methodology used by human factors engineering designer and systems analyst. Observational methods, function/task analysis, design aiding techniques and critical dimensions. Reliability of these techniques.
522 Optimization Methods in Industrial Engineering (3) Classical optimization theory, unidimensional and n-dimensional search techniques, Lagrangean relaxation, simplex method, linearization techniques, quadratic programming, and dynamic programming. Prereq: 301 or 537.

523 Linear Programming and Extensions (3) Simplex and revised simplex methods, duality, parametric and post-optimality analysis, use of LP software integer programming techniques, branch and bound and cutting planes, network programming. Prereq: 301 or 537.


531 Motivational Theories, Systems and Practices in Various Organizations (3) Application of motivational theories and concepts in use in technology based organizations. Impact of concepts evaluated according to results in various types of organization structures.

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 both internal and international competition. Management systems which promote or inhibit productivity or quality improvements.

533 Theory and Practice of Engineering Management I (3) Comparison of classical management principles and theory with environment, needs, and practices of research and development and other scientific-engineering organizations. Cases used to illustrate contemporary problems and environments. Technical management function, marketing of technical services and products.

534 Engineering Management Control Systems (3) Underlying framework of accounting principles and practices reviewed as basis for evaluating productivity costs, requirements for new ventures, changes in strategy, financial condition. Computer data bases examined for control system alternatives.

535 Organizational Behavior and Managerial Decisions (3) Theories of individual and group behavior and their application to decision making processes. Roles of various people categories and managerial decision making processes in normal mode. Case studies used to identify causes of irrational decision making policies, and organizational behavior and to suggest corrective action.

536 Project Management (3) Management and control of multidiscipline and technological projects. Coordination and interactions between client and various service organizations. Selection of project manager and progress and management, typical problems associated with various phases of life cycle of project. Case studies illustrate theories and concepts.

537 Industrial Engineering Analysis and Control Techniques (3) Modern methods 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 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment of manufacturing or service enterprise. Organizational and financial planning and evaluation. Cost and location studies and market analysis to determine commercial feasibility of new ventures.

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 analysis; Bayesian analysis of sequential decision making; artificial intelligence in complex decision analyses. Prereq: 518, 523.


604 Advanced Topics in Optimization (3) Multi-stage optimization theory. State increment dynamic programming adaptive optimization theory. Prereq: 603.


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.

Interdisciplinary Programs

(College of Liberal Arts)

The College of Liberal Arts offers a series of interdisciplinary undergraduate majors and minors through its Interdisciplinary Programs. These programs include Afro-American Studies, American Studies, Ancient Mediterranean Civilizations, Asian Studies, Cinema Studies, Comparative Literature, Latin American Studies, Linguistics, 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.

Afro-American Studies

GRADUATE COURSES

421 Comparative Studies in African and Afro-American Societies (3) Education, religion, and social stratification. Views Afro-Americans and Africans of each other and concept of Pan-Africanism.

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

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

461 African Prehistory (3) Same as Anthropology 461.


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

Asian Studies

GRADUATE COURSES

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

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

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

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

Cinema Studies

GRADUATE COURSES

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

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

Comparative Literature

GRADUATE COURSES

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

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

Latin American Studies

GRADUATE COURSES

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

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

Linguistics

GRADUATE COURSES

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

411 Linguistic Anthropology (3) Same as Anthropology 411.

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

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

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

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

430 The Development of Synchronic Linguistics as a Science (3) Development of first synchronic paradigm of linguistics. Impact of social sciences on American descriptivists. Prague School. Transformational-gen-
## Urban Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>401</td>
<td>The City in the U.S. (3) (Same as Planning 401.)</td>
</tr>
<tr>
<td>441</td>
<td>Urban Geography (3) (Same as Geography 441.)</td>
</tr>
<tr>
<td>464</td>
<td>Urban Ecology (3) (Same as Sociology 464.)</td>
</tr>
</tbody>
</table>

## Women’s Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>400</td>
<td>Topics in Women’s Studies (3) Content varies. May be repeated.</td>
</tr>
<tr>
<td>422</td>
<td>Women Writers in England (3) (Same as English 422.)</td>
</tr>
<tr>
<td>425</td>
<td>Women’s Health (3) (Same as Health 425.)</td>
</tr>
<tr>
<td>434</td>
<td>Psychology of Gender (3) (Same as Psychology 434.)</td>
</tr>
<tr>
<td>466</td>
<td>Rhetoric of the Women’s Rights Movement (3) (Same as Speech 466.)</td>
</tr>
<tr>
<td>483</td>
<td>Afro-American Women in American Society (3) (Same as Afro-American Studies 483.)</td>
</tr>
</tbody>
</table>

## Journalism

(College of Communications)

**MAJOR DEGREES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>M.S., Ph.D.</th>
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</thead>
<tbody>
<tr>
<td>Communications</td>
<td>James A. Crook, Director</td>
</tr>
</tbody>
</table>

**Professors:**

- Adamson, June N., M.S. ......................................................... Tennessee
- Ashdown, Paul G., Ph.D. .......................................................... Bowling Green
- Crook, James A., Ph.D. ................................................................ Iowa State
- Everett, George A., Ph.D. ........................................................... Iowa State
- Leiter, B. Kelly, Ph.D. ............................................................... Southern Illinois
- Singletary, Michael W., Ph.D. ..................................................... Southern Illinois
- Wilford, John N., M.A. ................................................................. Syracuse

**Associate Professors:**

- Bowles, Dorothy, Ph.D. ................................................................... Wisconsin
- Miller, M. Mark, Ph.D. ..................................................................... Michigan State
- Morrow, Jerry L., Ph.D. ................................................................. Toledo
- Prett, Sammie Lynn, M.S. ............................................................... Tennessee

**Assistant Professors:**

- Caudill, C. Edward, Ph.D. ............................................................. North Carolina
- Caudill, Susan M., Ph.D. ................................................................. Tennessee
- Heller, Robert B., M.A. ................................................................. Syracuse

**Adjunct Professor:**

- Haley, Alex

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.

## GRADUATE COURSES

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>403</td>
<td>International Communications (3) Development and operations of world mass communications channels and agencies. Comparative analysis of media, media</td>
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<td>practices, and flow of news throughout world. Print and broadcast systems in terms of relevant social, political, economic, and cultural factors. Relation</td>
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<td>of communications practices to international affairs and understanding. Adamson. May be repeated. Maximum 6 hrs.</td>
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<tr>
<td>410</td>
<td>Opinion Writing (3) Analysis of editorial positions, pageantry, and pages. Writing of editorials and columns for newspapers, magazines, and company publications,</td>
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<td>rhetorical devices and use of logic. Prereq: Communications 200, or consent of instructor.</td>
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<tr>
<td>411</td>
<td>Magazine Article Writing (3) Techniques of writing in-depth articles of mass circulation and specialized magazines. Organizing and presenting material,</td>
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<td>problems in specialized areas; business, science, agriculture, humanities. Prereq: Communications 200, or consent of instructor.</td>
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<tr>
<td>420</td>
<td>Print Media Management (3) Current business practices among print media, especially newspapers. Problems in management and production and outlook for</td>
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<td>new technologies. Prereq: 6 hrs mathematics and/or accounting and senior standing.</td>
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<tr>
<td>423</td>
<td>Public Affairs Reporting (3) Reporting and writing about courts, governments, and public agencies. Event and issue-oriented journalism of politics and</td>
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<td>public affairs. Prereq: 360.</td>
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<tr>
<td>433</td>
<td>Advanced Editing (3) Sensitivity to language and editing skills. Headline writing, layout, and production. Prereq: 203.</td>
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<tr>
<td>470</td>
<td>Public Relations Campaigns (3) Preparation of communications materials to implement planned public relations programs. Preparation of news releases—written</td>
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<td>and video—and broadcasting copy. Research, planning, communicating, and evaluation of major public relations projects and campaigns. Prereq: 203, 270, and</td>
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<td>senior standing.</td>
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<tr>
<td>480</td>
<td>Journalism in the High School (3) Functions and methods of high school publications. Problems related to staff selection, content of publications, copy,</td>
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<td>layout, photography, printing, advertising, and business. Planning course outlines and curricula for journalism/high school media studies.</td>
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<tr>
<td>490</td>
<td>Advanced Photojournalism (3) Advanced principles and methods of black-and-white photography. Introduction to color photography. News and feature</td>
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<td>photographs and photo essays. Prereq: 290 or consent of instructor.</td>
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<tr>
<td>516</td>
<td>Seminar in Journalism Issues (3) Topics vary. May be repeated. Maximum 6 hrs.</td>
</tr>
</tbody>
</table>

**520 Press-Government Relations (3) Development of adversary relationship between journalists and govern-**

ment officials. Philosophical and legal basis for open reporting of government. Use of press by candidates and incumbents. F

## Law

**DEGREES**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>J.D., J.D.-MBA, J.D.-M.P.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAJOR</td>
<td>Marilyn Yarbrough, Dean</td>
</tr>
</tbody>
</table>

**Professors:**

- Cohen, Neil P., LL.M. ........................................................... Harvard
- Cook, Joseph G., LL.M. ............................................................ Yale
- Gray, R. Macdonald (Emeritus), LL.M. ........................................................................................................ George Washington
- Hardin, Patrick, J.D. .............................................................. Chicago
- Hess, Amy M., J.D. ................................................................. Virginia
- Jones, Durward S., J.D. .............................................................. North Carolina
- King, Joseph H. (Distinguished Prof.), J.D. ................................................................................................. Pennsylvania
- Lacey, Forrest W. (Emeritus), S.J.D. ........................................................................................................ Michigan
- Le Clercq, Frederick S., LL.B. ...................................................... Duke
- Lloyd, Robert M., J.D. ............................................................... Michigan
- Miller, Charles H. (Emeritus), J.D. ........................................................................................................ George Washington
- Overtom, Elvin E. (Emeritus), J.D. ........................................................................................................ Michigan
- Phillips, Jerry J., J.D. ................................................................. Yale
- Picquic, Cheryl M., S.L.S. ............................................................ Vanderbilt
- Rikvin, Dean H., J.D. ................................................................. Michigan
- Sebert, John A., J.D. ................................................................. Michigan
- Sewell, Torey H. (Emeritus), LL.M. ........................................................................................................ George Washington

**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. F**

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

**540 Seminar in Newspaper Operations (3) On-site study of newspaper management operations. Positioning medium for its target audience and how this affects profitability. Prereq: 450 or consent of instructor.**

**550 Writing and Editing Projects (3) Specialized writing or editing interests; agriculture, politics, labor, finance, science; technical, general publications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.**

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

**580 Seminar in Visual Communication (3) Behavioral aspects of communication with images. Theories of psychological effect in shape, color, texture, and other design elements. Prereq: 203 or Advertising 350 or Advertising 430 or equivalent.**

**590 Communications and International Development (3) Relationship between mass communications and development of nations. Role of communications media of developed nations in "Third World" regions of globe. Communications as facilitator of international cooperation.**

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

**598 Internship (3) Professional work in journalism supervised by editor or manager with faculty approval. No retroactive credit for previous work experience. Prereq: Completion of core curriculum.**
DUAL J.D.-MBA 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.-M.B.A. program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and The Graduate School and College of Business Administration for the M.B.A. 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 college 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 of credit toward graduation from the College of Business Administration. Three of the 9 semester hours must be earned in Accounting 501, 505, or a more advanced accounting course. If College of Law credit is given for such accounting course, the dual degree student may not receive College of Law credit for Accounting for Lawyers (Law College Course 837).

The College of Business Administration will award credit toward the MBA for acceptable performance in a maximum of 12 semester hours of approved courses offered by The College of Law, 3 hours of which will replace Business Law 501, an MBA core requirement. 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 for graduate business courses and in the College of Business Administration for law school courses, grades awarded 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 Unsatisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for a College of Law course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be based on a regular or a cross-credit basis for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

Non-Law Elective Course Credit

Students enrolled in the J.D.-M.B.A. degree program may not receive credit towards the J.D. degree for courses taken in other departments of the University except for those taken in conjunction with the dual program.

Note: Students are advised to consult The Graduate School’s degree requirements as stated in the front section of this catalog as well as the requirements for this college.

DUAL J.D.-M.P.A. PROGRAM

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

Admission

Applicants for the J.D.-M.P.A. program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and the Department of Political Science and The Graduate School for the M.P.A. degree. Applicants must also be accepted by the Dual Degree Committee. All applicants must submit a Law School Admission Test (LSAT) score. An applicant’s LSAT score may be substituted for the Graduate Record Examination (GRE) score, which is normally required for admission to the M.P.A. program. Application may be made prior to or after matriculation in either the J.D. or the M.P.A. program, but application to the dual program must be made prior to entry into the last 29 semester hours required for the J.D. degree and prior to entry into the last 15 hours required for the M.P.A. degree.

Curriculum

A dual degree candidate must satisfy the requirements for both the J.D. and the M.P.A. degrees, as well as the requirements for the dual program. The College of Law will award a maximum of 9 semester hours of credit toward the J.D. degree for successful completion of approved graduate level courses (300 or 400 level or more advanced courses) offered in the Department of Political Science. The M.P.A. program will award a maximum of 9 semester hours of credit toward the M.P.A. degree for successful completion of approved courses offered in the College of Law. All courses for which such cross-credit is awarded must be approved by the J.D.-M.P.A. coordinators in the College of Law and the Department of Political Science. All candidates for the dual degree must successfully complete Administrative Law (Law 821) and are encour-
aged 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 computed in determining a student’s GPA or class standing. The College of Law will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for any law course in which the student earns a grade of 2.3 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

Law courses are not available for graduate credit; however, a graduate student may be allowed to take up to 6 semester hours of law courses and receive credit toward a degree upon approval of the College of Law and the major chairperson. The graduate student must register for the law course during regular registration at the College of Law requesting an S/N only. If a 2.0 or above is earned in a law course, an S will be recorded on the transcript. If a student earns below a 2.0, 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.

Different rules apply to the student enrolled in the Dual J.D.-M.B.A. or J.D.-M.P.A. Programs. Credit must be approved by the student’s major program and may be approved credits for the dual degree program. 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) Binding effect of judgments, 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 contracts; offer and acceptance, consideration, and other bases for enforcing promises; the Statute of Frauds, unconscionability and other controls of promissory liability. Introduction to relevant portions of Article 2 of the Uniform Commercial Code.

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

805 Legal Process I (2) Lawyer-like use of cases and statutes in prediction and persuasion. Analysis and synthesis of common law decisions; statutory interpretation; fundamentals of expository legal writing and legal research.

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

807 Torts I (3) Intentional torts, including battery, assault, false imprisonment, conversion, trespass, and negligence, including standard of care and proof of negligence. Other torts: strict liability, nuisance; products liability; business negligence; non-tort alternatives for recovery for personal injury; law reform; defamation, invasion of privacy, and wrongful public disclosure; misrepresentation, intentional falsehood, misappropriation of commercial values, and interference with contract; constitutional torts.

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

810 Property (4) Introductory course treating issues of ownership, possession, and title in the areas of landlord-tenant relations; estates in land and future interests; co-ownership and property rights in joint tenancy; and purchase and sale of real estate, conveyance of real estate, and real estate sales agreements and conveyances; title assurance and recording statutes; easements and other covenants; liens, taxes, and other encumbrances.

811 Constitutional Law I (3) Judicial review, limits on legislative power, separation of powers, and other bases for enforcing constitutional provisions.

812 Constitutional Law II (3) Judicial review, limits on legislative power, separation of powers, and other bases for enforcing constitutional provisions.

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

816 Computer-Assisted Legal Research (0) Introduction to basic retrieval systems. LEXIS and Westlaw. Offered periodically throughout the year. Consent by instructor required. Credit for first beginning spring of first year after completion of first draft of appellate brief in Legal Process I. Must be completed satisfactorily prior to end of second year of law study. Prereq: Completion of first draft of appellate brief in 806. S/N only.

818 Income Tax I (4) What is income; whose income is it; when is it income; how is it taxed (capital gains and losses, maximum and minimum tax); deductions and credits; rates and credits.

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

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

824 Local Government (3) Distribution of power between state and local governmental units; sources of authority for local government operations; 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.

827 Business Associations (4) Legal problems associated with formation, operation, and dissolution of unincorporated and incorporated business firms; legal rights and duties of firm members (partners and agents; partners and limited partners; and corporate shareholders, directors and officers); and others with whom these members interact in connection with firm’s business.

828 Advanced Business Associations (2) Selected topics from law of business associations. Prereq: 827. May be repeated.

830 Securities Regulation (3) Basic structure of federal securities laws. Legal rights and duties of investors in securities, underwriting of capital by new and growing enterprises; securities transactions by promoters, officers, directors and other insiders; regulations regarding trading in securities; regulation of brokers and dealers under Rule 100-5 and other antifraud provisions; and provision of legal and other professional services in connection with securities transactions.

832 Business Planning Seminar (2) Selected problems on corporate and tax aspects of business planning and transactions. Prereq: 818, 827, and 970.

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

835 Trade Regulation Seminar (2) Selected problems arising under laws regulating competition and conduct of business enterprises.

837 Accounting for Lawyers (2) Basic accounting documents, problems, and techniques to enable law students to use and understand essential accounting information.

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


843 Debtor-Creditor Law (3) Enforcement of judgments; bankruptcy and its alternatives for business and consumer debtors; emphasis on Federal Bankruptcy Code.

846 Constitutional Law I (3) First Amendment rights to freedom of religion, expression, association and press; Fourteenth Amendment rights against discrimination as to race, color, national origin, sex, etc.; the Bill of Rights and its applicability to federal and state governments; separation of powers; federalism; state and federal courts in civil rights actions; and remedies for violations of constitutional and other civil rights.
corporations and shareholders, and related topics. Pre-req: 818. Recommended prereq or coreq: 970.

973 Wealth Transfer Taxation (3) Transfers of wealth at death (estate tax) and during life (gift tax), and of generation skipping transfers; fiduciary income taxation. Recommended prereq or coreq: 916 and 935.

975 Tax Theory (3) Comparative study of methods and purposes of governmental revenue collection through examination of economic theory and various actual and proposed schemes of taxation. Pre-req: 818.

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

983 Products Liability (3) Scope of doctrine and theory of actions against insurers. Liability insurance defense duties of agents; excess liability; subrogation; and bad faith actions against insurers. Liability insurance defense.

973 Wealth Transfer Taxation (3) Transfers of wealth at death (estate tax) and during life (gift tax), and of generation skipping transfers; fiduciary income taxation. Recommended prereq or coreq: 916 and 935.

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

983 Products Liability (3) Scope of doctrine and theory of actions against insurers. Liability insurance defense duties of agents; excess liability; subrogation; and bad faith actions against insurers. Liability insurance defense.

993 Products Liability (3) Scope of doctrine and theory of actions against insurers. Liability insurance defense duties of agents; excess liability; subrogation; and bad faith actions against insurers. Liability insurance defense.

996 Law Review (1) Completion of a potentially publishable case note. Proposals must be approved by supervising faculty and by Academic Standards and Curriculum Committee. Proposals must be approved by supervising faculty member. Proposals must be approved by supervising faculty member and by Academic Standards and Curriculum Committee. Maximum of one section per semester during last two years of study. Pre-req: Second-year standing.

994 Independent Study (1-4) Independent study under direct supervision of faculty member. Proposals must be approved by supervising faculty member and by Academic Standards and Curriculum Committee. Maximum of one section per semester during last three semesters of study.

996 Law Review (1) Completion of a potentially publishable case note. Proposals must be approved by supervising faculty member. Proposals must be approved by supervising faculty member and by Academic Standards and Curriculum Committee. Maximum of one section per semester during last three semesters of study.

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

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

Library and Information Science

(Office of the Provost)

MAJOR

Library Science M.S.L.S.

DEGREE

Gary R. Purcell, Director

Glen E. Estes, Assistant Director

Professors:


Associate Professors:


Assistant Professors:

Palmquist, Ruth A., M.A. Iowa Pollard, Richard, Ph.D. Brunel (UK)

The Graduate School of Library and Information Science provides a program leading to the preparation of librarians and information professionals for work in all types of libraries and information centers. The program of study includes a graduate curriculum leading to the Master of Science in Library Science. The program is approved by the American Library Association.

The mission of the school is to provide excellence in teaching, research, and public service in library and information science. The goals and objectives of the school are:

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

1. Knowledge of the historical role of libraries and other information agencies in society.

2. A knowledge of how information flows through contemporary society.

3. An understanding of the role of the librarian and/or information specialist as a mediator between information and the user with an emphasis on the improvement of the quality of information services in response to the needs of society.

4. An understanding of and competence in the selection, acquisition, organization, storage, retrieval, and dissemination of information.

5. An understanding of bibliographic control and knowledge of information sources in various formats and subjects.

6. An understanding of management theory and practice, particularly as these related to library and information services.

7. A knowledge of research methods sufficient to enable them to engage in effective problem solving.

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 libraries and other types of organizations.

3. Leadership for professional associations.

C. To conduct basic and applied research which promotes the generation of new knowledge, services, and technology. The school will encourage:

1. Research which strengthens its instructional and public service programs.

2. The use of a variety of research methods.

3. Sharing the results of its research.

4. Increased research quality and productivity.

ADMISSION REQUIREMENTS

Candidates who have at least a 3.0 average in the junior and senior years will receive first consideration. Applicants are required to take the general test of the Graduate Record Examination. The test should be taken at least one semester in advance of application for admission to The Graduate School.

Foreign applicants are required to take the Test of English as a Foreign Language. A personal data sheet and three recommendations (obtained from the Graduate School of Library and Information Science) should be returned to the assistant director of the school.

MASTER OF SCIENCE IN LIBRARY SCIENCE

The program leading to the Master of Science in Library Science involves a total of 39 semester hours of graduate courses, 18 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 30 hours must be taken in the Graduate School of Library and Information Science, allowing the student to receive 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.

FINANCIAL ASSISTANCE OPPORTUNITIES

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

Work opportunities in a scientific-technical environment are available through subcontracts with Oak Ridge National Laboratory and the Department of Energy.

A limited number of graduate 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.L.S. in Library and Information Science, write to Admissions, Graduate School of Library and Information Science, 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. degree in Library Science is available to residents of the states of Arkansas, Georgia, West Virginia, or Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

430 History of the Book (3) History of writing and various methods of bookmaking from earliest times through 19th century. Sp

475 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 475.)

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

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

510 Information Professionals and Their Organizations (3) Variety and prospects of information professions; professional achievements, responsibilities, goals, and issues. E, Su, A

520 Technical Services I (3) Technical services principles and techniques: acquisitions, basic manual and automated cataloging, structure and use of library catalogs, basic subject organization and indexing. E, Su, A

521 Technical Services II (3) Library of Congress subject organization and description, automated cataloging and catalogs, cataloging of serials and more difficult materials. Prereq: 520. Sp

530 Information Sources and Services (3) Basic bibliographic and information sources, online databases. Interview and search techniques, selection and evaluation of information collections and development and evaluation of services. E, Su, A

531 Sources and Services for the Social Sciences (3) Information sources in social sciences: political science, sociology, psychology, geography, history, anthropology, sources and services in business, education, and law. Prereq: 530. Sp

532 Sources and Services in Science and Technology (3) Information sources in engineering, physical and life sciences. Prereq: 530. Sp

533 Sources and Services for the Humanities (3) Information sources in philosophy, religion, fine arts, performing arts, literature and language, and history. Organization of collections for optimum use. Prereq: 530. Su


540 Research Methods in Library and Information Science (3) Research methods applicable to librarianship and information management. Process and conduct of empirical research; analysis of published research. Prereq: Admission to program or consent of instructor. E, Su, A

550 Library and Information Agency Management (3) Management and organizational concepts applicable to libraries and other information agencies. Prereq: Admission to program or consent of instructor. E, Su, A

551 School Libraries and Media Centers (3) Planning, implementing and evaluating school library programs. Current developments, role of technology, relationships with district and state services. F, Su

552 Academic Libraries (3) Development and present status, mission and objectives within higher education institutions, trends, problems, recurring issues. F

553 Special Libraries and Information Agencies (3) Development and present status, scope and objectives, administrative and organizational problems and techniques. F

554 The Library in the Community (3) Application of marketing analysis for planning and policy formulation. Public library focus. Sp

560 Development and Management of Collections (3) Philosophy and process of building and managing collections in libraries and information agencies; environment; community analysis; policy statements; collection evaluation; and preparation of buying lists. Prereq: 530. E, Su, A

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

562 Serials (3) Serials selection; acquisition, bibliographic control, storage, maintenance, and public service. Prereq: 560 or consent of instructor. Sp

563 Nonbook Materials (3) Selection, acquisition, bibliographic representation, storage, utilization, and programming; microformats, films, video, sound recordings, and as information media. E

564 Records Management and Archives (3) Objectives and functional elements of records management and archives programs within various types of organizations, management of creation, distribution, retention, storage, retrieval, protection, and disposition of organizational records regardless of information medium. Sp

565 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 569.)


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

573 Services for Children and Young Adults (3) Philosophy and objectives of public and school library services for children and young adults. Reading, listening, and viewing guidance to meet adult interests; development of specialized collections; services for adults. F

574 Adult Materials and Services (3) Fiction and subject categories, popular and standard; reading, listening, and viewing guidance to meet adult interests; development of specialized collections; services for adults. F

580 Foundations of Information Science (3) Identifies the attributes of information, information theory, relevance, use and user studies, bibliometrics, and major components of information retrieval system design. Related research findings to library and information system practice. F, Sp

581 Information in Society (3) Characteristics of an information society, knowledge and information, effect of technological innovation, use and effect of media. F

582 Automation (3) Computer concepts and their applications to basic library and information center operations. E, Su, A

583 Information Systems Analysis and Design (3) Tools and methodologies in library/information agency systems planning and implementation. Role and training of systems analyst, systems study from planning through implementation and evaluation, and related topics. Sp

584 Bibliographic Database Design (3) Design and construction of bibliographic databases, record and database structure, document representation, indexing, abstracting, thesaurus construction and maintenance, and information retrieval. Sp

585 Information Technologies (3) Computer-based and non-computer related media and methods for information storage, retrieval, and transfer within and external to library/information center environment; existing and prototype systems and interfacing of technologies. Prereq: 562 or consent or instructor. Sp

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

591 Supervised Readings in Library and Information Science (3-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

593 Independent Study (3) Prereq: Consent of advisor. Maximum 6 hrs.

599 Practicum (3) Opportunity to translate theory into practice under guidance of qualified information professional. Prereq: Completion of core courses relevant to student's practicum design. Written consent of advisor and approval of practicum coordinator. May be repeated with consent of advisor and practicum coordinator.

Life Sciences

(Office of the Provost)

MAJOR

ACADEMIC DEGREES

Life Sciences

M.S., Ph.D.

Howard I. Adler, Chair

Coordinating Council:
Becker, Jeff M., Cellular and Molecular Biology
Bright, Janice M., Veterinary Medicine
Burghardt, Gordon M., Ethology
Douggall, D. K., Biotechnology
Farkas, W. R., Environmental Toxicology
Hickox, L. G., Plant Physiology and Genetics
Vaughan, Gerald, Physiology

The programs leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate programs which augment the programs of individual departments.

The Life Sciences Council supports studies and research in the following concentrations: physiology, biotechnology (M.S. only); cellular, molecular and developmental biology; environmental toxicology; ethology; and plant biology and genetics. Students interested in any of these areas should contact either the chair of Life Sciences or the director of the area of interest. Each program is overseen by a committee and may have unique admission and graduation 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, and a year of physics. Specific course deficiencies may be corrected during the first year.

DEGREE REQUIREMENTS

The Master's degree requires a minimum of 30 semester hours of study approved by the student's committee, a thesis, and an oral examination. Within the biotechnology program only, a non-thesis M.S. option is available. Students choosing this option are expected to complete: (1) two summers’ co-op experience in an appropriate industry. An evaluation by supervisor and a written report are required.
experience, maximum 4 hrs.); (2) A written report in the form of a scientific paper in an area of specialization chosen by the student and advisor. The minimum requirements for the doctoral degree include at least 6 hours above the 600 level. 24 semester hours of course 600, a pattern of courses approved by the student's committee, a comprehensive examination, a doctoral dissertation, and a defense of dissertation. Individual programs may have additional requirements.

**CONCENTRATIONS**

**Biotechnology**

The Biotechnology program will prepare students to participate in the wide variety of opportunities presented by the use of living cells or subcellular components, or the use of biological or chemical production of useful materials. This will be achieved at the M.S. level as a development in the study of the biology and biochemistry of cells and molecules; by formal study of cells and of engineering aspects of biotechnology; and by the development of special expertise in areas such as animal embryo manipulation, automated chemical synthesis of macromolecules, boprocess engineering, bioprocesses and biotransformations, liposomes, microscopy and image processing, monoclonal antibodies and hybridoma technology, plant tissue culture, recombinant DNA technology and risk assessment, and modeling. The production of a research thesis or an industrial co-op experience plus an area of specialization will also be an important part of the training experience.

Required courses are Life Sciences 509, 511, 512, 531, 532; Biochemistry 511; Microbiology 410; Chemical Engineering 475; and Zoology 507.

**Cellular, Molecular and Developmental Biology**

The inter-departmental program in cellular, molecular and developmental biology includes research in structural or functional aspects of cells or subcellular components, or the interactions between cells.

Required courses are Life Sciences 511, 512, 531, and 532.

**Environmental Toxicology**

The toxicology program provides intensive training in basic toxicological principles and techniques. Courses and research expose trainees to mechanisms of intended and unintended interactions between living systems and potentially toxic agents from the point of view of biochemistry, physiology, ecology, public health, environmental law and regulation, pest management, pollution control and repair, and testing and residue analysis of toxicants.

Required courses are Biochemistry 561, 562, 604; and Life Sciences 510.

**Ethology**

Ethology is the naturalist study of normally occurring animal and human behavior. The program provides intensive training in basic ethology with specialized studies available in the development, evolution, and physiology of behavior; comparative psychology; human ethology; and behavioral ecology and socio-biology.

Required courses for the Master's are Psychology/Zoology 450, 459; Zoology 524, 583; Statistics 531-32; and Zoology/Psychology 516.

The Ph.D. requirements are the same as for the Master's with the additional requirements of one additional statistics course and six semester hours of courses numbered above 600 approved by student's committee.

**Physiology**

The inter-departmental program in physiology includes research in the areas of cellular, comparative, developmental, exercise, muscle, neuro-physiology, regulatory, or reproductive.

Required courses are Zoology 520, 521, Human Anatomy, Comparative Vertebrate Biology, 420, Biochemistry 410; four 600-level semesters; and a statistics sequence.

**Plant Physiology and Genetics**

This program provides the opportunity for intensive training and research experience in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions of problems concerning the interactions of physiology and genetics in applied and fundamental aspects of plant science.

Required courses are Life Sciences 510; Botany 521, 522; Biochemistry 511, 512; Plant and Soil Science 471 or Zoology 560; Plant and Soil Science 551; Microbiology 410.

**GRADUATE COURSES**

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

**552 Registration for 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 only.** E

**506 Biotechnology Seminar (1-2) Topics of importance to biotechnology. May be repeated. Maximum 6 hrs.**

**510 Special Topics in Life Sciences (1-3) Specializations in biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.**

**511 Advanced Cellular Biology (3) Cell structures and functions at molecular and supramolecular level. Membrane structure, function, and biogenesis; cellular communication; receptors and membrane flow; growth regulation and oncogenes; plant cell structure and function; contractility and motility; mitosis and meiosis; blood and immune cells.**

**512 Advanced Molecular Biology (4) (Same as Biochemistry 512.)**

**525 Research Practicum in Life Sciences (1-3) Individual sections for each of biotechnology; cellular, molecular and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.**

**529 Biotechnology Practicum Co-operative Experience (2) Work experience in commercial or industrial sectors for students undertaking non-thesis option of biotechnology concentration. Evaluation by supervisor and written report by student. May be repeated. Maximum 4 hrs.**

**531 Biotechnology Laboratory (3) Growth of microorganisms, analysis of extracellular and intracellular components.**

**532 Biotechnology Laboratory (3) Pilot scale yeast cultivation, enzyme isolation, purification and characterization. Application of purified enzymes to food production fermentations and fermentation process control.**

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

**610 Advanced Topics in Life Sciences (1-3) Topics vary, may be repeated. Maximum 6 hrs.**
601 Research Methods (3) Seminar covering broad range of issues: research process as applied to study of strategic management. Literature and examples of research. Research proposal.

610 Seminar in Advanced Organization Theory (3) Analysis of functioning of complex organizations. Classical and open systems models, organization growth and change, organizational effectiveness and design of complex organizations.

611 Seminar in Strategic Management I (3) Analysis of concepts and research in strategic management.

612 Seminar in Strategic Management II (3) Analysis of concepts and research in strategic management.

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.)

626 Seminar in Industrial Psychology (3) In-depth analysis of current issues and problems: performance appraisal/criterion development, and training and development. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 626.)

627 Seminar in Applied Industrial Psychology (3) In-depth analysis of the current issues, concerns, and methods: advanced quantitative psychometrics and employee selection. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 627.)

638 Current Topics in Industrial/Organizational Psychology (3) In-depth analysis of various topics: organizational change and development, psychology and problems of interviewing, consumer behavior. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 638.)

640 Seminar in Operations Management (3) Research and concepts. Application of quantitative methods to operations management problems. May be repeated.

680 Field Work in Industrial and Organizational Psychology (1-3) Field work in planning and implementation of research in industrial and organizational psychology. 1 hr per 30 hrs of practice. Maximum 12 hrs. (Same as Psychology 690.)

Management Science
(College of Business Administration and Intercollegiate Program)

MAJORS DEGREES
Management Science M.S., Ph.D.
Business Administration MBA

Kenneth C. Gilbert, Chair
Professor:
Ho, James K., Ph.D. .................. Stanford
Associate Professor:
Gilbert, Kenneth C., Ph.D. ............... Tennessee
Assistant Professors:
Bowers, Melissa R., Ph.D. ............... Clemson
Kaplan, Lori A., Ph.D. ...................... Michigan
Noon, Charles E., Ph.D. .................. Michigan
Patel, Minnie H., Ph.D. .................. Georgia Tech

Additional Committee Members:
Fowler, Oscar S., Management
Hilliard, Jimmy E., Finance

Leitnaker, Mary G., Statistics
Raislon, Bruce A., Geography
Sullivan, William G., Industrial Engineering

THE MASTER’S PROGRAM

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

Management Science coursework will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area. Supporting areas are available in other departments of the College of Business Administration (excluding statistics) as well as in computer science, public administration, ecology, and other areas, subject to approval by the Management Science Committee.

Admissions Requirements

The Master’s program requires three Graduate School Rating 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

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<tr>
<th>Hours</th>
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<tr>
<td>Core Requirements</td>
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<tr>
<td>Management Science 531, 532, 533, 534</td>
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<tr>
<td>Statistics 568</td>
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<tr>
<td>Applied specialization area (approved by advisor) or Statistics elective—500 level or above (approved by advisor) or Mathematics—400 level or above (approved by advisor)</td>
</tr>
<tr>
<td>Electives selected from mathematics, statistics, computer science, and/or management science area</td>
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<td>TOTAL</td>
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A thesis option is available to qualified students which substitutes 6 hours of thesis credit for the following 8 hours of course work: Management Science 534, 3 hours in the applied concentration area and 3 hours of electives in any area. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during the student’s first semester and must approve all courses on a semester-by-semester basis.

Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics requirements. On the other hand, a
student lacking experience in rigorous senior-level mathematics courses will be asked to take such courses to fulfill the 6-hour mathematics requirement. The total course load will remain 38 hours for all non-thesis students and 36 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 12 as a function of prior background.

THE DOCTORAL PROGRAM

The Ph.D. program in Management Science under the College of Business Administration is designed to prepare students for research related to the application of mathematical tools to complex decision making. Three primary objectives of the program are:
1. to provide, through management science coursework, a thorough knowledge of common Management Science/Operations Research mathematical models and their uses;
2. to provide sufficient advanced study in a supporting area to qualify the graduate for a joint faculty position in the supporting area and management science. The candidate may choose from functional areas (accounting, finance, marketing, management, and transportation and logistics) or other disciplines, (e.g., computer science, forestry, ecology, and public administration);
3. to develop in the student, through coursework in mathematics, statistics and computer science, a high degree of mathematical maturity to enhance a potential career in management, research, or teaching.

Admission Requirements

The doctoral program requires three Graduate School Rating Forms and the GRE or GMAT, in addition to The Graduate School’s Admission 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 inference, Statistics 563, 564, by passing a written qualifying examination. Mastery of 12 to 14 semester hours in mathematics core coursework must be demonstrated by passing a written qualifying examination. Topics normally include numerical analysis, either Mathematics 471, 472, 453, and 571, or 571-572, and real analysis, Mathematics 445-446. Other options may be approved. In exceptional circumstances, the faculty will consider waiving the mathematics and/or statistics qualifying examinations.

These requirements generally are completed by the end of the first year of the program. There is no foreign language requirement.

Comprehensive Examination

Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation

The student must complete 24 semester hours of Management Science 680: Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the science. A final oral examination is conducted over the dissertation and such other segments of the program that the faculty committee deems appropriate. This effort, which is beyond the minimum 46 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 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 beyond the requirements. May be repeated. S/NC only. E

531 Mathematical Programming (3) Linear programming procedures, duality and sensitivity analysis.

Network flows, integer, and nonlinear programming. Prereq: Fundamental course in algebra and differential calculus, proficiency in computer language.


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) Application 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.

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

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-dual basis tree methods. Prereq: 531 or equivalent.

631 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branches 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.

691-62 Management Science Seminar (1,1) Subjects selected from current literature. S/NC only.
**Marketing**

**Professors:**
- Barnaby, David J., Ph.D. Purdue
- Cadotte, E. R., Ph.D. Ohio State
- Jenkins, Roger L., Ph.D. Ohio State
- Locander, W. B., Ph.D. Illinois
- Woodruff, R. B., DBA Indiana

**Associate Professors:**
- McMillan, J. R., Ph.D. Ohio State
- Reizenstein, Richard C., Ph.D. Cornell
- Rentz, J. O., Ph.D. Georgia

**Assistant Professors:**
- Faulds, D. J., Ph.D. Iowa
- Gardial, S. F., Ph.D. Houston
- Schumann, D. W., Ph.D. Missouri
- Speck, P. S., Ph.D. Texas Tech

**BUSINESS ADMINISTRATION CONCENTRATIONS**

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

**MBA Concentration:** Marketing.

Minimum course requirements are three courses from the following:
- 503, 504, 505, 506, 550, 593, 599, Logistics and Transportation
- 507, Business Administration
- 510, 599

**Ph.D. Concentration:** Marketing.

Minimum course requirements are 12 hours from among the following courses: 601, 602, 603, 604, 605, 606.

**GRADUATE COURSES**

**501 Marketing Management (3)** Marketing viewed as total system designed to plan, promote, and distribute goods and services to household consumers and industrial users. Demand analysis as basis for marketing decisions.

**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: 501.

**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 analyses to marketing strategy decisions. Prereq: 501.

**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: 501.

**506 Marketing Strategy (3)** Integration of concepts and analytical skills from each component area of marketing to formulate cohesive, well-organized marketing program. Prereq: 501.

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

593 Independent Study (3) Directed research and study. Prereq: MBA Core and consent of instructor. May be repeated. Maximum 9 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.

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

601 Marketing Theory (3) Nature and scope of marketing, role of theory development and theory testing important to marketing research.

602 Research Methods I (3) Research process: problem formulation, research and experimental design, measurement and implementation of results. Design: experimental design, survey research, and measurement.

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

604 Seminar in Buyer Behavior Research (3) Behavioral study of people in their roles as buyers and users of goods and services both individual and group processes.

605 Research Methods II (3) Analytical approach to marketing decisions and role of quantitative methods. Models and model building in marketing: consideration of decision theory, linear programming, simulation and other mathematical representations of marketing phenomena.

606 Special Topics (3) Topics vary: marketing strategy, advanced consumer behavior, influence and persuasion theory and strategy, pricing issues, international marketing issues, and nonprofit organization marketing issues.

**Logistics and Transportation**

**Professors:**
- Davis, F. W., Jr., Ph.D. Michigan State
- Dicer, Gary N., DBA Indiana
- Frye, J. L. (Emeritus), Ph.D. Indiana
- Hendrix, F. L. (Emeritus), Ph.D. North Carolina
- Langley, C. J., Jr., Ph.D. Penn State
- Mundy, Ray A., Ph.D. Penn State
- Patton, E. P., Ph.D. North Carolina

**Associate Professor:**
- Foggion, J. H., DBA Indiana

**BUSINESS ADMINISTRATION CONCENTRATIONS**

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

**MBA Concentration:** Logistics and Transportation.

Minimum course requirements are 501, 508, and one course from the following:
- 504, 506, 507, 593, and 599

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

Minimum course requirements are 12 hours to include 601, 602, 603.

**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 (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.

**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 Operations and Logistics Management (3)** (Same as Management 505.)

**506 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. Practical applications through case approach and simulation game.

**507 International Logistics and Transportation (3)** Logistics strategy in the multi-national firm: materials management, international sources and distribution, and importing/exporting. Issues: international carrier management and operations and comparative national transport systems analysis.

**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 (3-6)** Directed research and study. Prereq: Consent of instructor. May be repeated.

**599 Special Topics in Logistics and Transportation (3-6)** Seminar designed to study specific current problem areas in logistics and transportation. Topic announced prior to offering. Prereq: Consent of instructor. May be repeated.

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

**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 Macrotransportation Systems (3)** Contemporary national logistics and transportation systems, governmental policies in logistics and transportation sector, and current literature and research in field.

**603 Research Methodology in Logistics and Transportation (3)** Fundamental research process in areas of logistics and transportation, history and development of body of knowledge, and contemporary research methodology to develop student dissertation topics.

**Materials Science and Engineering**

(Graduate Programs)

**MAJORS**

**DEGREES**

**Metallurgical Engineering**
- M.S., Ph.D.

**Polymer Engineering**
- M.S., Ph.D.

**Joseph E. Spurlin, Head Professor:**

- Ashbee, K. H. G. (Racheff Chair of Excellence), Ph.D. Birmingham (UK)
- Bogue, Donald C., Ph.D. Delaware
- Borie, Bernard S., Ph.D. MIT
- Brooks, C. R., Ph.D. Tennessee
- Buchanan, Raymond A., Ph.D. Vanderbilt
- Clark, Edward S., Ph.D. California
- Canonico, D. A., Ph.D. Lehigh
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.

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 faculty committee and covering the review paper and other areas of metallurgical or polymer engineering.

The candidate's degree program must be

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 is available to residents of the state of Virginia, the M.S. and Ph.D. programs in Polymer Engineering are available to residents of Arkansas, Kentucky, Louisiana, Texas, or Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

421 Mechanical Metallurgy (3) Brittle fracture due to metalurgical and environmental factors; stress-life and strain-life fatigue analysis; residual stresses; creep and stress rupture; finite plastic strain, ductile fracture, fracture by forging, rolling, deep drawing, stretch forming; formability testing. Prereq: 302 or 201 and Mechanical Engineering 469 or equivalent.


423 Metallurgical Fabrication (3) Principles and processes of welding, casting and powder metallurgy; solidification, segregation, heat flow, microstructure, residual stresses; thermal treatments, sintering, non-destructive testing. Prereq: 301, 320. 3 hrs of 2 hrs and 1 lab. F.

424 Metallurgical Process Design (3) Property control through composition; thermal and mechanical selection; material and property selection; steels and nonferrous alloys. Prereq: Materials Science and Engineering 201 or equivalent.

425 Metallurgical Applications in Manufacturing and Processing (3) Fabrication methods, standards and specifications; principles of thermomechanical processing for finished and semi-finished products; casting, forming, joining; heat treatment, powder metallurgy, corrosion control. Prereq: 201.

442 Mechanical Properties of Polymers (3) Deformation in amorphous and crystalline states; isotropic and anisotropic properties, phenomenological and molecular interpretations. Rubber elasticity; thermodynamics and mechanical behavior in terms of statistics of networks. Yielding and crazing. Fiber drawing; structural, mechanical models, technology, viscoelasticity; Boltzmann's superposition principle; time-temperature superposition. Internal friction. Prereq: 441.

443 Polymer Processing (3) Rheological measurements; flow through tubes and slits, and effects and extrudate swell; selected application, screw extrusion, injection molding, sheet extrusion, spinning methods, structure development, properties.

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

470 Corrosion Science and Engineering (3) Mechanisms and control of corrosion and degradation processes; thermodynamics and electrode kinetics of corrosion reactions; electrochemical measurement techniques; applications to design. Prereq: 201 or equivalent.

471 Semiconductor Materials (3) Theory, properties and processing of semiconductors: applications to solid-state devices; basic physics of semiconductor materials; crystal growth, films, doping, annealing, etching, electrical properties and performance evaluation. Prereq: 310. F.

472 Fundamental Principles of Composite Materials (3) Establishment of physical principles basic to design, manufacture and application of fiber reinforced polymers, metals and composites. Prereq: 390 or equivalent.

474 Biomaterials (3) Metals, polymers and ceramics used in orthopaedic, cardiovascular, and dental surgical implant devices: corrosion and degradation problems; materials properties of primary importance; tissue response to synthetic materials. Prereq: 201. Recommended for engineering science and mechanics majors.

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

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


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

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

505 Engineering Analysis (3) Same as Chemical Engineering 405.
522 Defects in Crystals (3) Analytical and experimental analysis of defect interactions in solids. Prereq: 421 or consent of instructor.

523 Plastic Deformation of Metals (3) Geometry and mechanisms of single crystal plastic deformation: slip, twinning, and cleavage, work hardening, effect of temperature and stress; plastic flow of crystal aggregates; orientation relationships. Prereq: 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 transformations; heat flow; residual stresses; theories of hot cracking, cold cracking and porosity formation, applications to process utilization.

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 Metallurgical Materials (3) Theories of phase transformations; transformation, 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 Potentiodynamic polarization; theories of environmental and mechanical factors contributing to pitting, crevice, fretting, wear, fatigue and stress corrosion. Prereq: 470 or consent of instructor.


540 Basic Polymer Chemistry (3) Synthesis, reactions and degradation of polymers. Molecular characterization; solution methods and spectroscopy. Prereq: Semester of organic chemistry and thermodynamics or equivalent.

541 Fluid Mechanics and Polymer Processing (3) Navier-Stokes equations and illustrative problems; application in chemical engineering and polymer engineering; packed and fluidized beds, multiphase systems; mass transfer and chemical conversion in polymer processing: screw extrusion, fiber spinning, injection molding. (Same as Chemical Engineering 541.)

542 Further Topics in Polymer Processing (3) Description and analysis of selected polymer processing operations. Prereq: 541.


544 Polymer Solution Thermodynamics and Characterization (3) Theories of solutions, statistical thermodynamics, characterization, treatment of chromatography, viscosity, light scattering and osmotic pressure. Prereq: Undergraduate physical chemistry.

545 Physical Characterization of Polymers (3) Birefringence theorem; end-to-end single x-ray and light scattering; spherulitic and fibrous structures; introduction to electron microscopy.

546 Mechanical Properties of Solids Polymers (3) Types of mechanical behavior: Hookian and rubber elasticity, fracture: linear viscoelasticity; dynamic mechanical behavior and testing; loss tangent; experimental methods. Introduction to mechanical behavior of polymer gels.

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.

550 Principles of Ceramic Processing (3) Treatment of ceramic processing; raw materials preparation and characterization; sintering, melting, sintering techniques, mechanisms and kinetics. Prereq: 360 or equivalent.

551 Inorganic Glass Forming Systems (3) Physical and mechanical behavior of glasses; structural theories of glass formation; major glass forming systems: silica, oxides glass, metal glasses, chalcogenide glasses. Prereq: 363, Chemistry 371.

570 Chemical Thermodynamics (3) Enthalpy and entropy of mixing; Gibbs function and chemical potentials of measuring activity; solution, phase rule; heat capacity of gases, liquids and solids; calculation of phase diagrams. Prereq: 303 or equivalent.

571 Electron Microscopy (3) Operation of electron microscope; kinematical and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: 304 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 structure.

573 Biomaterials Analysis and Development (3) Physical-property limitations of current implant surgical materials and methods of improvement: resistance to corrosion, mechanical damage; detrimental effects of specific metal ions; development of new biomaterials and new materials processing techniques. Prereq: 470, 474 or consent of instructor.

574 Formability of Materials (3) Modeling and analysis of finite plastic strain with application to primary and secondary forming operations; crystalline and noncrystalline metals; flow localization, instability, predictive testing. Prereq: Consent of instructor.

576-77 Special Topics in Materials Science and Engineering (3,3) Topics of current significance and interest. Prereq: Consent of instructor. May be repeated.


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

621-22 Theoretical Metallurgy (3,3) Topics in solid state physics as applied to metallurgy; introduction to quantum theory, specific heats, electron theory of solids, electrical and thermal conductivity, magnetic properties, theories of alloy formation. Prereq: Consent of instructor.

623-24 Solidification and Crystal Growth (3,3) Theories of solidification, fluid flow effects, phase equilibrium, nucleation, growth and morphology; secondary nucleation theory; solidification theory, metastability. Prereq: Consent of instructor.

641 Advanced Rheology and Viscoelasticity 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 of structure development to analysis of polymer processing operations. Prereq: 541.

643 Phase Transformations in Polymers (3) Glass transition and glass transformation, annealing, of polymeric glasses; crystallization of polymers; nucleation, growth and morphology, secondary nucleation theory; solidification of copolymers; crystallization under stress. Prereq: 543.

671 Quantitative Microscopy (3) Principal acoustic, optical, x-ray neutron, electron and field-ion techniques for examination of microstructures of materials. Prereq: 400.


676-77 Advanced Topics in Materials Science and Engineering (3,3) Latest developments and/or advanced special topics. Prereq: Consent of instructor. May be repeated.

679-79 Seminar in Recent Advances in Materials Science and Engineering (3,3) Directed and independent study of advanced topics. Prereq: Consent of instructor. May be repeated.

Mathematics (College of Liberal Arts)

MAJOR

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

G. Samuel Jordan, Head

Professors:

Albert, G. E. (Emeritus), Ph.D. ......... Wisconsin
Alexiades, V., Ph.D. ......... Delaware
Anderson, D. F., Ph.D. ......... Chicago
Baker, G. A., Ph.D. ......... Cornell
Bradley, John S., Ph.D. ......... Iowa
Carruth, J. H., Ph.D. ......... Louisiana State
Clark, C. E., Ph.D. ......... Louisiana State
Daverman, Robert J., Ph.D. ......... Wisconsin
Desatt, Donald J., Ph.D. ......... Maryland
Dobbs, D. E., Ph.D. ......... Cornell
Eaves, D. E. (Emeritus), Ph.D. ......... Texas
Frandsen, Henry, Ph.D. ......... Illinois
Hallam, T. G., Ph.D. ......... Missouri
Hinton, D. B., Ph.D. ......... Tennessee
Housshieh, A. S. (Emeritus), Ph.D. ......... Chicago
Husch, L. S., Ph.D. ......... Florida State
Johnsson, K. Ph.D. ......... Bielefeld
Jordan, G. Samuel, Ph.D. ......... Wisconsin
Kuperschmidt, B. A. (UTSI), Ph.D. ......... MIT
McConnel, R. M., Ph.D. ......... Duke
Mathews, H. T., Ph.D. ......... Tulane
Miller, D. D. (Emeritus), Ph.D. ......... Michigan
Rajagopal, E. S., Ph.D. ......... Illinois
Reddy, K. C. (UTSI), Ph.D. ......... Indian IT
Schaefier, P. W., Ph.D. ......... Maryland
Serbin, Steve, Ph.D. ......... Cornell
Sonl, K., Ph.D. ......... Oregon State
Stallman, F. W. (Emeritus), Ph.D. ......... Giessen
Stephenson, K. R., Ph.D. ......... Wisconsin
Wachspress, E., Ph.D. ......... Rensselaer
Wade, W. R., Ph.D. ......... California (Riverside)
Wagner, C. G., Ph.D. ......... Duke

Associate Professors:

Aliakoks, N., Ph.D. ......... Brown
Dydk, J. Ph.D. ......... Warsaw
Gross, L. J., Ph.D. ......... Cornell
Karakashian, O., Ph.D. ......... Harvard
Kimble, K. R. (UTSI), Ph.D. ......... Ohio State
Kuo, Y., Ph.D. ......... Cincinnati
Lenthart, S., Ph.D. ......... Kentucky
Mulay, S., Ph.D. ......... Purdue
Rosinski, J., Ph.D. ......... Wroclaw
Row, W. H., Jr., Ph.D. ......... Wisconsin
Simpson, H., Ph.D. ......... Cal Tech
Smith, J. Ph.D. ......... California
Sonl, R. P., Ph.D. ......... Oregon State
Sundberg, C., Ph.D. ......... Wisconsin
Thistlethwaite, M. B., Ph.D. ......... Manchester
THE DOCTORAL PROGRAM

For the Ph.D. in Mathematics, the student must meet the following four requirements in addition to those of The Graduate School:

1. Satisfy either of the following: the standard program or the mathematical ecology concentration.
2. A student intending to work in mathematical ecology may complete either, but he/she is encouraged to complete the 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 a transfer is determined by the complete history of his/her earlier examinations from the standard program and part 1 of the mathematical ecology concentration. A description of both programs is below.

3. Demonstrate proficiency in one foreign language, normally French, German or Russian. This requirement is to be met prior to the examination in the area of specialization. The student’s doctoral committee may require that a written final examination be passed and that credit be received for a reading course.
4. Take a one-year, 600-level sequence in mathematics outside of his/her area of specialization. The use of the course selected to fulfill this requirement must be approved by the department head and the student’s doctoral committee (such approval may occur after the requirements have been met). A student may take this specialty examination only twice.

5. Students may take as many written examinations a maximum of three times, but no one failing four exams, counting possible repetitions, will be permitted to take another round of exams.

Mathematical Ecology Concentration

Students must pass examinations in two areas:

1. Three subjects in mathematics. One must be mathematical ecology and two must be from the list under the standard program.
2. At most, 4 minus n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
3. Students may take a collection of written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.

Mathematical Ecology Concentration

Students must pass examinations in two areas:

1. Three subjects in mathematics. One must be mathematical ecology and two must be from the list under the standard program.
2. Students may take as many written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.

GRADUATE COURSES

400 History of Mathematics (3) Development of major ideas in mathematics from ancient to modern times and influence of ideas in science, technology, philosophy, art, and other areas. Writing emphasis course: at least one in-class essay examination and 3000 words of writing outside classroom. Prereq: Calculus.

401 Mathematics and Microcomputers (3) Primarily for students seeking certification as mathematics teachers at secondary level. Use of microcomputers to study concepts and problems in mathematics. Does not satisfy the major requirements for a B.S. or M.S. in mathematics. Prereq: 141 plus 1 semester of discrete mathematics, 221 plus 180.

404 Applied Vector Calculus (3) Topics from variational and vector calculus, line and surface integrals, divergence theorem and theorems of Gauss and Stokes. Prereq: 241.

405 Models in Biology (3) Difference and differential equation models of biological systems. Prereq: 141-42 or 151-52.


Assistant Professors:

Fitzpatrick, B., Ph.D. ................................... Brown
Janik, T., Ph.D. ........................................... Warsaw Tech
Overholt, M., Ph.D. ........................................ Michigan
Richter, Stefan, Ph.D. ....................................... Michigan
Svirsky, R., Ph.D. ........................................... Johns Hopkins

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 coursework 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 or secondary school teaching experience. Applicants must have successfully completed one year of calculus (141-42 or equivalent) and a course in matrix algebra (251 or equivalent).

The following requirements must be met:

1. Complete 30 hours of coursework of which 21 must be at the 500 level. The coursework must include 504, 505, 506, 507, and 6 hours in 509. At most, 6 hours may be taken outside the Department of Mathematics (selected in consultation with the advisor).
2. Pass a final examination upon completion of all coursework.

In exceptional circumstances, part of admission requirement (b) might be satisfied concurrently with coursework. Normally Master of Mathematics degree students will start the program by taking 504 during the summer.

THE MASTER OF SCIENCE PROGRAM

The department offers two options for the Master of Science degree. The first option requires a thesis for which 6 hours must be earned along with 24 additional hours of work in acceptable courses numbered above 400. Of the additional hours, 6 must 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 second option, for which 30 hours in courses numbered above 400 are required. Of these, 21 hours (at least 15 of which must be in mathematics) must be in courses numbered above 500. Of the 30 hours, 9 in courses approved by the advisory committee may be taken in fields other than mathematics. For this option it is also required that a written final examination be passed and that credit be received for a reading course (588) in which a term paper or project is required.

2. At most, 4 minus n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
3. Students may take a collection of written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.

Mathematical Ecology Concentration

Students must pass examinations in two areas:

1. Three subjects in mathematics. One must be mathematical ecology and two must be from the list under the standard program.
2. Students may take as many written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.

THE STANDARD PROGRAM

For the Master of Science in Mathematics, the student must meet the following requirements in addition to those of The Graduate School:

1. Satisfy either of the following: the standard program or the mathematical ecology concentration. A student intending to work in mathematical ecology may complete either, but he/she is encouraged to complete the 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 a transfer is determined by the complete history of his/her earlier examinations from the standard program and part 1 of the mathematical ecology concentration. A description of both programs is below.

2. Demonstrate proficiency in one foreign language, normally French, German or Russian. This requirement is to be met prior to the examination in the area of specialization. The student’s doctoral committee may require that a written final examination be passed and that credit be received for a reading course.
3. Take a one-year, 600-level sequence in mathematics outside of his/her area of specialization. The use of the course selected to fulfill this requirement must be approved by the department head and the student’s doctoral committee (such approval may occur after the requirements have been met). A student may take this specialty examination only twice.

4. Students may not count passes on examinations from the list under the standard program. Students may take as many written examinations a maximum of three times, but no one failing four exams, counting possible repetitions, will be permitted to take another round of exams.

2. Ecology, covering material selected from nine hours of coursework outside of mathematics at the 500 level or above.

a. The courses submitted for examination must be approved by the student’s doctoral committee and the departmental Graduate Committee. The courses must be prepared, administered, and graded by instructors of the courses involved, along with at least one member of the mathematical ecology section before submitting materials to the committees for approval.

4. Students may take the written examination at most twice.
Prereq: Consent of instructor. May be repeated. Maximum 499.
Seminar in Mathematics (1-3) Topics vary. Credit available only to satisfy MBA core requirements. Prereq: 1 yr calculus or equivalent, and 604.

500 Seminar for Teachers (3) For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus or equivalent.

501 Honors: Advanced Calculus 1 (3,3) Honors version of 455-56. Prereq: 351 or consent of instructor.

502 Honors: Advanced Calculus II (3,3) Honors version of 455-46. Prereq: 341 or consent of instructor.


508 Seminar in Analysis (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

509 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

510 Seminar in Topology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

511 Seminar in Differential Equations (1-3) Prereq: Consent of instructor or 453 and programming experience. Prereq: 453 or consent of instructor.


515 Seminar in Analysis (1-3) May be repeated. Maximum 12 hrs.

516 Seminar in Algebra (1-3) May be repeated. Maximum 12 hrs.

517 Seminar in Topology (1-3) May be repeated. Maximum 12 hrs.

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

519 Seminar in Mathematics (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

520 Seminar in Applied Mathematics (1-3) May be repeated. Maximum 9 hrs.

521 Seminar in Topology (1-3) May be repeated. Maximum 12 hrs.

522 Seminar in Analysis (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

523 Seminar in Topology (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

524 Seminar in Analysis (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

525 Seminar in Topology (1-3) May be repeated. Maximum 12 hrs.

526 Seminar in Analysis (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

527 Seminar in Topology (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

528 Seminar in Analysis (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

529 Seminar in Topology (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

530 Seminar in Analysis (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

531 Seminar in Topology (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

532 Seminar in Analysis (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
the rem,s of Krein-Milman, Paley-Wiener, Lax, Malgrange-
and normally 6 semester hours of coursework (400-level or above) in mathematics.
2. Six semester hours of thesis.
3. Participation in the departmental seminar program.
4. Submission and defense of a written thesis that demonstrates the ability to conduct and report on an independent investigation.
5. Passing a final examination on all work submitted for the degree.

Course Option
This option is restricted to those students who have had the equivalent of a thesis experience. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:
1. A minimum of 24 semester hours of coursework that includes at least 12 semester hours of graduate (500-level or above) courses in mechanical and/or aerospace engineering and normally 6 semester hours of coursework (400-level or above) in mathematics. No more than 3 semester hours of engineering coursework may be below the 500 level.
2. Participation in the departmental seminar program.
3. Passing a comprehensive written and oral final examination on all coursework submitted for the degree. The student's committee will be of sufficient size to include all of the study areas reflected in the course program.

Problems Option
The requirements of this option are that the student must satisfactorily complete a program of study that includes:
1. A minimum of 24 semester hours of coursework that includes at least 12 semester hours of graduate (500-level or above) courses in mechanical and/or aerospace engineering and normally 6 semester hours of coursework (400-level or above) in mathematics.
2. A minimum of 6 semester hours in 590 Selected Engineering Problems. A written report must be presented for each problem investigated.
3. Participation in the departmental seminar program.
4. Passing a comprehensive written final examination on all coursework submitted for the degree and an oral examination on all work (including problems).

THE DOCTORAL PROGRAM
Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds.

The student must satisfactorily complete an approved program of study that includes:
1. A minimum of 72 semester hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including:
   a. A minimum of 24 semester hours in doctoral dissertation.
   b. A minimum of 12 semester hours of graduate credit in mathematics in courses numbered 400 or above with a minimum of 6 semester hours numbered 500 or above.
   c. A minimum of 24 semester hours in mechanical and/or aerospace engineering courses numbered 500 and above, with at least 9 semester hours of 600-level courses. These are exclusive of thesis, problems, or dissertation credit.

The student's advisory committee can approve a student's petition to replace one 600-level course with one or more 500-level courses that are more appropriate.
4. Participation in the departmental seminar program.
5. The passing of a written and oral comprehensive examination is required as well as a successful defense of 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 Aerospace Engineering is available to residents of the states of Arkansas, Kentucky, or South Carolina. The M.S. in Aerospace Engineering is also available to residents of Kentucky. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES
Senior (400-level) mechanical and aerospace engineering courses may be taken for graduate credit by non-mechanical or non-aerospace engineering majors, if approved by the student's major department. Mechanical or aerospace engineering majors may not normally use more than one 400-level engineering course to meet their advanced degree requirements. Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

Mechanical Engineering

GRADUATE COURSES
422 Environmental Noise (3) Basic principles of acoustics: measurements and control of noise in industrial and community environments. Prereq: Senior standing in engineering or consent of instructor.
445 Lubrication (3) Hydrodynamic theory of lubrication of sliding bearings; application of Navier-Stokes equations to infinite and finite bearings; analytical and numerical solutions; applications to design. Prereq: 344, Aerospace Engineering 351.
449 Mechanical Engineering Laboratory (3) Design, conducting and reporting results of experimental exercises, first principles, data analysis, graphical and analytical representation of data and formation of conclusions. Prereq: 332, 344, 345. Coreq: 475. 3 tabs. Sp,Su
451 Systems and Controls (3) Analytical models of physical systems comprised of combinations of mechanical, fluid, electrical, and thermal components; feedback control systems, transient and frequency response, stability analysis; nonlinear controllers of linear systems; sampled-data systems, digital filters. Prereq: 341, 363, Electrical Engineering 301-02. F,Sp
455 Introduction to Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering solid mechanics system. Participation in team design effort; design report. Prereq: 363 and 465.
456 Introduction to Thermal Design (2) Engineering economy, optimization; design for automation, reliability, patents and product liability; design of mechanical engineering thermal-fluid system. Participation in team design effort; design report. Prereq: 332, F,Sp
461 Computer Integrated Manufacturing (3) Application of computers to control of machine tools, robots, and automated assembly. Programming languages and computer-aided part programming; Dimensioning and metrology. Prereq: 366 or Industrial Engineering 404, Basic Engineering 201. Sp
462 Tool Design (3) Principles underlying tool and die design; design for high-speed, precision, production; work-holding fixtures; comparison of material removal methods; selection of tool material; plastic production. Prereq: 366 or Industrial Engineering 404, Engineering Science and Mechanics 321.
469 Machine Design (4) Design of complete machine; documentation, complete specifications, design calculations, working drawings, and cost analysis. Written and oral report. Prereq: 455, 466. Sp
471 Refrigeration and Air Conditioning (3) Vapor compression and absorption cycles; heat pump systems; psychrometric processes; air washers; cooling towers; solar radiation; building heat transmission. Prereq: 332, 344.
474 Solar Energy Utilization (3) Nature and availability of solar radiation; review of selected heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and method of storage. Selected applications. Prereq: 332, 344, or consent of instructor.
475 Thermal Engineering (3) Thermal systems, turbomachinery, heat exchangers, combustion and system analysis and design, second law and economic analysis. Prereq: 332, 344. F,Sp
479 Thermal Engineering Design (4) Design of complete thermal-fluid system, economic, technical and optimization aspects. Participation in team design effort, formal presentations and design report. Prereq: 456, 475. Sp
494-95 Selected Topics in Mechanical Engineering 1-3 (1-1-1) Problems and topics related to developments and practice in mechanical engineering. Prereq: Consent of instructor. 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. F,Sp
507 Application of Numerical Linear Algebra in Systems and Control Engineering (3) (Same as Chemical Engineering 507 and Electrical and Computer Engineering 507.)
512-21 Thermodynamics I and II (3,3) Macroscopic thermodynamics, including First and Second Law analysis, nature and characteristics of thermal processes, heat transfer, combustion, gas mixtures, and property relations, determination of thermodynamic properties from molecular structure: spectroscopic data, kinetic theory, statistical mechanics, quantum physics, Schroedinger equation. Prereq: 330.

523 Special Topics in Thermodynamics (3) Application of thermodynamics to topics of current interest in mechanical engineering. Prereq: Consent of instructor.

526 Combustion and Chemically Reacting Flows I (3) Fundamentals: thermochemistry, chemical kinetics and conservation equations; phenomenological approach to laminar flames; diffusion and premixed flame theory; single droplet combustion; deflagration and detonation theory; stabilization of combustion waves in laminar flames; flammability limits of remixed laminar flames; introduction to turbulent flames. Prereq: 522, 531.

526 Combustion and Chemically Reacting Flows II (3) Advanced topics: phenomenological approaches to turbulent flames; fundamentals of turbulent flow; application of the Navier-Stokes equations to the prediction of turbulent reacting flows with premixed and/or non-premixed reactants; spray combustion models; fluidized bed combustion; chemically reacting boundary layer flow; gas turbine and/or rocket motor combustors; tur- naces; introduction to supersonic combustion and heat transfer. Prereq: 526.


561 Vibrations (3) Free and forced vibration of single and multiple degrees of freedom systems linear and nonlinear. Prereq: Undergraduate vibrations course.

571 Metal Machining and Forming (3) Mechanics of cutting and forming; non-metallic and chemically reacting ideal gases, rocket nozzle design; ideal rocket performance parameters; rocket heat transfer; chemis-try of propellants and rocket engine systems; ground testing; introduction to solid propellant rockets. Prereq: Consent of instructor.

582 Rocket Propulsion II (3) Solid propellant rocket performance, heterogeneous and homogeneous prop-pellent chemistry and combustion system performance, thermal decomposition and gas phase reaction models; effect of chamber pressure and additives on solid propel-lant burn rates, erosive burning; analysis of two-phase solid rocket exhaust flow. Introduction to nuclear and electric propulsion. Science and resistance and electric field (ion) engine performance, magnetohydrodynamic thrusters, traveling wave thrusters; exotic propulsion systems. Prereq: Consent of instructor.

584-85 Turbomachinery Systems I, II (3,3) Ideal cycle analysis of turbomachinery, real cycle analysis, compo-nent performance analysis, component design and systems integration (blades, nozzles, combustors, com-presors, turbines); high speed, high pressure, high temperature, high speed turbomachinery. Prereq: 584, 585. Component matching, transient operation, surge and rotating stall, engine control systems, structural consid-erations. Prereq: First year graduate standing and con-sent of instructor.


588 Measurement Science I (3) (Same as Nuclear Engineering 588, Civil Engi-neering 588, Electrical and Computer Engineering 588, Engineering Science and Mechanics 588, and Aero-space Engineering 589.)

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engi-neering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, and Aero-space Engineering 589.)

590 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq: Con-sent of advisor. May be repeated. S/NC only.

591 Seminar (1) All phases of mechanical engineering, reports of current research at UTK. May be repeated. S/NC only.

592 Project (3) Project, selected problems, report, paper, oral presentation. Prereq: Consent of instructor.

593 Seminar (1) Project, selected problems, report, paper, oral presentation. Prereq: Consent of instructor.

594-55 Special Topics in Mechanical Engineering (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. 600 Doctoral Research and Dissertation (3-15) P/NP only. E

610 Advanced Topics in Fluid Mechanics and Heat Transfer (3) Advanced theory and application of fluid mechanics and heat transfer; natural convection, multi-phase flows, high speed, compressible and turbulent reacting and reacting flows, advanced boundary layer techniques, combustion, per-turbation and variational methods of analysis, heat ex-changer theory and design. May be repeated. Maximum 9 hrs. Prereq: Consent of instructor.

611 Advanced Convection Heat Transfer, Fluid Mechanics and Mass Transfer (3) Stagnation point and high speed viscous boundary layer flows, problems in heat transfer at high supersonic and hypersonic speeds; laminar and turbulent boundary layer heat transfer with surface modifications; effects of gas species recommination; stagnation point heat transfer, Lee’s integral solution for high speed boundary layers; heat flux through high speed and Currency boundary layers and radiation cooling techniques. Prereq: 512 and consent of instruc-tor.


613 Advanced Radiation Heat Transfer (3) Radiation heat transfer in absorbing, emitting and scattering media; introduction of thermal radiation with conduction and convection heat transfer. Prereq: 511, 512.


Aerospace Engineering

GRADUATE COURSES


423 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow, compressibility effects; numerical solution methods. Prereq: 351, Mechanical Engineering 391. Sp

424 Astronautics (3) Propulsion, trajectories, guid-ance, control, and atmospheric reentry of space vehicle systems. Prereq: 382, Mechanical Engineering 332. Sp

425 Propulsion (3) Principles of propulsion devices; turbo-jet, ram jet and rocket engines. Prereq: 351. F

426 Introduction to Aerospace Design (2) Design process, synthesis, safety, reliability, patents, product liability, economic analysis, optimization, design standards, design studies. Individual design reports. Prereq: 351, 370, 363, Coreq: Mechanical Engineering 344. F

439 Aerospace System Design (4) Synthesis and design of complete aerospace system, control and structural aspects. Participation in team design effort, formal presentations and design report. Prereq: 425, 456. Sp

449 Aerospace Engineering Laboratory (3) De-signing, conducting, and reporting results of experi-mental exercises. Test standards and specifications. Analysis of data and formation of conclusions. Prereq: 345, 351, 3 labs. F

494-95 Selected Topics in Aerospace Science (1-4, 1-4) Current problems and topics in aerospace science. Prereq: Consent of instructor.

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

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

511 Inviscid Flow (3) Kinematics and dynamics of inviscid fluids; potential flow about body, conformal mapping. Prereq: 452 or Mechanical Engineering 531. Mathematics 425 or equivalent.

512 Viscous Flow (3) Equations of viscous fluid flow; laminar and turbulent flow; transition; separation; bound-ary layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 531 or equivalent.

513 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments; representative experiments: hot wire anemometry and
turbulence measurements, flow visualization, wind tunnel tests, water table experiments, supersonic flow experiments, boundary layer measurements, laser-optical measurements. Prereq: 423 or Mechanical Engineering 531.

515-16 Air Vehicle Aerodynamics and Performance (3,3) Application of aerodynamics principles to air vehicles to provide estimates of performance, stability, and control characteristics for subsonic to hypersonic speeds. Relations among thrust, drag, lift and attitude, propulsion systems, vehicle performance characteristics, and trajectory optimization. Prereq: 422; 515 for 516.

521-22 Aerodynamics of Compressible Fluids (3,3) One-dimensional flow; hypersonic flow; weak, small perturbation theory; slender body theory; similarity rules; method of characteristics. Prereq: 422 for 521; 522 for 522.

525 Hypersonic Flow (3) Slender body flow; similitude; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. Prereq: 512.

527-28 Aerospace Ground Test Facilities (3,3) Atmospheric models and similarity considerations; aerodynamic test facilities; continuous and intermittent wind tunnels and ballistic ranges; propulsion test facilities or air breathing and rocket engines; space environment and space vehicle test facilities. Prereq: 515 and 521, Mechanical Engineering 513 and 522.

529 Rarefied Gas Dynamics (3) Binary elastic collisions; kinetic theory; flow regimes; Boltzmann and model equations; introduction to hypersonic surface interactions; slip boundary conditions, free molecule, slip and transition flow. Monte Carlo simulation; experimental techniques; interpretation of measured gas flows. Prereq: 522, Mechanical Engineering 522.

531 Magnetohydrodynamics (3) Electromagnetic field theory; chemical kinetics; thermodynamic and thermophysical properties of plasmas; governing equations and applications. Prereq: 422 and Mathematics 471.

532 Introduction to Turbulence (3) Macroscopic effects; analogies, statistical treatment, correlation functions, energy spectra, diffusion, application 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; small disturbance theory; shock wave properties; shock-free flows; strong viscous interaction phenomena. Prereq: 522.


556 Vertical or Short Take Off and Landing Aircraft (3) Performance, stability, control of rotary wing, tilt wing, vectored lift and jet vertical lift type aircraft. Vertical and transition flight modes. High lift airfoils. Automatic control systems. Simulation facility types and flight testing. Prereq: 555.


561 Fundamentals of Acooacoustics (3) Generation, propagation, and atmospheric absorption and moving media. Prereq: Consent of instructor.

564 Spacecraft Attitude Dynamics and Control (3) Rotational attitude dynamics of space vehicles. Gyroscope 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 (orbit, launch vehicles and launching), spacecraft structure, power systems, attitude control systems, telemetry/tracking/command, and communication systems, spacecraft testing, reliability, and application of satellites (communications, weather, Earth observation, and future applications). Prereq: 425, Mathematics 471, 404.

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Civil Engineering 596, Electrical and Computer Engineering 596, Engineering Science and Mechanics 588, and Mechanical Engineering 586.)

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 596, Electrical and Computer Engineering 596, Engineering Science and Mechanics 589, and Mechanical Engineering 586.)

590 Selected Engineering Problems (2-6) Enrolment limited to students in programs. Prereq: Consent of advisor.

595 Seminar (1) All phases of aerospace engineering reports on current research at UTK. May be repeated. S/NC only.

599 Special Topics in Aerospace Engineering (1-3) May be repeated. Maximum 6 hrs.

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

631 Magnetohydrodynamics I (3) Electromagnetic field equations, motions of single charged particle, electric and magnetic fields, Boltzmann equation, conduction and diffusion in ionized gases, continuum magnetohydrodynamic equations. Prereq or coreq: 512. Prereq: Mathematics 561 or equivalent.

632 Magnetohydrodynamics II (3) Alten 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 662.


551-52 Advanced Aerodynamics (3,3) Subsonic, transonic, supersonic, and hypersonic flows treated in generalized and unified manner with combined viscous/inviscid effects. Relationships among various regimes of flow fluids. Fundamental assumptions, limitations of approximations and consequences. Foundations of gas dynamical approximations to airplane, rocket, ground testing and jet propulsion. Discussion of special topics according to interest of students. Prereq: 511, 522.


689 Advanced Topics in Aerospace Engineering (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Medical Biology

(College of Medicine-Knoxville Unit)

Carmen B. Lozzio, Acting Chair

Professors:

Chen, J. P., Ph.D. ................................ Pennsylvania State University
Farkas, W., Ph.D. ................................ Duke University
Fuhr, J. E., Ph.D. ................................ St. John's University
Condon, C. C. (Emeritus), M.D. ................... Michigan State University
Johnston, J. B., D.V.M. (Emeritus) .............. Illinois State University
Lange, R. D. (Emeritus) ............................ Washington (St. Louis) University
Loizzo, Carmen B., M.D. ......................... Buenos Aires University
McDonald, T. P., Ph.D. ......................... Tennessee State University
Wigler, P. W., Ph.D. .............................. California State University
Wust, Carl J., Ph.D. ................................ Indiana University

Associate Professors:

Carroll, R., Ph.D. .................................. Cornell University
Hanna, W. T., M.D. ................................. Ain-Shams University
Ichiki, A. T., Ph.D. ................................. UCLA
Schroeder, E. C., D.V.M. ......................... Michigan State University

Assistant Professors:

Matteson, K., Ph.D. ............................... Wisconsin University
Switzer, R. C., III, Ph.D. ......................... Michigan State University
Tyler, J., Ph.D. ................................. SUNY Buffalo

May be repeated. Maximum 6 hrs.

Worthington, R. E. ................................. Washington (St. Louis)

The Department of Medical Biology of The University of Tennessee Medical College-Knoxville Unit was formed from the faculty of The University Memorial Research Center and Hospital in 1978. The Research Center was established in 1956. The faculty has research, education, and service interests in cancer, blood diseases, metabolism, toxicology, neuroscience, birth defects, cytogenetics, and clinical genetics. Courses in these areas are offered to students at the graduate and undergraduate levels. Elective courses are also available to students in the College of Medicine.

The faculty of the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. in Comparative and Experimental Medicine. Other advanced degree students can do thesis research in the department by arrangement with other life science departments at the University.

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

508 Graduate Research Participation (3) Advanced research techniques while conducting individual biomedical research projects under supervision of faculty. Open to all graduate students. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

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

522 Special Topics in Cancer (1-3) Prereq: 521 and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

531 Principles of Hematology (3) Pathophysiology of blood and blood forming systems, Lectures, class discussions, and demonstrations. Prereq: Upper division histology and/or cell biology, Zoology 410 and 420.

Carmen B. Lozzio, Acting Chair
Microbiology - Veterinary Medicine

See Veterinary Medicine for program description.

Music

(NO College of Liberal Arts)

MAJOR

DEGREES

Music

M.M., M.A.

John J. Meacham, Head

Professors:

Bitzas, George C., M.M. .... Converse
Brock, John P., M.M. ....... Alabama
Carter, W. J. (Emeritus), D.M.A. ....... Eastman
Coker, J., M.A. ......... Sam Houston
Combs, F. M., M.A. .... Missouri
DeVine, George F. (Emeritus), Diploma
Dorn, W., M.A. ......... Columbia
Fred, Herbert W., Ph.D. ........ North Carolina
Hollard, A. G. (Emeritus), M.M. ........ Northwestern
Huber, Calvin R., Ph.D. ........ North Carolina
Lennon, J. A., D.M.A. ...... Michigan
Meacham, John J., M.M. ........ Northwestern
Northington, D. B., D.M.A. ........ Yale
Pederson, D. M., Ph.D. ...... Iowa
Starr, W. J. (Emeritus), M.M. ........... Missouri
Stutenberger, D. R., D., M.A. ........ Maryland
VanVactor, D. (Emeritus), M.M. .... Northwestern

Associate Professors:

Adams, Fay, M.M. ............ Tennessee
Bommelje, W., M.M. ........... Tulia
Carter, P. S., M.M. ........ Colorado
Fraley, M., B.M. ........ Oberlin
Horodysky, P., M.M. ........ Manhattan
Hough, Don, M.M. ........... Tennessee
Hough, Dolly C., M.M. ....... Texas
Jacobs, J. A., D.M.A. ......... Texas
Johnson, A. E., D.M.A. ....... Stanford

MacMorr, W. S., M.M. ........ Wisconsin
McClelland, D. K., M.A. ....... Columbia
Michalopolus, L. W., M.A. .... Columbia
Scarlett, William P., M.M. .... Louisiana State
Searle, S., M.M. .............. Tennessee
Teachev, J. C., D.M.A. ........ Florida State
Young, S. E., Ph.D. ............ North Carolina

Assistant Professors:

Boling, M., E., M.M. .......... Tennessee
Brown, Donald R. ............. California
Duberry, T. S., M.M.A. ......... Yale
Erwin, A. Y., M.M. ............ Southern Cal
Goosby, D., M.M. ............... Texas
Hawthorne, W., Ph.D. .......... Cincinnati
Schoeder, E., Ph.D. .......... Stanford
Sperl, G. R., M.M. ............. Indiana
Leach, C. F., M.M. .......... New Mexico

The Department of Music offers the Master of Music degree with concentrations in accompanying, choral conducting, composition, instrumental conducting, jazz, performance (organ, piano, strings, voice, and percussion), piano pedagogy and literature, sacred music, string pedagogy, and theory, and the Master of Arts degree in Music with concentrations in musicology and theory.

Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by UT Knoxville, appropriate to the applicant's prospective area of concentration on the Master's level.

Applicants who plan to pursue the concentration in performance are required to audition before the appropriate area faculty committee. Applicants for admission to the program in composition must submit scores and tape recordings of representative works. Applicants for the concentration in jazz must audition in jazz improvisation and jazz piano proficiency and interview with members of the faculty in this area. Other applicants are required to have an interview with members of the faculty in the prospective area of concentration.

All applicants are required to take the Diagnostic Examinations in music theory and music history/literature. These examinations are given by the Department of Music at the beginning of each semester.

All concentrations require a written and oral final examination.

THE MASTER OF MUSIC PROGRAM

A minimum of 30-33 semester hours of coursework is required for the Master of Music degree. These hours are specifically distributed according to the student's concentration. All concentrations require coursework in music history/literature and music theory and allow for elective courses. Specific curricula are available from the Department of Music.

The graduate recital is given in lieu of thesis by Master of Music degree students with concentrations in performance, pedagogy, jazz, and accompanying. A performance project is given in lieu of thesis by students with concentrations in choral conducting, instrumental conducting, and sacred music. A thesis is required of students in composition and theory.
Music General

GRADUATE COURSES

500 Thesis (1-15) P/NP only. E
501 Graduate Recital (2)
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/NP only. E
511 Lecture Recital (2)
521 Special Topics in Performance (1-3) Prereq: Consent of department head.
561 Church Music Performance Project (1-2) May be repeated. Maximum 3 hrs.

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, 1600-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 viewpoints of individuals and historical eras through selected writings.
490 Church Music Methods and Administration (3)
510 Music Bibliography (2) Bibliographic methodology in music.
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, chaconne, madrigal, and other vocal and instrumental forms and genres.
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-romantic.
580 Music in the Twentieth Century (3) From 1890, Debussy, to present, Stockhausen and others.

Music Instrumental

GRADUATE COURSES

410 Band Arranging (3) Study and application of techniques employed in scoring for marching and concert bands. Prereq: Music Theory 320.
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.
570 Advanced Suzuki Pedagogy (2) Study of psychology, procedures and literature utilized by Shin'ichi Suzuki in Japan. Prereq: 495 or consent of instructor. May be repeated. Maximum 4 hrs.
580 Band Literature (3) Band literature and origins of band, its important expanded cultivation during past century in United States and Europe.
582 Instrumental Conducting Performance (1) Jury performance; conducting band or orchestra in public.
583 Practicum for Instrumental Conductors (1) Intern experience in choral music; S/NP only.
584 Practicum for Instrumental Conductors (1) Intern experience in field other than area of major interest; S/NP only.
595 Instrumental Conducting Seminar (3) Rehearsal and performance problems and techniques allied to score reading and preparation, particular attention to individual problems. Prereq: 490 or equivalent.

Music Jazz

GRADUATE COURSES

410 Advanced Improvisation (3) Further development of individual skills and solving individual problems in jazz improvisation. Prereq: 210 and 220.
420 Jazz Pedagogy (1) Methods and materials relating to teaching of jazz, designing and administering jazz programs, and modern techniques for jazz ensembles. Prereq: Studio music and jazz major or consent of instructor.
520 Seminar in Jazz (3) Topics varies.

Music Keyboard

GRADUATE COURSES

410 Early Keyboard Literature (2) Keyboard music through baroque period, music for harpsichord. Prereq: Music History 210-20.
420-30 Piano Literature I,II (2,2) 420--From 1750 to middle 19th century; 430--Middle 19th century to present.
460-70 The Organ and Its Literature I,II (3,3) Development of organ and organ literature from Middle Ages to present; problems of style and interpretation; pedagogical literature and methods; organ design. Prereq or coreq: Music History 220 and consent of instructor.
485-95 Suzuki Piano Method I,II (2,2) Psychology, procedures, and literature of Suzuki piano method. Must be taken in sequence. Prereq: Consent of instructor.
520 Piano Literature Seminar (2) Topics vary. May be repeated. Maximum 6 hrs.

531-41 Recital Project (2,2) Preparation and accomplishment of full recital for accompanying concentrations only: 531--Vocal recital, 541--Instrumental recital. Prereq: Consent of instructor.
540-50 Advanced Piano Pedagogy I,II (2,2) 540--Evaluation and study of methods and materials for teaching piano at all levels. Supervised laboratory teaching. Prereq: 440, 450, or consent of instructor. 550--Introduction and principles of Kodaly, Orff, Suzuki, Dalcroze Eurhythmics, and class piano teaching. Prereq: 440, 450 or consent of instructor.
560 Organ Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

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.
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 non-tonal 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.
550 Music Theory Seminar (1-3) Topics vary.
593 Independent Study (1-15) See page 31. Prereq: Consent of department head.

Music Voice

GRADUATE COURSES

430-50 Choral Literature I,II (3,3) 430--Study of world music cultures. Interview and principles of Kodaly, Orff, Suzuki, Dalcroze Eurhythmics, and class piano teaching. Prereq: 440, 450 or consent of instructor.
460-70 The Organ and Its Literature I,II (3,3) Development of organ and organ literature from Middle Ages to present; problems of style and interpretation; pedagogical literature and methods; organ design. Prereq or coreq: Music History 220 and consent of instructor.
550-60 Advanced Vocal Pedagogy I,II (2,2) 550--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 medieval ages to present with consideration of historical development of major choral genres.
590 Advanced Choral Conducting (3) Expansions and continued refinement of conducting technique; development of choral rehearsal skills. Prereq: Consent of instructor.
594 Project in Choral Conducting Performance (1-3) Public performance, critical document; recording proj. 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 Performance

GRADUATE COURSES

All performance courses require an audition and consent of instructor. May be repeated. Maximum 8 hrs toward M.M. degree.

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)
490 Organ (1-4)
494 Composition (1-3)
495 Composition with Electronic Media (1-3)
499 Improvisation (1-2) May not be used toward applied music requirement.

GRADUATE COURSES

501 Woodwind Choir (1) May be repeated.
503 Small Jazz Ensemble (1) May be repeated. Maximum 12 hrs.
504 Jazz Ensemble (1) May be repeated.
505 Studio Orchestra (1) May be repeated. Maximum 12 hrs.
506 Trombone Choir (1) May be repeated.
509 Tuba Ensemble (1) May be repeated.
510 Percussion Ensemble (1) May be repeated.
511 Marimba Choir (1) May be repeated.
512 Baroque Ensemble (1) May be repeated.
513 Synthesizer Ensemble (1) May be repeated.
514 Brass Choir (1) May be repeated.
515 Chamber Music Ensemble (1) May be repeated. Maximum 12 hrs.
520 UT Singers (1) May be repeated.
530 Chamber Singers (1) May be repeated.
532 Collegium (1) May be repeated.
534 Saxophone Choir (1) May be repeated.
540 Opera Theatre (1) May be repeated.
542 Opera Workshop (1) May be repeated.
550 Concert Band (1) May be repeated.
552 Campus Band (1) May be repeated.
554 Varsity Band (1) May be repeated.
556 Laboratory Band (1) May be repeated.
558 Marching Band (1) May be repeated.
570 Symphony Orchestra (1) May be repeated.
580 Concert Choir (1) May be repeated.
582 University Chorus (1) May be repeated.
583 Men's Chorale (1) May be repeated.
589 Women's Chorale (1) May be repeated.
599 Accompanying (1) May be repeated.

Music Ensemble

GRADUATE COURSES

501 Woodwind Choir (1) May be repeated.
503 Small Jazz Ensemble (1) May be repeated. Maximum 12 hrs.
504 Jazz Ensemble (1) May be repeated.
505 Studio Orchestra (1) May be repeated. Maximum 12 hrs.
506 Trombone Choir (1) May be repeated.
509 Tuba Ensemble (1) May be repeated.
510 Percussion Ensemble (1) May be repeated.
511 Marimba Choir (1) May be repeated.
512 Baroque Ensemble (1) May be repeated.
513 Synthesizer Ensemble (1) May be repeated.
514 Brass Choir (1) May be repeated.
515 Chamber Music Ensemble (1) May be repeated. Maximum 12 hrs.
520 UT Singers (1) May be repeated.
530 Chamber Singers (1) May be repeated.
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534 Saxophone Choir (1) May be repeated.
540 Opera Theatre (1) May be repeated.
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554 Varsity Band (1) May be repeated.
556 Laboratory Band (1) May be repeated.
558 Marching Band (1) May be repeated.
570 Symphony Orchestra (1) May be repeated.
580 Concert Choir (1) May be repeated.
582 University Chorus (1) May be repeated.
583 Men's Chorale (1) May be repeated.
589 Women's Chorale (1) May be repeated.
599 Accompanying (1) May be repeated.

Nuclear Engineering

(College of Engineering)

MAJOR DEGREES

Nuclear Engineering ..................... M.S., Ph.D.

Thomas W. Kerlin, Head

Professors:

Dodds, H. L., PE, Ph.D. .................. Tennessee
Kerlin, T. W., Ph.D. ..................... Tennessee
Keshock, Edward G., PE, Ph.D. ........... Oklahoma State
Mihalczow, J. T., Ph.D. ................... Tennessee
Pasqua, P. F. (Emeritus), PE, Ph.D. .... Northwestern
Perez, R. B., Ph.D. ....................... Madrid
Roland, H. C. (Emeritus), Ph.D. ......... Tennessee
Stevens, P. N., PE, Ph.D. ................. Northwestern
Uckan, N. A., Ph.D. ....................... Michigan
Uhrig, R. E. (Distinguished Prof.), PE, Ph.D. ............ Iowa
Upadhyaya, B. R., Ph.D. .................. California

Associate Professors:

Katz, E. M., PE, Ph.D. ....................... Tennessee
Miller, L. F., PE, Ph.D. ................... Texas A&M
Scott, T. H., PE, Ph.D. .................... Florida

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 fission energy or fusion energy) or a radiation protection engineering concentration at the Master’s level.

A joint fusion energy program has been developed under graduate curricula in engineering and the Electrical and Computer Engineering Departments. Cross-listed courses from each department are used to satisfy degree requirements. Students may have the opportunity to do their research at the Fusion Energy Division of Oak Ridge National Laboratory or at the Plasma Science Laboratory, affiliated with the Electrical and Computer Engineering Department. A limited number of Graduate Research Assistantships are available at each location. Further information about this program is available from the department.

Students in the Nuclear Engineering Department have an opportunity to affiliate with the Measurement and Control Engineering Center and the Waste Management Research and Education Institute. These organizations provide unique research opportunities.

THE MASTER'S PROGRAM

A graduate program leading to the Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program.

The student must complete 24 semester hours of coursework approved by the student's advisory committee that includes the following:

1. A major consisting of a minimum of 12 semester hours of graduate courses in nuclear engineering. This must include at least one of the following two-semester sequences: 511, 512; 551, 552; 563, 564; 571, 572.
2. A minor of 6 semester hours of elective courses in mathematics, statistics or computer science.
3. Six semester hours in either nuclear engineering or a related field.

The M.S. candidate must also demonstrate research or design capability. This requirement may be satisfied by preparing a thesis or participating in the nuclear engineering practice school, as described below.

Thesis - The student performs independent research on a topic approved by the graduate committee. He/she submits a thesis on this research. The student then must pass an oral examination on the thesis and all graduate coursework. The student must enroll for six semester hours of NE 509 (Thesis).
from the Residency Assistant 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**

401 Nuclear Reactor Theory (3) Thermal and fast spectrum computational methods; homogeneous and heterogeneous media. Equations that relate thermal and neutronic variables, power distribution calculations, and reactivity control methods. Prereq: 302.

403 Nuclear Engineering Laboratory (3) Cross-section measurement, diffusion properties of neutrons, critical loading experiment, control rod calibration, statistical weight, shielding, xenon poisoning, dynamics and controls experiments. Prereq: 304 or equivalent. Coreq: 451, 405 or equivalent.


406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma-ray and neutron attenuation, biological effects, approaches of shield design, discrete ordinates, and Monte Carlo. Prereq: Physics 232.

421 Introduction to Nuclear Criticality Safety (3) Fundamentals of nuclear criticality safety; critical accidents; safety standards; overview of experiments, computational methods, and applications. Prereq: Introduction to nuclear engineering and nuclear reactor theory.

463 Introduction to Fusion Energy I (3) (Same as Electrical and Computer Engineering 463.)

464 Introduction to Fusion Energy II (3) (Same as Electrical and Computer Engineering 464.)

494 Special Topics in Nuclear Engineering (3) Problems related to research and practice. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 6 hrs.

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

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

511-12 Transport Processes in Nuclear Engineering (3.5) Rheology of nonwet and non-wet non-nuclear fluids; integral and system conservation equations for single and multi-component fluids; in-depth development of differential conservation equations for mass, energy, and momentum. Solution 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. Control and feedback techniques that remain validated in the following methods to nuclear plant dynamics, simulation and control problems.

522 Experimental Methods in Reactor Dynamics (3) Introductions to core and feedback techniques. Measurement, analysis, and interpretation of process signals for reactor surveillance and diagnostics. Introduction to time-series analysis of these methods to reactor plant dynamics, simulation and control problems.

541 Reactor Fuel Management (3) Topics relative to core 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 enrichment, fabrication, storage, reprocessing, and transport applications. Information on current status and review of experiments; tours of fissile material facilities in the United States. Prereq: 421.

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 or equivalent.

552 Radiation Monitoring and Dose Assessment (3) Methods for area work and environmental monitoring; dose assessment; pathways analysis; risk projections and regulations. Prereq: 551.

561 Plasma Diagnostics I (3) (Same as Electrical and Computer Engineering 562.)

562 Plasma Diagnostics II (3) (Same as Electrical and Computer Engineering 562.)

563 Plasma Engineering I (3) Integration of plasma physics models, fusion engineering design criteria, and fusion technology into design of future plasma experiments and reactors. Particle, momentum, and energy balance equations. Simulation of various fusion reactor plasmas. Prereq: 464 or consent of instructor. (Same as Electrical and Computer Engineering 563.)

564 Fusion Technology (3) Engineering problems associated with fusion reactor design; vacuum and magnetic systems; materials and irradiation; plasma heating, fueling and impurity control; review of major design studies. Prereq. 563. (Same as Electrical and Computer Engineering 564.)


572 Reactor Theory and Design (3) Analytical and numerical techniques for neutronics modeling of nuclear systems. Multigroup cross section theory for homogeneous and heterogeneous problems, selected topics from literature. Class project: solution of nuclear design problem. Prereq. 571 or equivalent.

581 Reactor Shielding (3) Application of analytic/deterministic solutions to reactor shielding problems. Magnetic systems; materials and irradiation; plasma heating, fueling and impurity control; review of major design studies. Problems and interface between science and technology transfer to shield design problems. Nuclear science, hybrid techniques, Monte Carlo methods, modern codes, adjoint Monte Carlo methods, and deterministic methods. Prereq: 581 or equivalent.

582 Monte Carlo (3) Analysis of radiation transport problems in radiation shielding by Monte Carlo method, description of MORME code. Random sampling, evaluation of integrals, radioactive transport, techniques of variance reduction, forward and adjoint modes of analysis, importance functions and splitting, weight window survival biasing and contribution theory. Prereq: 581.

585 Process System Reliability and Safety (3) Qualitative and quantitative techniques for assessing and improving process system reliability and safety. Fault tree analysis and associated dependent failure analysis. (Same as Chemical Engineering 585.)

588 Measurement Science I (3) Principles of measurement, introduction to uncertainty analysis, one-dimensional and two-dimensional problems, fundamentals of data reduction and processing, one-dimensional and two-dimensional problems, fundamentals of data reduction and processing, introduction to time-series analysis, and analysis of frequency domain and time-domain data. Measurement, analysis, and interpretation of process signals for reactor surveillance and diagnostics. Introduction to time-series analysis of these methods to nuclear plant dynamics, simulation and control problems.

589 Measurement Science II (3) Concepts of measurement, introduction to uncertainty analysis, one-dimensional and two-dimensional problems, fundamentals of data reduction and processing, one-dimensional and two-dimensional problems, fundamentals of data reduction and processing, introduction to time-series analysis, and analysis of frequency domain and time-domain data. Measurement, analysis, and interpretation of process signals for reactor surveillance and diagnostics. Introduction to time-series analysis of these methods to nuclear plant dynamics, simulation and control problems.
The Masters' Program

The College of Nursing offers the Master of Science in Nursing degree with concentrations in adult health nursing, parent-child nursing, mental health nursing, family nurse practitioner, nurse anesthesia and nursing administration.

Admission Requirements
1. Meet requirements for admission to The Graduate School.
2. Hold a Bachelor's degree in Nursing 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 3.0 for courses in the undergraduate major.
4. Complete the General portion of the Graduate Record Examination. NOTE: A strong performance on this examination may compensate for a GPA lower than 3.0.
5. Complete Graduate Program Data Form.
6. Submit three Graduate School Rating Forms from individuals familiar with the applicant's current work performance or academic aptitude.

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 a physical examination and rubella immunization or sufficient titer completed within six months of registering for clinical courses.
4. Each student must present evidence of current CPR certification.
5. Non-registered nurse students must have completed 8 semester hours of chemistry or biology, a nutrition and microbiology course, and 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 complete a research-oriented project while registered for 580 Nursing Project.

Program Requirements
All students must complete a minimum of 36 semester hours distributed as follows:

Core (12 credits)
- 503-04 Holistic Nursing
- 510 Theoretical Foundations of Nursing

Research (9-12 credits)
- 501 Nursing Research: Methods, Design, and Analysis
- 550 Thesis
- 580 Nursing Project

Concentration (12 credits)--choose one
- 530-31 Adult Health Nursing I,II
- 540-41 Family Nurse Practitioner I,II
- 550-51 Parent-Child Nursing I,II
- 560-61 Mental Health Nursing I,II

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 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.

Requirements for Second Master's Degree
Those who already hold a Master's or doctoral degree may apply up to 6 semester hours from that degree to meeting MSN program requirements. In order to apply these hours to the MSN degree, the following criteria must be met:
a. The courses utilized must be relevant to the MSN.

b. The credits must have been earned within the time limits established for the MSN.

c. The utilization of these courses must be approved by the student's committee, by the Dean of the College, and by the Dean of The Graduate School.

2. Regardless of the specific courses transferred in order to reduce degree requirements, the following distribution of required nursing courses must be completed:

<table>
<thead>
<tr>
<th>Core</th>
<th>Concentration</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>12</td>
<td>6</td>
</tr>
</tbody>
</table>

**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 cooperative 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, educators, and/or administrators. Specifically, the graduate of this program should be able to:

1. Analyze, test, refine, extend, and expand the theoretical basis of nursing practice.
2. Conduct nursing research that generates and advances nursing as a discipline.
3. Provide leadership as nurse researchers, educators, and/or administrators in current and emerging health care settings.
4. Collaborate with members of other disciplines in health-related research of mutual concern.
5. Analyze, develop, and recommend health care policy at various levels.

**Admission Requirements**

1. Meet requirements for admission to The Graduate School.
2. Hold a Master's degree in nursing from a program accredited by the National League for Nursing.
3. Have a minimum cumulative graduate grade-point average of 3.3 on a 4.0 scale.
4. Have a cumulative score of at least 1000 on the verbal and quantitative sections of the Graduate Record Examination.
5. Have successfully completed a basic statistics course.
6. Complete Graduate Program Data Form, College of Nursing.
7. Submit Graduate School Rating Forms from three college level instructors and/or nurses and administrators who have supervised applicant's professional work.
8. Have a personal interview with the College of Nursing Graduate Student Admissions Committee.
9. Submit entire application (Graduate Application for Admission, 3 Graduate School Rating Forms, Graduate Program Data form, academic transcripts, and GRE scores) and schedule personal interview by March 1st of the year preceding Fall admission.

**Program Requirements**

The following courses are required for all students:

<table>
<thead>
<tr>
<th>Concentration Courses</th>
<th>601-2</th>
<th>603-4</th>
<th>605-6</th>
<th>611</th>
<th>614</th>
<th>600</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>Theory Construction and Analysis I, II</td>
<td>Advanced Nursing Research I, II</td>
<td>Nursing Research Seminar</td>
<td>Advanced Nursing Seminar</td>
<td>Nursing Preceptorship</td>
<td>Dissemination</td>
<td>66</td>
</tr>
<tr>
<td>Research</td>
<td></td>
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</table>

The electives should constitute a cognate area. All 12 hours should be selected from a specific area of concentration. Appropriate cognate areas are anthropology, child and family studies, clinical psychology, educational administration, educational psychology, management, medical ethics, public health, and social work.

**Doctoral Committee**

The student and major professor identify a committee composed of at least five faculty members who hold the rank of assistant professor or above, four of whom, including the chair, must be approved by the Graduate Council to direct doctoral research. Two of the faculty members must be from an academic unit other than nursing. The committee should be formed during the student's first year of doctoral study.

**GRADUATE COURSES**

500 Thesis (1-15) P/NP only. E
501 Nursing Research: Methods, Design, and Analysis (3) Methodology, design, and analysis issues and their interrelationships in planning, implementation, and evaluation of nursing and health-related research. Investigation of computer applications to data analysis. Prereq or coreq: Graduate level statistics course, 510. F,Sp,Su
502 Registration for Use of Facilities (3-15) Required for all students. Prereq or coreq: Graduate level statistics course, 510. F,Sp,Su
503 Holistic Nursing: Wellness (3) Examination of philosophy of holistic nursing and new paradigms for nursing assessment, diagnosis, implementation, and evaluation of principles of health promotion, education, and innovative strategies for achievement of wellness. Prereq or coreq: 501, 520. 2 hrs and 4 labs. Sp
504 Holistic Nursing: Illness (3) Exploration, analysis, and application of principles of holistic nursing to patients with acute and chronic pathophysiological disease: mind-body influences and interactions. Prereq: Nursing Assessment and Wellness Promotion and Physiological Principles or equivalents. Prereq or coreq: 503. F,Sp
505 Advanced Clinical Pharmacology (3) Pharmacological agents utilized to treat common, recurrent health problems: indications, contraindications, side and interactive effects of commonly prescribed drugs. Prereq: 302 or coreq: 503. 2 hrs and 4 labs. F,Sp
509 Graduate Seminar in Public Health (1) (Same as Public Health 590, Social Work 590, Physical Education 590, Nutrition and Food Sciences 590.)
510 Theoretical Foundations of Nursing (3) Historical evolution of nursing science; examination and critical analysis of nursing's metaparadigm and selected conceptual models, philosophies, and theories; contemporary ethical theories and application to nursing practice. Prereq or coreq: 503. F,Sp
520 Nursing Resource Management (3) Selected organizational, conflict management, decision-making, leadership, professional, technological, ethical, and other theories, principles, and concepts applicable to advanced clinical nursing practice. Prereq or coreq: 505. F,Sp
530 Adult Health Nursing I (6) Exploration and application of advanced nursing, physiological, developmental, and psychosocial theories to nursing care and management of clients and their families who are experiencing episodes of acute and chronic illnesses and related crises; role of clinical nurse specialist in helping clients and families achieve optimal wellness. Prereq: 506. F,Sp or coreq: 501, 505, 2 hrs and 4 labs. F
531 Adult Health Nursing II (6) Further emphasis on role of clinical nurse specialist in providing and managing nursing care for acutely and chronically ill adults across life span: explorations, analysis, and application of selected advanced management, supervisory, organizational, and leadership theories, and concepts and health related research applications to implementation of clinical nurse specialist role. Prereq: 530. 2 hrs and 4 labs. F
533 Directed Study in Technical Nursing Education (3) Philosophy, history and contemporary issues in technical nursing education and nursing as a profession. Prereq: Graduate student or consent of instructor. Su
540 Family Nurse Practitioner I (6) Exploration and application of selected theories in family nursing care and research questions focusing on the study of families and individuals of all ages and environments in a family context. Prereq: 504. Prereq or coreq: 501, 520. 2 hrs and 4 labs. Sp
541 Family Nurse Practitioner II (6) Continuation of 540. Seminar and clinical practice designed to facilitate further development of specialized knowledge and skills utilized for advanced practice. Role orientation of clinical nurse specialist or nurse practitioner in family nursing care and management of women and/or child-bearing or child-rearing families in community and home settings. Prereq: 504. Prereq or coreq: 501, 520. 2 hrs and 4 labs. Sp
550 Parent Child Nursing I (6) Exploration and application of selected advanced nursing, physiological, psychological, development, environmental, cultural, and other theories, principles, and concepts to childbearing or child-rearing families in all care settings; setting of family well-being, and interventions designed to recognize and respond to threats to well-being of mothers, neonates, children, and adolescents. Prereq: 504 or coreq: 501, 520. 2 hrs and 4 labs. Sp
551 Parent Child Nursing II (6) Continuation of 550. Seminar and clinical practice designed to facilitate further development of specialized knowledge and skills utilized for advanced practice. Role orientation of clinical nurse specialist or nurse practitioner in nursing management of women and/or child-bearing or child-rearing families in community, hospital, or other health care settings. Prereq: 504. Prereq or coreq: 501, 520. 2 hrs and 4 labs. Sp
552 Parent Child Nursing Field Work and Seminar (5) Seminar and intensive clinical practice designed to facilitate further development of specialized knowledge and skills utilized for advanced practice. Role orientation of clinical nurse specialist or nurse practitioner in nursing management of women and/or child-bearing or child-rearing families in community, hospital, or other health care settings. Prereq: 504. Prereq or coreq: 501, 520. 2 hrs and 4 labs. Sp
555 Parent Child Nursing Seminar (5) Seminar and intensive clinical practice designed to facilitate further development of specialized knowledge and skills utilized for advanced practice. Role orientation of clinical nurse specialist or nurse practitioner in nursing management of women and/or child-bearing or child-rearing families in community, hospital, or other health care settings. Prereq: 504. Prereq or coreq: 501, 520. 2 hrs and 4 labs. Sp
560 Mental Health Nursing I (6) Exploration and application of selected concepts and principles in mental illness and related disorders to the development of clinical nursing practice as a mental health nurse. Prereq or coreq: 511. 1 hr and 4 labs. Sp
561 Mental Health Nursing II (6) Exploration and application of selected theoretical frameworks and models to case management and related disorders to the development of clinical nursing practice as a mental health nurse. Prereq or coreq: 511. 1 hr and 4 labs. Sp
570-71 Pharmaceutical Strategies and Nurse Anesthesia Practice I, II (3, 3) Application of pharmaceutical principles to nurse anesthesia practice; pharmacokinetic and pharmacodynamic actions of anesthetics and related drugs including dosages, side effects, and interac-
tive effects. Prereq or coreq: 503. F,Sp
572 Chemistry and Physics of Nurse Anesthesia (3) Chemical and physical principles and applications to in-depth study of current and emerging anesthetic practice, including anesthetic and pharmaceutical actions of anesthetics and ad-

drug interactions in dosage forms, side effects, and interac-
tive effects. Prereq or coreq: 503. F,Sp
573 Directed Study in Nurse Anesthesia Practice (8) Exploration and application of advanced nursing, physiological, developmental, and psychosocial theories to nursing care and management of clients and their families who are experiencing episodes of acute and chronic illnesses and related crises; role of clinical nurse specialist in helping clients and families achieve optimal wellness. Prereq: 506. F,Sp or coreq: 501, 505, 2 hrs and 4 labs. F
574 Family Nurse Practitioner I (6) Exploration and application of selected theories in family nursing care and research questions focusing on the study of families and individuals of all ages and environments in a family context. Prereq: 504. Prereq or coreq: 501, 520. 2 hrs and 4 labs. Sp
Nutrition and Food Sciences

(College of Human Ecology)

MAJORS DEGREES

Nurition M.S.
Food Systems Administration M.S. Human Ecology Ph.D.

James D. Moran III, Acting Head

Professors:
Beauchene, Roy E., Ph.D. .............. Kansas State
Carruth, Betty Ruth, Ph.D. .............. Missouri
Quinton, H. W., Ed.D. ................. Duke
Sachan, Dileep S., Ph.D. .............. Illinois
Smith, John T., Ph.D. ................. Missouri

Associate Professors:
Andrews, Frances E., Ph.D. .............. Ohio State
Brooks, M. D. (Memphis), M.S. ........ Alabama
Hughtton, B., Ed.D. .................... Columbia
Skinner, Jean D., Ph.D. .............. Oregon State

Assistant Professors:
Bailey, James W., Ph.D. .............. Iowa State
Costello, Carol, Ph.D. .............. Tennessee
Powell, J. A. (Memphis), M.P.H. ........ North Carolina
Snedl, J. P., Ph.D. .................... Ohio State

Instructors:
Jones, K., MBA ...................... East Texas State
McGrath, M., M.S. .................... Purdue

Master of Science programs are available in Nutrition, Food Science, and Food Systems Administration. Within the Nutrition program, a student may choose a concentration in nutrition science or public health nutrition. A graduate degree combined with an approved pre-professional practice experience beyond the baccalaureate degree completes the requirement for eligibility as a member of The American Dietetic Association and qualifies the graduate to apply for the Registration Examination to become a Registered Dietitian (R.D.). Students may receive more information from the department about R.D. requirements.

ADMISSION REQUIREMENTS

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

Admission into any of the graduate programs in the department is dependent on completion of undergraduate courses that give knowledge from coursework and write a major graduate program. For all programs in Nutrition Science and Food Science, courses in general and organic chemistry, physiological chemistry, food and clinical analysis, microbiology, mathematics, physiology, econometrics, science of food, and nutrition are essential. For the Master's program in food systems administration, undergraduate courses in food service systems administration, quantity food production, cost control, and personnel development are essential. In addition, students with work experience will be given preference.

THE MASTER'S PROGRAM

In Nutrition, students may choose a thesis or non-thesis option. Students emphasizing public health nutrition must choose the non-thesis option. Nutrition students who choose the non-thesis option must take 515 or 541 and 2 hours from 542-544, which are designed as courses in which the student will integrate knowledge from coursework and write a major paper upon completion of an individual project.

Thesis Option: The program consists of a minimum of 33 hours with at least 16 hours of coursework in the department. NFS 503 or 504, 511, 512, and 540 are required. Six hours of Thesis 500 are required and may be applied toward the 33 hours. Six hours outside the department are recommended. A minimum of 22 hours at the 500 or 600 level is required.

Non-Thesis Option: The program consists of a minimum of 36 hours with at least 20 hours of coursework in the department. NFS 501 or 504, 511, 512, 540, 541, and 2 hours from 542-544 are required. Students in public health nutrition must take 513, 514 and 515. Six 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 given at the end of the program.

Food Systems Administration

In Food Systems Administration, students may choose a thesis or non-thesis option. Food Systems Administration students who choose the non-thesis option must take 541, 546 and 3 hours from 548, which are designed as courses in which the student will integrate knowledge from coursework and write a major paper upon completion of an individual project.

Thesis Option: The program consists of a minimum of 33 hours with at least 16 hours of coursework in the department. NFS 537, 541, and 546 are required. Six hours of thesis 500

605-06 Nursing Research Seminar (2,2) Selected research topics. Required of all doctoral students. Pre- req: 604. F.Sp
611 Advanced Nursing Seminar (2) Current health and nursing issues; analysis and critique of current research on nursing and health care delivery system. Prereq: 620. Sp
612 Health and Nursing Policy/Planning (3) Policies affecting nursing education and practice; health policies and political processes; interactions between health professionals, commercial organizations, and government in health policy development and health planning activities. Prereq: 611. F
614 Nursing Preceptorship (3) Individually-designed practicum, field, or internship experiences in variety of administrative, educational, research, or clinical practice settings. Prereq: 612. Prereq or coreq: 913. Sp

Prerequisites:


590 Nursing Administration (3) Exploration, analysis and application of selected organizational, management, and leadership theories and financial principles to delivery of nursing services. Structure, functions, organization, behaviors, and adaptive processes of health care organizations. Prereq: 504. Prereq or coreq: 501, 510. Six hours from 5 and 4 labs. Sp

591 Nursing Administration II (3) Continuation of 590. Utilization of human and financial resources, conflict resolution, and organizational development with application to mid-level and top-level nursing administration positions. Prereq: 550, 2 hrs and 4 labs. F

595 Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

600 Doctoral Research and Dissertation (3-15) Prereq: Only. E

601-02 Theory Construction and Analysis I, II (3,3) Theory building in nutrition science; analysis of existing nutrition and health policies; theory building from existing knowledge. Prereq: 503, 510, or consent of instructor. F,Sp

602 Advanced Nursing Research I (3) Advanced concepts in research methodology and data analysis and interpretation. Quantitative nursing research. Prereq: 601, 6 hrs of graduate-level statistics. F

604 Advanced Nursing Research II (3) Continuation of 603. Qualitative nursing research. Prereq: 603.
are required and may be applied toward the 33 hours. Six hours outside the department are required. A minimum of 24 hours at the 500 and 600 level is required.

A written comprehensive examination is given at the end of the program.

THE PH.D. CONCENTRATION

Students enrolled in the food science concentration specialize in either the physico-chemical or socio-cultural aspects of food in relation to people and their environment. Students are expected to develop strength in nutrition and other areas by taking courses in a cognate area. Food systems administration, food technology, education, and the natural and behavioral sciences are among the potential cognate areas.

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. In either concentration, students may specialize in nutrition education, using nutrition and food science as foundation areas, and incorporate study of food science and factors that influence dietary change. Cogitate areas could include sociology, education, communications, marketing, anthropology, and/or statistics. Students are expected to acquire advanced training in food science, chemistry, biology, and other natural and behavioral sciences. The doctoral program emphasizes human nutrition, experimental nutrition (small animals), and intermediary metabolism.

REQUISITE TO DEGREE REQUIREMENTS:

1. Sixteen hours with a concentration in food science or nutrition including 9 hours at the 600 level (exclusive of dissertation).
2. NFS 511, and 512, 503 or 504 (nutrition science concentration) or 503 and 504 (food science concentration);
3. Minimum 4 hours of NFS 540;
4. Minimum 9 hours of statistics, computer science and research methods;
5. Minimum 6 hours in a cognate area;
6. Students without college teaching experience are required to take the fall semester seminar for GTAs and NFS 548 comprising a faculty-supervised problem in college teaching.

ACADEMIC COMMON MARKET

An agreement among southern states for a shared graduate program 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 Food Systems Administration is available to residents of the states of Arkansas, Kentucky, South Carolina, or West Virginia. The M.S. program in Nutrition is available to residents of Arkansas, Kentucky, South Carolina, or Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records. For the Ph.D., see Human Ecology.

GRADUATE COURSES

413 Experimental Food Science (3) Individual and group laboratory experimentation in food science; microcomputer applications. Prereq: 312, Plant and Soil Science 471, 1 hr and 2 labs. F

414 Nutrient-Drug Interactions (2) Nutrient effects on absorption and toxicity of drugs; drug effects on absorption and metabolism of nutrients. Prereq: 300 or equivalent. Sp, A

423 Foodservice Systems Design and Equipment (3) Physical facility design; production and delivery systems analysis; equipment selection and purchase. Prereq: Quantity Food Procurement, Production and Service work lab or consent of instructor. A

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

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

503 Physicochemical Properties of Foods I (3) Proteins and lipids: physical and chemical characteristics; behavior in foods. Prereq: 201 or equivalent. 413, F, A

504 Physicochemical Properties of Foods II (3) Sugars, starches, non-starch polysaccharides, hydrocolloids, and pigments: physical and chemical characteristics; behavior in foods. Prereq: 201 or equivalent. 413, F, A

505 Food Texture (2) Classification of foods according to functional factors; instrumental and sensory methods in evaluation of texture. Prereq: 413 or Food Technology and Science 411, statistics or consent of instructor. 1 hr and 1 lab. Su

506 Sensory Analysis (3) Principles and methodology for sensory evaluation of food; application to laboratory and consumer panels; interpretation of data. Prereq: 413 or consent of instructor. 2 hrs and 1 lab. F

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: 301 or 313 or consent of instructor. F, A

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

511 Advanced Physiological Chemistry (4) Bioenergetics, flux control and hormonal interrelationships. Prereq: 313 or consent of instructor. F


513 Community Nutrition (3) Orientation to community; assessment of nutrition problems, needs, and resources; functional roles of public health nutritionist. Concurrent field experiences. Prereq: 313 or consent of instructor. F

514 Community Nutrition (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: 514 and consent of instructor. F

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: 313 or consent of instructor. F

517 Childhood and Adolescent Nutrition (3) Application of nutrition principles to school age children; effects of diseases on growth and health maintenance; nutritional assessment and counseling for nutrition. Prereq: 313 or consent of instructor. Sp

518 Nutrition and Aging (3) Nutritional problems of adults; nutritional requirements, dietary intakes; effects of nutrition on biological aging. Prereq: 313 or consent of instructor. Sp
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 record 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.

3. 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.

4. 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.

5. Twelve hours of coursework in the department must be at the 500 level or above exclusive of Thesis 500.

6. 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.

2. Thirty-four hours of graduate coursework are required of which 22 hours must be at the 500 level or above.

3. All students are required to include 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 department must be at the 500 level or above.

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 principles applied to retail and wholesale nurseries and landscape contracting firms. Methods of producing liners, container and field-grown woody ornamental plants. Prereq: 220, 330, and Plant and Soil Science 210, or consent of instructor. 2 hrs and 1 lab.

440 Advanced Turfgrass Management (4) Principles and scientific basis of turfgrass culture: adaptation, ecology, physiology, soil fertility, and grass nutrition; climatic influences on grass culture; physiology of clipping and water management; design, construction, and management of golf courses; and physiological influences of pest infestation and control measures. Prereq: 340 or consent of instructor. 3 hrs and 1 lab.

460 Professional Practices in Landscape Construction and Management (2) Professionalism, salesmanship, design, budgeting, estimating, specification, and contract management in landscape services industry. Interaction with industry representatives through special presentations. Prereq: 350 or consent of instructor.

470 Advanced Landscape Design (4) Comprehensive application of landscape design skills. Design applications involving site layout, landscape detailing, applied landscape construction, planting design. Analysis, programming, design, detailing, estimating, and specifying applicable to various landscape projects. Prereq: 260, 350, and 380, or consent of instructor. 1 hr and 5-3 1/2 hrs.

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

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 when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. 6 S/U.


550 Microtechnique (3) Methods of investigating histotechnology, histochemistry, ploidy, and pathological structures in ornamental and crop plants, light microscopy. Prereq: 6 hrs biological science, 8 hrs chemistry, and consent of instructor. 1 hr and 2 labs. S/U.

570 Physiology and Development of Ornamental Plants (3) Basic and applied physiology of ornamental plants related to growth and development in production and utilization. Critical review of literature and discussion of juvenile and phase change, flowering, photoperiodism, thermoperiodism, vernalization, cold acclimation, hardness, dormancy, growth regulators, environmental stress, and post-harvest consideration. Prereq: Botany 351 and consent of instructor.

580 Ornamental Plant Nutrition (3) Applications of nutrition principles and analysis in production of ornamental crops. Comprehensive study of functional roles of nutrients essential to plant growth; critical evaluation of recent developments in nutrient sources and formulations, fertilizer recommendation, and nutrient uptake and water relations of ornamental plants grown in containers and in the field. Prereq: Botany 351, Plant and Soil Science 311 and consent of instructor. S/U.

590 Seminar (1) Current literature and developments. May be repeated. Maximum 3 hrs. E

593 Problems in Ornamental Horticulture and Landscape Design (1-3) Topic related to technology and science. May be repeated. Maximum 6 hrs. E

Pathobiology

(University of Veterinary Medicine)

MAJOR DEGREE

Veterinary Medicine (D.V.M.)

David O. Slauson, Head
Associate Professors:
- Wilkinson, J. E., D.V.M., Ph.D. — Cornell
- Reinemeyer, C. R., D.V.M., Ph.D. — Ohio State
- Maddux, J., D.V.M., Ph.D. — Kansas State
- Breider, M. A., D.V.M., Ph.D. — Texas A&M
- Shull, R. M., D.V.M. — Cornell
- McCracken, M. D., D.V.M., Ph.D. — Purdue
- Slauson, D. O., D.V.M. — Ohio State
- Michel, R. L. (Emeritus), V.M.D.

Residents:
- Petersen, M. G., D.V.M. — Colorado State
- Bouley, D., D.V.M. — Tennessee
- Dean, D. F., D.V.M. — Tennessee
- Duncan, R. B., D.V.M. — Ohio State
- Silva-Krott, I., B.V.Sc. — Austria

Instructor:
- Peterson, M. G., D.V.M. — Colorado State

Assistant Professors:
- Breider, M. A., D.V.M., Ph.D. — Texas A&M
- Maddux, J., D.V.M., Ph.D. — Kansas State
- Reinemeyer, C. R., D.V.M., Ph.D. — Ohio State
- Wilkinson, J. E., D.V.M., Ph.D. — Cornell

**Graduate Courses**

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

**501 Special Topics in Pathobiology (1-2) May be repeated. Maximum 6 hrs. E**

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

**503 Comparative Pathology (2) Pathogenic mechanisms. Comparative aspects. Study of gross, microscopic and ultrastructural lesions. Prereq: Histology. 2 hrs and 1 lab. Sp.A**

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

**601 Advanced Topics in Pathobiology (1-3) Necropsy, histopathology, clinical pathology, clinical parasitology, clinical immunology, clinical bacteriology and mycology, and clinical virology. May be repeated. Maximum 12 hrs. E**

**602 Veterinary Biopsy (1-2) Examination of biopsy specimens and interpretation of observations. Preparation of specimens for sectioning. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. E**

**603 Correlative Post-Mortem Pathology (1-3) Gross and microscopic post-mortem examination of animals. Correlative interpretation of clinical diseases and lesions. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E**

**604 Veterinary Pathology Seminar (1) Microscopic slides and transparencies of lesions from cases examined by pathologists, residents, and graduate students. Interpretation of observations. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. E**

**605 Pathobiology Seminar (1) Subjects of current interest in biomedical science. Students present one seminar per term enrolled. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. Class meets once monthly. E**

**606 Ultrastructural Pathology (1) Ultrastructural changes in diseased cells, interpretation of observations. Prereq: Professional medical degree or consent of instructor. F.A**

**607 Diagnosis and Pathogenesis of Virus Diseases of Domestic Animals (3) Advanced study of virus diseases important to domestic animals: virus biology, pathogenesis, pathology and diagnosis. Technical training in virus diseases diagnosis. Prereq: Cellular and Comparative Biochemistry, and Advanced Topics in Biochemistry, Virology, and Virology Lab, or Microbiology-Veterinary Medicine 811-812. 2 hrs and 1 lab. Sp.A**

**608 Techniques in Pathology (2) Fixation, processing and staining of tissue specimens; specialized gross dissection techniques; photography of gross specimens and photomicrography. Prereq: Consent of instructor. Sp.**

**609 Principles of Pathology (1) Advanced topics in pathobiology and mechanisms of disease: pathophysiology, cellular degeneration, inflammation, immunopathology, hemostasis. Principal biochemical and morphologic responses of various cells, tissues, and organs to injury and other metabolic derangements. Participants present seminars on selected topics from current literature and textbooks. Prereq: Consent of instructor. F.A**

**Philosophy**

*College of Liberal Arts*

**MAJOR**

**DEGREES**

Philosophy ............................................ M.A., Ph.D.

George G. Brenkert, Head

Professors:
- Aquila, Richard E., Ph.D. — Northwestern
- Brenkert, George G., Ph.D. — Michigan
- Cebik, L. B., Ph.D. — Nebraska
- Davis, John W., Ph.D. — Emory
- Edwards, Rem B., Ph.D. — Emory
- Gruber, Glenn C., Ph.D. — Michigan
- Postow, Betsy C., Ph.D. — Yale
- Van de Vate, Dwight, Jr., Ph.D. — Yale

Associate Professors:
- Bennett, James O., Ph.D. — Tulane
- Cohen, Sheldon M., Ph.D. — Northwestern
- Emmett, Kathleen A., Ph.D. — Ohio State
- Lavin, Michael, Ph.D. — Stanford
- Holt, John E., Ph.D. — Ohio State
- Osborne, Martha Lee, Ph.D. — Tennessee

Assistant Professor:
- Hamlin, H. 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 a thesis are 30 hours, including 6 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 36 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**

Specific requirements for doctoral students in Philosophy include a minimum of three academic years of graduate study involving at least 48 semester hours in coursework (normally 16 semester courses or their equivalent, exclusive of credit for thesis and dissertation) of which no fewer than 30 hours shall be in courses numbered over 500 and no fewer than 6 hours shall be in courses numbered over 600. The specific number and distribution of courses will be determined by the student's faculty committee.

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, or an equivalent, exclusive of credit for thesis and dissertation) of which no fewer than 30 hours shall be in courses numbered over 500 and no fewer than 6 hours shall be in courses numbered over 600. The specific number and distribution of courses will be determined by the student's faculty committee.

Students must also complete a minimum of 30 hours of Philosophy 500. Of non-thesis hours, at least 30 credits must be in Philosophy courses numbered 200 or above. The specific number and distribution of courses will be determined by the student's faculty committee.

**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 pro-
<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>Description</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contemporary Ethical Theory (3)</td>
<td></td>
<td>Courses offered each year and may be repeated when topic varies. Maximum 9 hrs.</td>
<td>Requires a minimum of 6 hours of philosophy or consent of instructor.</td>
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<tr>
<td>Topics in Logic (3)</td>
<td></td>
<td>Prerequisites: 6 hrs of logic or consent of instructor. Effective Fall 2010.</td>
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<tr>
<td>American Philosophy (3) Colonial to early 20th Century</td>
<td></td>
<td>Prerequisites: 6 hrs of philosophy or consent of instructor. Maximum 9 hrs.</td>
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<tr>
<td>Topics in History of Philosophy (3) Figures or topics in ethical theory, application to issues in health, business, technology, ecology, and other practical fields</td>
<td>3-12</td>
<td>Prerequisites: Consent of Medical Ethics Committee.</td>
<td></td>
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<tr>
<td>Topics in History of Philosophy (3) Figures or topics in ethical theory, application to issues in health, business, technology, ecology, and other practical fields</td>
<td>3-12</td>
<td>Prerequisites: Consent of Medical Ethics Committee.</td>
<td></td>
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<tr>
<td>Applied Ethical Theory (3) Single author, tradition, or topic in ethical theory, application to issues in health, business, technology, ecology, and other practical fields</td>
<td>3-12</td>
<td>Prerequisites: Consent of Medical Ethics Committee.</td>
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<tr>
<td>Topics in Value Theory (3)</td>
<td></td>
<td>Prerequisites: Consent of Medical Ethics Committee.</td>
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<tr>
<td>Ethics (3) Dominant movements in history of ethics</td>
<td></td>
<td>Prerequisites: 6 hrs of philosophy or consent of instructor. Maximum 9 hrs.</td>
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<tr>
<td>Topics in Natural Sciences (3) Nature of subject matter and method of science. May be repeated. Maximum 9 hrs.</td>
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<tr>
<td>Philosophy of Social Sciences (3) Nature of subject matter and method of science. May be repeated. Maximum 9 hrs.</td>
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<tr>
<td>Philosophy of Religion (3) Examination of central problems. (Same as Religious Studies 570.)</td>
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<tr>
<td>Topics in Metaphysics and Epistemology (3)</td>
<td></td>
<td>Prerequisites: 6 hrs of philosophy or consent of instructor. Maximum 9 hrs.</td>
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<tr>
<td>Philosophy of Mind (3) Relation of mental to physical and of role of words in discourse for mental activities, thinking and feeling. Maximum 9 hrs.</td>
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<tr>
<td>Social and Political Philosophy (3) Philosophical problems concerning social and political life: family, state, freedom, justice; major theoretical responses: anarchism, socialism, and capital. Maximum 9 hrs.</td>
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<tr>
<td>Political Economy (3) History of political economy and political thought. May be repeated. Maximum 9 hrs.</td>
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<tr>
<td>Philosophy of Language (3) Survey of issues such as meaning, reference, and truth. Prerequisites: 6 hrs of philosophy or consent of instructor.</td>
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<tr>
<td>Courses in Recent Continental Philosophy (3)</td>
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<td>Selected thinkers or topics: existentialism, phenomenology, hermeneutics, structuralism, post-structuralism. Prerequisites: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 9 hrs.</td>
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<tr>
<td>Thesis (1-15)</td>
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<td>Prerequisites: 6 hrs of philosophy or consent of instructor. Must be taken when student is in graduate study.</td>
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<tr>
<td>Registration for Use of Facilities (3-15)</td>
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<td>Prerequisites: 6 hrs of philosophy or consent of instructor. Must be taken when student is in graduate study.</td>
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<tr>
<td>Topics in the History of Ancient and Medieval Philosophy (3) May be repeated. Maximum 9 hrs.</td>
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<tr>
<td>Topics in the History of Modern Philosophy (3)</td>
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<tr>
<td>Topics in Twentieth-Century European Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.</td>
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</tbody>
</table>
THE MASTER'S PROGRAM

Thesis Option
This program is designed primarily for students intending to go into industrial or governmental laboratories as scientists. The course requirements include 24 semester hours of physics courses, of which at least 12 semester hours are taken from Physics 511-12, 521-22, 531-32, 541-42, or 571-72. Each candidate must present an acceptable thesis, 6 hours of 500, and pass oral examination on course material and thesis.

Non-Thesis Option
This program is designed primarily for students intending to teach in colleges or universities on the elementary or intermediate level, or for students specifically intending to work toward a Ph.D. Students seeking the non-thesis option must apply to the department's graduate committee for permission to enroll under this program. The requirements are the satisfactory completion of 30 hours coursework composed of 18 semester hours from Physics 511-12, 521-22, 531-32, 541-42, and 571-72; 6 semester hours in a minor field; and 6 semester hours from other courses numbered above 400 (preferably advanced laboratory nature). At least 20 hours must be taken at the 500 level or above. In addition, the candidate must pass a written examination administered by his/her committee.

THE DOCTORAL PROGRAM

All students are expected to take Physics 521-22, 531, 541-42, 551, 561, 571-72, and 611. Physics 601-62 are normally required of students specializing in atomic physics; Physics 621-22 of students in nuclear physics; Physics 626-27 of students in elementary particle physics; Physics 663-64 of students in plasma physics; Physics 681-82 of students in health physics; Physics 671-72 of students in solid state physics; and Physics 681-82 of students specializing in molecular spectroscopy. Students specializing in chemical physics may substitute Chemistry 572 for Physics 551 and should complete at least 6 semester hours chosen from Chemistry 580, 670.

The courses Physics 531, 571-2, 521-2, 541-2, 561-2, 565-56 constitute the core curriculum. They are the usual basis for the departmental comprehensive examination which is normally taken by a well-prepared student after two years of graduate study.

A reading knowledge of one foreign language in which there exists a significant body of literature is required. German 332 or French 302 with a grade of A or B may be substituted for the corresponding language examination.

The dissertation topic will be chosen with reference to one of the fields in which research facilities can be made available either at The University of Tennessee laboratories in Knoxville, The University of Tennessee Space Institute at Tullahoma, Tennessee; the Oak Ridge National Laboratory, Oak Ridge, Tennessee; or at other research facilities used by the University faculty.
flows; subsonic, supersonic and hypersonic flows; con-

501 Graduate Research Participation (3) Advanced research participation in the supervision of staff research
director whose research area coincides with interests of
student. Open to all graduate students in good standing.
Prereq: Consent of department and research director.
May be repeated with consent of department. Maximum
18 hrs. SNC only. E

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

505 Physics of Fluids (3) Fluid physics, overview of
fluid mechanics and associated computational tech-
niques; general description of laminar and turbulent
flows; subsonic, supersonic and hypersonic flows; con-

506 Experimental Methods (3) Principles, real opera-
tional considerations of laser, high power, high en-
density, optical interferometers, holography, oscillo-
detectors, photomultiplier tubes, image intensifiers,
image converters, image dissectors, streak cameras, and
storage oscilloscopes. Design and operation of laser

crystographic-based devices, data acquisition tech-
niques, including synchronous detection, digital electronic
methods and micro-computer data acquisition and
registration methods.

507 Contemporary Optics (3) Topics in geometrical,
physical, Fourier, and nonlinear optics and introductory
laser physics. Extensive use of computer calculations and
design of practical and sophisticated optical sys-
tems.

508 Laser Physics (3) Mode analysis, stable and un-
stable resonators; rate equations and population inver-
sion, saturation, relaxation oscillations, fluctuations and
noise, laser stability; quantum theory of laser, photon
coherence; mode-locking, Q-switching and frequency
stabilization; specific laser types: semiconductor and
solid-state, excimer, copper vapor and dye lasers.

511-12 Theoretical Physics (3,3) Classical theoretical
physics, with limited use of mathematics. Prereq: 512,
521, advanced calculus, differential equations, and
vector analysis.

521-22 Quantum Mechanics (3,3) Fundamental prin-
ciples of quantum mechanics, free particle, harmonic
oscillator, hydrogen atom, electron in a magnetic
field, vectors, matrices, tensors, curvilinear coordi-
nates, functions of a complex variable, partial differential
equations and boundary value problems, Green's func-
tions, integration by parts, spherical harmonics, Bessel functions, calculus of variations.
Prereq: Advanced calculus and differential equations.
Must be taken in sequence. (Same as Mathematics 517-
18.)

573 Numerical Methods in Physics (3) Numerical methods for solution of physical problems, use of digital

580-07 Nonlinear Optics (3,3) Nonlinear optical sus-
cceptibilities, wave propagation in nonlinear media, sum-
frequency and difference frequency generation, har-
monic generation, parametric amplification and oscilla-
tion, stimulated Raman processes, two- and multi-
photon processes, four-wave mixing and phase conjugation,
transient coherent optical effects and free induction
decay, optical breakdown and nonlinear effects in plas-
mas. Prereq: 501-511. May be repeated.

605 Laser Spectroscopy (3) Application of lasers to spectroscopy of atomic and molecular systems; review of
classical multi-pole radiation, atomic L-S and J-J coupling, fine structure and Stark effects, spontaneous emis-

607-09 Quantum Physics (3,3) Quantum mechanics, classical and quantum fields, quantum electrodynamics,
quantum field theory; canonical and fluctuation
functions. Crystal oscillator strengths, effective mass
approximation. Dia-para- and ferromagnetism; neu-
tral and ionized Fe, Ni, Co. Photonic and electronic

610 Quantum Optics (3) Quantum theory of emission and absorption of radiation; frequency-dependent sus-
cceptivity; coherence theory; field quantization and coherent phenomena; radiation interaction with atoms; photon optics, coupling and higher-order cohe-

611 Advanced Quantum Mechanics & Field Theory (3)
Second quantization, quantization of electromagnetic

field, emission, absorption, and scattering of light,
bremsstrahlung, pair creation and annihilation, quantum
field theory methods in condensed matter physics, and
quantum optics. Topics vary according to interests of
instructor. Prereq: 522 and 542 or equivalent. Prereq or coreq: 561 or consent of instructor.

612 Advanced Topics in Quantum Field Theory (3)
Renormalization, renormalizable quantum field theories,
Ginzburg-Landau expansions, Fock space, Schwinger-Dyson

tions, field quantization, quantum electrodynamics, grand unified theories, and
advanced topics in theoretical physics. Topics vary
according to interests of students, instructor and present state of physics.
Prereq: 561 or 611 or consent of instruc-

617-18 Lie Algebras in Mathematics and Physics (3,3)
(Same as Mathematics 617-18.)

622-27 Elementary Particle Physics (3,3) Survey in elementary particle physics covering experimental
methods, conservation laws, invariance principles, and
models of interactions. May be repeated with consent
of instructor.

631 Advanced Topics in Relativity of Cosmology (3)
Tensor fields, cosmological parameters, Friedmann and
Lemaître equations, recurrence and present state of physics. Cosmological solutions of
Einstein's field equations, black holes, inflationary uni-
verses, unified field theories or interaction between cos-
mology and nuclear and elementary particle physics.
Prereq: 531 and 561.

641 Advanced Topics in Classical Theory (3) To meet
special needs of students. Advanced dynamics, theoretical hydrodynamics, electromagnetic theory, statistical
mechanics, or theory of nonequilibrium processes. Pre-

642 Advanced Topics in Quantum Theory (3) To meet
special needs of students. Angular-momentum theory, beta-ray theory, theory of atomic spectra, molecular
structure and valence theory, theory of radiation, electric and magnetic susceptibilities, high energy processes,
scattering and collision processes, or theory of fields.
Prereq: 522. May be repeated with consent of depart-
ment. Maximum 9 hrs.

643 Computational Physics (3) Developing computer
algorithms for solving representative problems in various
fields of physics, celestial dynamics in astrophysics,
boundary value problems in electromagnetic, atomistic,
and nuclear structure and theory on solid state physics,
transport problems in statistical mechanics, Monte Carlo simulation of liquids, fitting and interpolation of
or providing correlation functions or optimization strategy.
Prereq: 522, 531, 542, and 572.

661-62 Collision Interactions (3,3) Interaction of elec-
tronic radiation and charged particles with atoms and
molecules or free particles, scattering, ionization, trans-
port, and capture, collective excitations, Cerenkov
radiation, and stopping power. Prereq: 522.

663 Advanced Plasma Physics I (3) (Same as Electri-
cal and Computer Engineering 663.)

664 Advanced Plasma Physics II (3) (Same as Electri-
cal and Computer Engineering 663.)
Planning

(Office of the Provost)

MAJOR DEGREE
Planning ............................................. M.S.P.

James A. Spencer, Director

Professors:
Johnson, David A., Ph.D. ......... Cornell
Kenney, Kenneth B., Ph.D. ......... North Carolina
Prochaska, J. M., M.P.U. ......... Michigan State
Shouse, Walter L. (Emeritus), M.C.P. ......... Harvard
Spencer, James A., M.C.P. ......... Ohio State

Associate Professors:
Browne, George E., M.A. ......... George Washington
Fisher, Patricia, Ph.D. ............. Florida State

Assistant Professor:
Newsom, Theodore J., Ph.D. ......... Penn State

The Graduate School of Planning offers a program of studies leading to the professional degree of Master of Science in Planning. The degree is the normal route for entry into professional positions in urban and regional planning or related positions. Graduates are candidates for positions in regional, city, county, and metropolitan planning agencies; in local, state, and federal agencies concerned with physical, economic, and administrative planning; in private business and organizations dealing with development problems; and in private consulting.

The Master of Science in Planning program is accredited by the Planning Accreditation Board, a joint undertaking of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning.

THE MASTER'S PROGRAM

Admission Requirements
Applicants are to submit an application for admission to The Graduate School, two letters of reference from faculty familiar with their prior academic work, and a statement describing personal career objectives. If the applicant has prior work experience in planning, a reference letter should also be provided by the work supervisor. Graduate Record Examination scores are requested of all applicants whose undergraduate GPA is below 3.0. Other applicants are encouraged to submit them.

Degree Requirements
The M.S.P. requires completion of at least 48 hours of graduate credit, at least 30 of which must be in planning. The following courses are the core curriculum required of all students: 510, 511, 515, 520, 521, 523, 530, 531, 532, 540, and 545.

Students should plan to enter the program in the fall term to take the core courses in the proper sequence. Each student is required to develop an area of concentrated competence beyond the core curriculum. After selecting the area of concentration, usually by the end of the second semester, the student takes a prescribed set of courses in the subject area. Further enhancement of the concentration is gained by taking additional elective courses in the subject and by focusing the thesis or major paper on the subject. Concentration courses are drawn from the planning curriculum and from other departments in the University. Concentrations are available in land use planning, analytical methods in planning, economic development planning, and real estate development planning.

Students have the latitude to propose an alternate specialization consisting of at least 9 hours of coursework, subject to approval of a faculty committee. Courses are available in transportation, health, education, environmental, and social planning.

Each student is required to demonstrate competence in professional research. This may be done in one of two ways:

Thesis Option—Complete a thesis for 6 hours credit;
Non-Thesis Option—Complete a major study with acceptable documentation. To be eligible for the major study option, the student must have completed at least 12 hours of graduate coursework in planning with at least a 3.5 cumulative grade-point average. The student meeting these criteria may present a proposal to his/her committee for a major study that will include at least 6 hours of subsequent course work. The proposal shall justify the selection of the topic, describe the approach to the study, and describe the nature of the final product. The topic will normally be expected to reinforce or complement the student's concentration.

Student academic progress is monitored by the faculty. A student failing to maintain an acceptable grade-point average may be placed on probation or dismissed from the program.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

401 The City in the U.S. (3) Development and character of U.S. cities. Contemporary issues and selected case studies. (Same as Urban Studies 401.)
402 Survey of Planning (3) History of city development and of planning. U.S. experience in urban and other levels of planning. State of the art, process, comprehensive planning, implementation devices, Planning issues in society. Not for credit for M.S.P. degree.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. SNC only. E
510 Fundamentals of Planning (2) History of planning, structure and development of urban areas, operations of contemporary planning agencies, trends and issues.
511 Graphic and Oral Communications in Planning (1)
515 Theory of Planning (2) Analysis of nature and objectives of planning process; role of planner and planning function in public decision-making. Prereq: 510 or consent of instructor.
520 Planning Research Methods (3) Research techniques for subject areas associated with city and regional planning. Research tools, data collection and analysis as basis for planning and decision-making.
521 Computers in Planning (3) Basic computer concepts, hardware and software, use of mainframe and microcomputers in planning and government.
522 Computers in Planning II (3) Software and systems for planning and local government. Content varies. Projects in small groups or off-campus study mode. Prereq: 521 and consent of instructor.
523 Statistics for Planners (3) Applications of basic descriptive and inferential classical and non-parametric techniques in planning research. Data organization and display, measures of location, dispersion and association; data transformations; some basic probability theory; selection of two and sample test; correlation and regression analysis. Prereq: 520 or consent of instructor.
524 Advanced Data Analysis (3) Applications of statistical data analysis in planning. Regression analysis, multiple correlation, regression models and use of computer packages for data analysis. Prereq: 521, 523 and consent of instructor.
526 Library Research for Planning (1) Survey of publications of interest to planners, resources and research techniques. Use of facilities and collections of library.
530 Planning Analysis and Forecasting (3) Methods of quantitative analysis and modeling in urban and regional studies. Population, employment, and economic base studies, forecasting techniques. Coreq: 520 or consent of instructor.
531 Urban and Regional Analysis (3) Past, present and possible future patterns of urban and regional structures, drawing on contemporary theories, models, and empirical research.
532 Planning Methods (5) Preparation of comprehensive plans for urban areas or regions. Development of baseline data and forecasts, formulation of alternative plans and strategies, and development of plan implementation programs. Extensive laboratory experience. Prereq: 510, 520, 530 and 531 or consent of instructor.
537 Planning and Transportation (3) (Same as Civil Engineering 537.)
538 Urban and Site Design (3-6) Principles of design of residential subdivisions and some components of physical community, shopping centers, institutional complexes, central business districts. Problems of reviewing alternative designs against each other or written regulations. Extensive laboratory experience.
539 Planning for Historic Preservation (3) Planning for preservation, restoration, and conservation of historic buildings, areas and sites as related to comprehensive planning process. National, state, and local government roles in preservation, designation of sites, legislative needs, financing and administrative organizations.
540 Legal Aspects of Planning (3) Legal basis for planning and guiding community development. Legal tools of planning. Prereq: 510 or consent of instructor.
545 Planning and Property Development (2) Process of urban development in the context of public and private sectors in real estate development and its relationship to planning. Partnership roles of public and private sectors in urban development and redevelopment. Prereq: 510 or consent of instructor.
546 Housing (3) Nature and demand for housing in U.S. and abroad, U.S. experience. Private market processes and public influences. Problems of meeting housing supply, impact of new technology, and governmental programs to improve supply and quality of housing.
550 Economic Development Planning (3) Planning for economic change in local and regional organizational and governmental programs. Economic development planning process.
551 State and Regional Planning (3) Theory and practice of planning at state, sub-state, and metropolitan levels.

552 Development Planning in the Third World (3) Seminar on urban and regional development in Third World nations. Population growth, settlement patterns, economic development, land framework of integrated resource management. (Same as Ecology 552.)

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

554 TVA, Planning and Development (3) Review and evaluation of U.S. national experiment in river basin planning and development, Tennessee Valley Authority.

555 Environmental Planning (3) Role of planners and planning in maintenance of balance between natural and built environment. (Same as Ecology 555.)

560 Policy Analysis and Strategic Planning (3) Models of policy making process and role of strategic planning and applied decision making. Quantitative and qualitative approaches, evaluative research and program evaluation, and impact assessment.

590 Practicum (6) Prereq: Consent of instructor. S/NC or letter grade.

591 Special Topics (1-3) Prereq: Consent of instructor.

592 Readings in Planning (1-3) Prereq: Consent of instructor. May be repeated.

593 Problems in Planning (1-3) Prereq: Consent of instructor.

Plant and Soil Science

(College of Agriculture)

MAJOR

Plant and Soil Science .......................... M.S., Ph.D.

John E. Foss, Head

Professors:


Associate Professors:


Lessman, Gary M., Ph.D. .... Michigan State Lewis, R. J., Ph.D. ............. NC State Miller, R. D., Ph.D. ......... Kentucky Reich, V. H., Ph.D. ......... Iowa State Rhodes, G. N., Jr., Ph.D. .... NC State Samu, C. E., Ph.D. ......... Michigan State Tyler, D. D., Ph.D. ......... Kentucky West, D. R., Ph.D. ......... Nebraska Wyatt, J. E., Ph.D. ......... Florida

Assistant Professors:

Logan, Joanne, Ph.D. ......... Nebraska Mullien, M. D., Ph.D. ....... NC State Newton, D. (Adjunct), M.S. .... Kentucky Wilson, G. V., Ph.D. ......... Arkansas

The Department of Plant and Soil Science offers graduate programs leading to the Master of Science and the Doctor of Philosophy. Concentrations for the graduate programs are offered in the following areas: plant breeding, economic botany, and soil and water conservation. For further information, contact the department head.

THE MASTER'S PROGRAM

The program requires writing a thesis based on original research. A minimum of 30 hours is required for the Master's degree program of which 6 credits must be Thesis 500. At least 14 credits must be taken in courses numbered above the 500 level. The student's advisory committee will consist of the major professor, who will act as chair-person of the committee, and a minimum of two other faculty members. The advisory committee approves the student's research problem and coursework and conducts the final oral examination covering the thesis and graduate courses.

THE DOCTORAL PROGRAM

A minimum of 72 hours beyond the Bachelor's degree, exclusive of Thesis 500, is required. Of this number, 24 hours must be Doctoral Research and Dissertation 600. The student's advisory committee will consist of the major professor, who will act as chair-person of the committee, and a minimum of two other faculty members. At least 14 credits must be taken in courses numbered above the 500 level. The student's advisory committee approves the student's research problem and coursework and conducts the final oral examination covering the thesis and graduate courses.

GRADUATE COURSES

411 Soil Microbiology (3) Soil microbial population and role in soil ecosystem, microbial transformations of organic and inorganic compounds, decomposition of residues, dynamics of soil organic matter. Prereq: 210 and Chemistry 115 or 350 or consent of instructor. F

412 Soil Genesis, Classification, and Mapping (3) Soil genesis and formation, observing and describing morphological and chemical properties of various soils; chemical and physical properties, classification, mapping. Two Saturday field trips. Prereq: 210 or consent of instructor. 2 hrs and 1 lab. Sp

413 Soil Chemistry (3) Principles concerning structural and chemical properties of soil materials; colloidal fraction as related to exchange, chemical equilibria, soil acidity, oxidation-reduction, water and nutrient availability and waste disposal. Prereq: 311 or consent of instructor. F

414 Soil, Land Use, and the Environment (3) Soil as environmental component and soil properties affecting land use. Soil as resource in development planning, conservation of nonengineering aspects of site selection for land use, soil survey and resource data in land use, recognition and prevention of soil pollution. Prereq: 210 or consent of instructor. Sp, A

431 Crop Physiology and Ecology (3) Principles of crop physiology and ecology as applied to crop production. Effects of environmental factors on physiological processes. Prereq: 230, Botany 321, 2 hrs and 1 lab. F, A

432 Agricultural Climatology (3) Interactions between world, regional and local climates and agricultural systems; quantification of macro- and micro-climatic factors affecting crop yields. Prereq: 1 yr of physical or biological science, 2 hrs and 1 lab. F, A

433 Agricultural Pesticides (3) Regulation of pesticide use, development, transportation, marketing and use. Prereq: 1 yr of physical or biological science, 2 hrs and 1 lab. F, A

543 Principles of Plant Breeding (3) Genetic principles and techniques used in crop improvement. Prereq: Biology 520 or equivalent. 2 hrs and 1 lab. Sp

471 Statistics for Biological Research (3) Application of statistical interpretation of biological research data. Prereq: descriptive statistics, probability distributions, confidence intervals, and chi-square tests, analysis of variance, mean separation procedures, linear regression and correlation. Prereq: Mathematics 121 or equivalent. F

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

501 Seminar (1) Application of speaking, writing, and organizational skills in preparation and presentation of scientific material to both scientific and general audiences. Preparation of abstracts for scientific presentations. F, Sp

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

511 Advanced Soil Fertigation (3) Concepts of soil chemistry and technology as related to nutrient movement and adsorption by plant roots. Fertilizer use efficiency as measured by plant response factors. Prereq: 413. Sp, A

512 Pedology (3) Physical and chemical weathering processes, factors of soil formation, soil forming processes. Prereq: 412 or consent of instructor. 2 hrs and 1 lab. F, A

514 Soil Physics (3) Physical and chemical relations among solid, liquid and gaseous phases of soil; system dynamics, interactions and interactions of phases on soil density, moisture characteristics, aeration, and relationship to plant growth. Prereq: 413 or consent of instructor. 2 hrs and 1 lab. F, A

530 Integrated Pest Management (3) (Same as Entomology and Plant Pathology 530.)

532 Advanced Crop Ecology (3) General and specific relationships among environmental factors, crop climates, and agricultural systems; quantification of macro- and microclimatic influences on crop growth; world climates and distribution of plant and animal species. Prereq: 417 or equivalent. 2 hrs and 1 lab. F, A

551 Advanced Plant Genetics (3) Discovery of genetic controlling elements, induced mutations, genome engineering, and genetic mapping. Prereq: 413 or equivalent. 2 hrs and 1 lab. F, A

552 Plant Breeding (3) Principles and techniques used in plant improvement. Prereq: Biology 520 or equivalent. 2 hrs and 1 lab. Sp
organization, polyploidy, tetrasomic inheritance, extra-chromosomal inheritance, apomixis, incompatibility systems, and genetic engineering of higher plants. Prereq: Biology 220, F.A.


571 Design and Analysis of Biological Research (3) (Same as Animal Science 571.)

593 Special Problems in Plant and Soil Science (1-3) May be repeated. Maximum 6 hrs. E

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

601 Special Topics in Soil Science (1-3) Thermodynamics of soil solutions, clay structure and surface chemistry, soil mineralogy, plant mineral nutrition, soil microbiology, water movement and use by plants, soil structure, soil thermal properties, interaction in the soil-plant environment. May be repeated. Maximum 6 hrs. E

603 Special Topics in Crop Physiology and Ecology (1-3) Microclimate of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and geomorphology in crop production. Theory and application of quantitative methods in crop physiology and ecology research. May be repeated. Maximum 6 hrs. E.

605 Special Topics in Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutations, chromosome dynamics, polyploidy, genetic engineering, interspecific hybridization, linkage, screening methods, genome organization. May be repeated. Maximum 6 hrs. E.

613 Advanced Soil Chemistry (3) Surface and colloid chemistry of soil minerals; recent developments in ion speciation, ion movement, surface charge, surface complexation and soil colloidal stability. Prereq: 413 or consent of instructor. F.A.


633 Plant Growth Control and Herbicide Action (3) Principles of uptake, translocation, mode of action and uses of herbicides and plant growth regulators, and their effects on plant morphology, metabolic systems and enzymatic activities. Practical aspects and current commercial uses of plant growth regulators. Prereq: Botany 521 and 522 or equivalent. F.A.

653 Advanced Plant Breeding (4) Development and utilization of concepts of quantitative parameters, inbreeding, heterosis, methods of selection, in vitro breeding, interspecific hybridization, stability parameters, genetic resistance and vulnerability to pests and environmental stresses. Prereq: 453 and 571 or consent of instructor. 3 hrs and 1 lab. Sp.A.

671 Advanced Research Planning (3) Development of agricultural research proposals utilizing prescribed resources and emphasizing experimental design and statistical techniques. Prereq: 571, Animal Science 572, Statistics 461, or equivalent. (Same as Animal Science 671.) F.A.
Examination (GRE) score, which is normally required for admission to the M.P.A. program. Application may be made prior to or after matriculation in either the J.D. or the M.P.A. program, but application to the dual program must be made prior to entry into the last 29 semester hours required for the J.D. degree and prior to entry into the last 15 hours required for the M.P.A. degree.

Curriculum
A dual degree candidate must satisfy the requirements for both the J.D. and the M.P.A. degrees, as well as the requirements for the dual program. The College of Law will award a degree, as well as the requirements for both the J.D. and the M.S.S.W. degrees, as well as the requirements for both the J.D. and the M.P.A. degree. Application may be made prior to or after matriculation in either the J.D. or the M.P.A. program, but application to the dual program must be made prior to entry into the last 29 semester hours required for the J.D. degree and prior to entry into the last 15 hours required for the M.P.A. degree.

Students in the dual degree program are required to take a set of core courses from each curriculum, but the program is designed to be flexible, providing students the opportunity to develop special areas of concentration. For the dual degree program, a minimum of 65 hours are required (35 hours must be in social work and 30 hours must be in public administration). Admission to candidacy will be completed separately for each degree.

A comprehensive examination is required in each discipline for students receiving the dual degrees. A faculty committee from Public Administration and Social Work will write and grade the respective examination.

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 toward a degree independent of the dual degree program.

Financial Aid
Students may apply for financial aid to both the College of Social Work and the Department of Political Science. Normally, students will not receive funding from both programs concurrently.

THE DOCTORAL PROGRAM
The Ph.D. program prepares students for careers in college teaching, as well as careers in other occupations related to service in the public or private sectors. Applicants for admission to the program should normally have completed a Master's degree in political science or a related field with a 3.0 GPA (3.5 for international students) and have earned a composite score of at least 1100 on the verbal and quantitative parts of the Graduate Record Examination.

Students admitted to the program must complete 78 hours of course work beyond the Bachelor's degree, must successfully pass written and oral comprehensive examinations in three broad subfields of political science, and must pass a final oral examination on the dissertation. In addition, students must satisfy a research tool requirement. This requirement may be satisfied either by demonstrating competency in one foreign language, or by completing 12 hours of coursework, numbered 500 or above, in empirical methodology.

In addition to the total hours required for the degree, the following requirements must also be met:
1. At least 63 hours must be in political science courses.
2. At least 48 hours in political science courses must be in courses numbered 500 or above.
3. Completion of Political Science 510 and 512.
4. At least 6 hours must be earned in political science courses numbered above 600, exclusive of dissertation hours.
5. A total of 24 hours must be earned by writing the dissertation.

GRADUATE COURSES
410 Special Topics in United States Government and Politics (3) May be repeated with consent of department. Maximum 6 hrs.
420 Political Attitudes and Opinions (3) Nature, formation, development, and dissemination of politically relevant attitudes and opinions in American political system.
421 Political Parties and Interest Groups (3) Examination of role of political parties and organized groups in American politics and government.
422 Political Campaigns and Elections (3) Analysis of nature of campaigns and elections in American political process.
430 United States Constitutional Law: Sources of Power and Restraint (3) Analysis of judicial review, constitutional powers of President and Congress, federalism, sources of regulatory authority, and constitutional protection of political and economic rights.
431 U.S. Constitutional Law: Civil Rights and Liberties (3) Analysis of current issues in civil rights and liberties including: first amendment freedoms, equal protection, privacy and rights of accused.
440 Public Management and Human Resources (3) Mobilization and management of technical and human resources in pursuit of public sector organization goals.
441 Budgetary Process and Financial Management (3) Fiscal planning, budget and expenditure processes in government, their policy and administrative implications.
442 Administrative Law (3) Legal dimensions of administrative power and procedures, and constitutional controls over administrators.
452 Black African Politics (3) Recent evolution and current political environment of Black African nations. (Same as Afro-American Studies 452.)
454 Government and Politics of China and Japan (3) Examination of the political setting, structure and political processes in China and Japan.
455 Latin American Government and Politics II (3) Selected topics on Latin American political dynamics, consideration of leading theoretical explanations. (Same as Latin American Studies 455.)
459 Government and Politics of the Soviet Union (3) Origins and development of Soviet political system, and study of selected policy areas.
460 Revolution (3) Examination of characteristics, theories, and consequences of revolution with particular focus on left-wing revolutions and movements.
461 Policy Making in Democracies (3) Comparative approach to theory and process of making public policy.
463 Contemporary Middle East Politics (3) Governments and movements in Middle East, their characteristics, bases, and interrelations.
464 Special Topics in Comparative Government (3) May be repeated with consent of department. Maximum 6 hrs.
469 Soviet Foreign Policy (3) Overview of Soviet international behavior since 1917 and examination of selected issues of Soviet foreign policy post World War II.

470 International Law (3) Nature and development of international law and compliance. Function of international law in context of international conflict.

475 Ancient and Medieval Political Thought (3) Survey of major western political thinkers from Socrates to Marsili of Padua.

476 Modern Political Thought (3) Survey of major western political thinker from Machiavel to Marx.

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

510 Scope and Methods in Political Science (3) Procedures of analysis in political science.

512 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: univariate and bivariate statistics.

513 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: multivariate model building.

514 Research and Methodology in Public Administration (3) Basic assumptions and techniques of research in public administration; measurement, analysis, and reporting of data.

520 Political Theory (3) Survey of major ideas, thinkers and works of Western political theory.

530 Topics in American Government and Politics (3) Survey of literature, approaches to research and analysis, critical examination of major works, and overviews of research in various subfields. May be repeated with consent of department. Maximum 9 hrs.

538 Urban Politics and Administration (3) American urban structure and urban politics. May be repeated with consent of department. Maximum 9 hrs.

540 Public Law (3) Selective examination of published research and current approaches in subfields of constitutional law, judicial process, and judicial behavior. May be repeated with consent of department. Maximum 9 hrs.

546 Law and the Administrative Process (3) Constitutional position; decisional processes, regulation and management; limitations on governmental action; questions of structure, role, and administrative choice. May be repeated with consent of department. Maximum 9 hrs.

550 Public Administration (3) Overview of public administration theory and function.

552 Organization Theory (3) Appraisal of major theories of organization and their applicability to public sector.

556 Policy Analysis (3) Role of administrators in policy analysis and decision making. May be repeated with consent of department. Maximum 9 hrs.

558 The Politics of Administration (3) Examination of public administration in context of American political system, policy making and political roles of public administrators and agencies. May be repeated with consent of department. Maximum 9 hrs.

560 Public Budgeting and Finance (3) Technical and political aspects of planning, preparing and adopting government budgets. Management implications of revenue collection, debt management, treasury function, accounting, internal auditing, purchasing risk management, post-auditing.

562 Public Management (3) Interpersonal and leadership skills, techniques and methods for planning, decision making, and implementation of management strategies in public sector. May be repeated with consent of department. Maximum 9 hrs.

564 Human Resource Management in Public Organizations (3) Integrative analysis of contemporary issues, challenges, methods and strategies related to effective management of human resources in public sector.

566 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system.

569 Internship in Public Administration (3-9) Open to students participating in approved internship programs. May be repeated with consent of department. Maximum 9 hrs. S/N/NC only.

570 Comparative Government and Politics (3) Selected topics in modern governments. May be repeated with consent of department. Maximum 9 hrs.

572 The Politics of Development (3) Selected topics dealing with political problems of less developed countries. May be repeated with consent of department. Maximum 9 hrs.

574 Area Seminar in Comparative Government and Politics (3) Selected topics in area studies: African, Asia, Latin America, Middle East, Soviet Union and Eastern Europe or Western Europe. May be repeated with consent of department. Maximum 9 hrs.

580 International Politics (3) Survey of literature and major aspects of international politics. May be repeated with consent of department. Maximum 9 hrs.

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

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

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

595 Readings and Special Problems in Political Science (1-3) Prior consent of instructor. May be repeated. Maximum 15 hrs.

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

610 Special Topics in Empirical Theory and Methodology (3) Advanced methods and procedures of analysis in political science. May be repeated with consent of department. Maximum 9 hrs.

620 Special Topics in Political Theory (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

626 Topics in Political Theory (3) Selected issues and problems in normative political theory. Specific content determined by instructor. May be repeated with consent of instructor. Maximum 9 hrs.

631 Topics in Parties and Elections (3) Analysis of party systems and electoral behavior. May be repeated with consent of department. Maximum 9 hrs.

634 Topics in American National Institutions (3) Deals with congress, executive or related subjects. May be repeated with consent of department. Maximum 9 hrs.

636 Comparative State Politics (3) Government and political processes of fifty states: general and particular characteristics. May be repeated with consent of department. Maximum 9 hrs.

640 Special Topics in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of national legal system. May be repeated with consent of department. Maximum 9 hrs.

642 The Politics of Criminal Justice (3) Selective examination of contemporary problems of research and public policy formulation: criminal process; law enforcement administration; criminal court administration; and prison administration. May be repeated with consent of department. Maximum 9 hrs.

654 Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor. May be repeated with consent of department. Maximum 9 hrs.

667 Comparative Public Administration (3) Comparison of policy-making structures and public policies in selected countries. May be repeated with consent of department. Maximum 9 hrs.

668 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration. May be repeated. Maximum 9 hrs.

670 Special Topics in Comparative Government and Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

682 Theory and Analysis of U.S. Foreign Policy Processes (3) Theoretical approaches to decision making in foreign policy area and analysis of policy-making process. May be repeated with consent of department. Maximum 9 hrs.

688 Special Topics in International Politics (3) Selected issues and problems in international politics. Specific content determined by instructor. May be repeated with consent of instructor. Maximum 9 hrs.

Polymer Engineering

See Materials Science and Engineering
THE MASTER'S PROGRAM

Graduate study leading to the Master of Arts in general psychology is normally available only to students entering the doctoral program in psychology. Requirements are (1) a score of at least 630 on the GRE in psychology; (2) at least 30 hours of graduate-level courses in psychology; and (3) a Master's thesis based on 6 hours of Thesis 500. A non-thesis Master's degree is available with the approval of the student's supervisory committee upon successful completion of a total of at least 36 hours in graduate-level courses in psychology and a final written examination.

THE DOCTORAL PROGRAM

A student with a B.A. or B.S. may apply to the Department of Psychology for admission to the doctoral program with a concentration in general psychology or clinical psychology. The doctoral program with a concentration in ethology or physiology is offered through the Life Sciences Program. Doctoral study in industrial and organizational psychology is offered through the Intercollegiate Program in Industrial and Organizational Psychology, to which application is made through the Department of Management.

Departmental Requirements

All students in the doctoral program in psychology must obtain a score of at least 630 on the GRE in psychology by the end of the first year, and all students must pass the departmental general psychology examination (a comprehensive, two-day essay exam) each year by the end of the second year. In addition, each student must pass the doctoral comprehensive examination, complete an acceptable doctoral dissertation, and conduct a satisfactory oral defense of the dissertation. All doctoral students must complete a minimum of 78 hours of graduate-level courses, including courses required by their program; at least 6 hours in courses outside of psychology; and at least 24 hours of dissertation research (Psy 600).

General Psychology

This program allows students to select from a variety of specializations oriented toward career goals in teaching and research in psychology in academic, institutional, or industrial settings. The program is highly flexible and individualized and seeks to provide a professional apprenticeship. Specializations include behavioral medicine and health psychology, child and adolescent development, cognitive and symbolic processes, conditioning and learning, ethology, existential phenomenology, psychometrics, psychophysiology, social psychology, and others. Requirements of the program are as follows:

1. Statistics 337-38, or equivalent, and two additional courses numbered above 500 in research methodology, quantitative methods, statistics, or psychometrics.
2. Competence in general psychology, demonstrated by passing a general comprehensive examination (Foundations of Psychology) or Psychology 420 (History and Systems of Psychology) or equivalent, plus at least one course or sequence equivalent from each of four categories in the following list. (This requirement may be met by passing approved written examinations.)

   a. Biological psychology: 461-69 Physiological Psychology and Laboratory; 526 Neuroanatomy; 527 Behavioral Neurology.
   d. Developmental psychology: 511 Developmental Psychology; 512 Life-span Development; 574 Child Psychopathology.
   e. Individual differences and personality: 445 Research Methods and Testing; 476 Theories of Personality.

   Research practicum (509) - research apprenticeship involving participation in the ongoing research of two different members of the faculty during the first two semesters in the program.

4. Pre-dissertation research project completed during the second year, involving the collection of original data or original analysis of existing data, reported in publishable form and acceptable to the doctoral supervisory committee.

5. At least 48 graduate seminars in psychology numbered above 600.

Clinical Psychology

This program is designed to lay the groundwork for a career as a clinical psychologist capable of working in both academic and applied settings. The program emphasizes the theoretical foundations of psychology as well as supervised experience oriented toward the development of practical skills. The program embodies the scientist-practitioner model of psychological practice. Requirements are as follows:

1. Apprenticeship with one faculty member during the first year, one day each week.
2. Pre-dissertation research project completed before forming a doctoral supervisory committee, reported in written form acceptable to the student's faculty advisor and the director of clinical training.
3. Supervised clinical placement two days (16 hours) each week during the second, third, and fourth years.
4. Satisfactory completion of listed courses (or equivalents) in the following nine categories: a. Foundations of Psychology (513); b. Measurement and Testing (445); c. Personality Theory and Research (570-71); d. Lifespan Development (512); e. Statistics and research methods (504 Empirical Methods in Psychology plus either 505 Research Design or 557 Applied Psychological Measurement); f. Psychopathology (572, 573, 574); g. Psychological Assessment (594-595, 596); h. Psychotherapy (670, 671, 673, 675); i. Legal, Ethical, and Professional Issues (565). 5. Satisfactory completion of at least 3 additional graduate-level courses in selected clinical topics in psychology.
6. Satisfactory completion of a one-year clinical internship at a site approved by the program.

GRADUATE COURSES

403 Psychology and the Law (3) Psychological aspects of legal systems. Prereq: 110 or equivalent, upper-division standing and consent of instructor.
434 Psychology of Gender (3) Biological, psychological, and sociological theories of human gender and role stereotypes and their consequences for behavior and experience. Prereq: 110 or equivalent, 210, 220. (Same as Women's Studies 434.)
440 Organizational Psychology (3) Social-psychological analysis of organizations, roles, conflict and systems theory. Prereq: 360.
450 Comparative Animal Behavior (3) (Same as Zoology 450.)
459 Comparative Animal Behavior Laboratory (3) Coreq: 450. (Same as Zoology 459.)
461 Physiological Psychology (3) Nervous system and physiological correlates of behavior. Biological basis of emotion, learning, memory and stress. Prereq: 110 or equivalent, 210, and 1 yr of biology or zoology introductory sequence.
469 Laboratory in Physiological Psychology (3) Laboratory studies of nervous system and physiological correlates of behavior. Coreq: 461.
470 Theories of Personality (3) Survey of major theories of human personality and their development. Prereq: 220 and 300 or 330.
480 Theories of Learning (3) Classical and current approaches to learning and cognition. Prereq: 310.
482 Topics in Psychology (3) Intensive analysis of special topics. Afro-American psychology or evaluation of programs in community. Prereq: Biological Basis of Behavior or Behavior and Experience: Humanistic Psychology and at least 9 hrs in 500-level courses. Recommend: Prereq: Statistics in Psychology, Methods of Research in Psychology. May be repeated. Maximum 6 hrs.
489 Supervised Research (1-9) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs in 399, 489, 491, 492, and 489 combined may apply toward undergraduate major.
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

508 Readings and Special Issues in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

509 Research Practicum (1-3) Required of first-year graduate students in psychology. May be repeated. Maximum 9 hrs. S/NC only.

510 Topics in Psychology (3) Intensive examination of selected issues in psychology. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

511 Developmental Psychology (3) Normal processes of human socialization; physical, cognitive, and emotional development from conception through infancy, childhood, and adolescence. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

512 Life-Span Development (3) Theories and research concerning normal human development throughout life, adulthood, and old age. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

513 Foundations of Psychology: Biological Factors, Perception, Learning, Thinking, Motivation (4) Intensive survey. Prereq: Consent of instructor.

516 Colloquium in Ethology (1) Current research and theory. May be repeated. Maximum 9 hrs. (Same as Zoology 516.) S/NC only.

517-18 Proseminar in Industrial and Organizational Psychology (3,3) (Same as Management 567, 568.)

520 Interventions for Behavioral Change (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Special emphasis in community. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

525 Laboratory Techniques and Instrumentation (3) Procedures for laboratory research involving humans and nonhuman animals. Techniques for collecting, transforming, storing, and retrieving data using microcomputers. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

526 General Vertebrate Neuroanatomy (3) Lecture and laboratory. Structure and functioning of central and peripheral nervous system. Prereq: 461, 469, or equivalent. Prereq: Consent of instructor. (Same as Zoology 526.)

527 Behavioral Neurology (3) Disorders of nervous system, organic brain dysfunctions. Diagnosis and treatment. Prereq: Consent of instructor.

528 College Teaching in Psychology (3) Concepts, techniques, and problems of college teaching. Prereq: Consent of instructor. S/NC only.


545 Advanced Animal Behavior (3) (Same as Zoology 545.)

546 Ethological Psychology (3) Basic ethology and comparative psychology. Implications for human behavior. Prereq: Consent of instructor.

549 Internship in School Psychology (1-4) (Same as Educational and Counseling Psychology 549.)

550 Social Psychology (3) Survey of theory and research concerning interpersonal interaction and individual behavior in social context. Prereq: Consent of instructor. S/NC only.

555 Psychometrics (3) Basic concepts: faster analysis, scaling, test theories, probability models and their applications, computerized adaptive testing and other topics. Prereq: Statistics 537-538 or equivalent. May be repeated. Maximum 6 hrs.

556 Theory of Mental Measurement (3) Classical and modern test theories. Reliability, validity, item- and test-characteristics, item analysis, construction functions and other topics. Prereq: 555 and consent of instructor. May be repeated. Maximum 6 hrs.

557 Applied Psychological Measurement (3) Issues and techniques in applying psychological measurement in organizational, clinical, and community research. Prereq: Statistics 537-538 or equivalent or consent of instructor. May be repeated. Maximum 9 hrs.

560 Psychology of Learning (3) Review of current evidence from research involving human and non-human animals. Prereq: 400 and consent of instructor. May be repeated. Maximum 6 hrs.

570 Personality: Theory and Research I (3) Advanced survey of psychological approaches to personality; selected readings. Prereq: 470 or equivalent.

571 Personality: Theory and Research II (3) Advanced survey of behavioral and humanistic approaches to personality; selected readings. Prereq: 470 or equivalent.

572 Descriptive Psychopathology (3) Diagnostic criteria of the DSM-III. Examples from written case-histories and recorded interviews. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

573 Dynamics of Psychopathology (3) Psychodynamic view of the causes and symptoms of major psychoses, neuroses, and adjustment disorders. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

574 Atypical Development in Childhood (3) Research on etiologies of atypical patterns of development in infancy and childhood. Prereq: 511 and consent of instructor. May be repeated. Maximum 6 hrs.

576 Object Relations (3) European and American conceptions of normal and psychopathological development of object relations. Significance for psychoanalytic therapy. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

578 Clinical Aspects of Human Sexuality (3) Variation in human sexual behavior. Theories of etiology, treatment. Prereq: Consent of instructor.

585 Seminar in Gerontology (1-3) (Same as Human Ecology 585, Educational and Counseling Psychology 585, Nursing 585, Public Health 585, Physical Education 585, Social Work 585, and Sociology 585.)

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

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

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

594 Psychological Assessment I (3) Basic concepts and techniques of adult assessment: intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

595 Psychological Assessment II (3) Basic concepts and techniques of personality assessment. Prereq: Consent of instructor. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

596 Laboratory in Psychological Assessment (1) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 595. May be repeated. Maximum 4 hrs. S/NC only.

597 Evaluation of Development in Childhood (3) Structured and projective tests and interview techniques for evaluation of intellectual, personality, and social development in childhood. Prereq: 511 and admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

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

601 Seminar in Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

605 Seminar in Research and Quantitative Methods (3) Prereq: 505, Statistics 537-538 or equivalent, or consent of instructor. May be repeated. Maximum 12 hrs.

610 Seminar in Applied Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

611 Seminar in Developmental Psychology (3) Prereq: 511 and consent of instructor. May be repeated. Maximum 12 hrs.

613 Seminar in Existential-Phenomenological Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

615 Seminar in Behavioral Neuroscience (3) Prereq: 461, 469, and consent of instructor. May be repeated. Maximum 12 hrs.


620 Seminar in Social and Organizational Psychology (3) Prereq: 440 or 550 and consent of instructor. May be repeated. Maximum 12 hrs.

622 Seminar in Comparative and Ethological Psychology (3) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

623 Seminar in Methods of Naturalistic Research (3) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

624 Seminar in Psychometrics (3) Prereq: 555 or consent of instructor. May be repeated. Maximum 9 hrs.

625 Seminar in Organizational Psychology (3) (Same as Management 625.)

626 Seminar in Industrial Psychology (3) (Same as Management 626.)

627 Seminar in Applied Industrial Psychology (3) (Same as Management 627.)

635 Ethical, Legal, and Professional Issues in Psychology (3) (Same as Educational and Counseling Psychology 635.)

638 Current Topics in Industrial/Organizational Psychology (3) (Same as Management 638.)

661 Advanced Psychometrics (3) Construction and standardization of psychological tests, questionnaires, rating scales; theory of errors of measurement; item analysis, scaling, equating, and development of norms; latent trait models; factor analysis; and other topics. Prereq: 555 or consent of instructor. May be repeated. Maximum 9 hrs.

668 Seminar in Psychopathology (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

670 Psychodynamic Psychotherapy I (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

671 Psychodynamic Psychotherapy II (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology and 670 or consent of instructor.

673 Laboratory in Psychotherapy (2) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 670 or 671. May be repeated. Maximum 6 hrs. S/NC only.

674 Group Psychotherapy (3) Theory and practice. Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 6 hrs.

675 Inference in Psychotherapy (3) Uses of actuarial data for assessment of strategies and tactics in psychotherapy. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

676 Special Techniques in Psychotherapy (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

679 Hypnosis and Imagery (3) Demonstration and practice of hypnotic induction. Survey of clinical applications of hypnosis and imagery. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

680 Seminar in Psychotherapy (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

681 Seminar in Assessment (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

683 Seminar in Behavioral Medicine (3) Current research and theory concerning relationships between behavior and health. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.
584 Neuropsychology (3) Investigation of brain-behavior relationships in adults and children. Introduction to administration of REITAN neuropsychological screening battery, Luria battery, and other tests of brain dysfunction. Prereq: Consent of instructor.

585 Psychopharmacology (2) Connections between pharmacology and psychology. Prereq: Consent of instructor.

690 Field Work in Industrial and Organizational Psychology (1-12) (Same as Management 690.)

695 Field Placement in Clinical Psychology (3) Prereq: Admission to doctoral program in clinical psychology and consent of instructor. Maybe repeated. Maximum 24 hrs. S/NC only.

696 Advanced Psychology Clinic Placement (1-3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Maybe repeated. Maximum 24 hrs. S/NC only.

Religious Studies

(College of Liberal Arts)

Charles H. Reynolds, Head

Professors:

Dungan, David L., Th.D. ...... Harvard
Humphreys, W. Lee, Ph.D. ...... Union
Linge, Daved E., Ph.D. ...... Vanderbilt
Lusby, F. Stanley, M.Div. ...... Colgate Rochester
Norman, Ralph V., Jr., Ph.D. ...... Yale
Reynolds, Charles H., Ph.D. ...... Harvard

Associate Professors:

Fitzgerald, James L., Ph.D. ...... Chicago
Gwynne, Rosalind W., Ph.D. ...... Washington
Hodges, John O., Ph.D. ...... Chicago
Levering, Miriam L., Ph.D. ...... Harvard

Assistant Professors:

Ehrlich, Linda C., Ph.D. ...... Hawaii
Hackett, Rosalind J., Ph.D. ...... Aberdeen

A Master's degree in Philosophy with a concentration in religious studies is available. (Details of this program are described under Philosophy.) Graduate courses in religious studies provide opportunity for students in a variety of disciplines to pursue work in religious studies as a graduate concentration.

GRADUATE COURSES

411 Modern Religious Philosophies (3) Religious implications of major Western thinkers and movements from Nietzsche to Heidegger. Prereq: Consent of instructor. (Same as Philosophy 411.)

412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) Investigation of selected writings and philosophic problems of traditions of Hinduism, Yoga, Vedanta, Buddhism, or Jainism. Prereq: 374 or 376 or consent of instructor. (Same as Philosophy 412.)

416 Jesus and Paul Compared (3) Central ideas and concepts of each person compared with equivalent concepts in the other. Advanced study of Gospels and letters of Paul. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

425 Seminar in Western Religions (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

430 Seminar in American Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

435 Seminar in Asian Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

440 Seminar in Comparative Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

446 Theoretical Issues in Medical Ethics (3) (Same as Philosophy 446.)

490 Readings and Research in Religious Studies (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


531 Topics in Religion and Society (3) Prereq: Consent of instructor.

532 Topics in the History of Religions (3) Prereq: Consent of instructor.

533 Topics in Religious Thought (3) Prereq: Consent of instructor.

544 Applied Ethical Theory (3) (Same as Philosophy 544.)

566 Topics in U.S. Religious History (3) Research in methods and sources for investigating United States religious history. Prereq: 351, 353, 355, 430, or consent of instructor. May be repeated. Maximum 6 hrs. (Same as History 566.)

570 Philosophy of Religion (3) (Same as Philosophy 570.)

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

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

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

Romance Languages

(College of Liberal Arts)

MAJORS

French .................................................. M.A.
Spanish .................................................. M.A.
Modern Foreign Languages ............ Ph.D.

John B. Romeiser, Head

Professors:

Barrette, Paul E., Ph.D. ............... California
Brady, Patrick, Ph.D. ............... Sorbonne
Cobb, Carl W., Ph.D. .......... Tulane
Elliott, Jacqueline C., M.A. .... Illinois
Handelman, Michael H., Ph.D. .... Florida
Helfin, William H., Ph.D. .... Florida State
Irving, Thomas B. (Emeritus), Ph.D. .... Princeton
Mauro, Ferdinando D. (Emeritus), Ph.D. .... Columbia
Petroskovska, Marija, Ph.D. .... Kentucky
Pinesky, Clara (Emeritus), Ph.D. .... California
Romaier, John B., Ph.D. ........... Vanderbilt
Vazquez-Bigi, A. M. (Emeritus), Ph.D. .... Minnesota
Wallace, Albert H., Ph.D. ........ North Carolina
Washburn, Yulan M., Ph.D. .... North Carolina

Associate Professors:

Campion, Edmund J., Ph.D. ............... Yale
DeRycke, Robert M., Ph.D. ........ Illinois
DiMarie, Salvatore, Ph.D. ........ Wisconsin
DiPuccio, Denise M., Ph.D. ........ Kansas
Duncan, Cynthia K., Ph.D. ........ Illinois
Levy, Karen D., Ph.D. ........ Kentucky
Rivera-Rodas, Oscar, Ph.D. .... California

Assistant Professors:

Brizio, Flavia, Ph.D. ............... Washington
Cazenave, Odile, Ph.D. ........ Penn State
Holmlund, Christine, Ph.D. .... Wisconsin
Milleret, Margo, Ph.D. .......... Texas
Rodriguez, Alberto, Ph.D. .... Brown
Young, Dolly, Ph.D. ............... Texas

The Department of Romance Languages offers two advanced degrees: the Master of Arts in French and in Spanish and the Doctor of Philosophy in Modern Foreign Languages. Inquiries should be addressed to the head of the department. The head, through the coordinators of Spanish and French, will make available further departmental requirements, regulations, and materials not listed below.

THE MASTER'S PROGRAM

Thesis Option

1. Completion of a minimum of 24 semester hours in coursework plus at least 6 hours in course 500. In French, 501 is required; in Spanish, 550. A maximum of 6 hours may be taken at the 400 level, the rest at the 500 level, and under certain conditions the student may take 600-level seminars. If the student chooses to have a minor (such as Italian or Portuguese), at least 24 hours (including 6 hours of thesis) must be taken in the major, 6 in the minor.

2. A thesis, with a minimum of 6 semester hours in course 550.

3. A written examination covering the coursework and selected items from a master reading list.

4. A final oral examination covering the thesis.

Non-Thesis Option

1. Completion of at least 30 semester hours, with a maximum of 9 at the 400 level, the rest at the 500 level, including 501 (French) or 550 (Spanish). Under certain conditions, the student may take 600-level seminars. If the student chooses to have a minor (such as Italian or Portuguese), at least 24 hours must be taken in the major, 6 in the minor.

2. Three term papers that have been accepted by the student's advisory committee.

3. A written examination covering the coursework and selected items from a master reading list.

4. A final oral examination to discuss the papers (French M.A. only).

THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

Admission Requirements

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

Requirements for the Ph.D.

Candidates must complete a minimum of 63 semester hours of course work beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. The program consists of a first concentration, a second concentration, and a cognate field.

1. First Concentration: French, German, or Spanish. It consists of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:

   - At least 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); French 512 (3), French 512 (3), or Spanish 512 (3); French 515-16 (2,2) or German 520 (3).
   - At least 12 hours at the 600 level (exclusive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It consists of at least 18 hours of courses beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.

3. Cognate Field: Six hours must be in graduate courses numbered 400 and above in a field outside of the department of the first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be given after completion of the 6 cognate hours by the language section concerned.

4. Additional Requirements: A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening, and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized measures that may be used for this purpose include applicable portions of either the National Teachers Examination, the MA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI).

If the student has not chosen a third language as his or her cognate area, basic competence (determined by a reading examination 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.

A comprehensive examination on the language and literature of 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 in the program should have the opportunity and will be strongly encouraged to instruct at least two foreign languages, 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 Germanic and Slavic 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 Residence Assistant in the Office of Graduate Admissions and Records.

French

GRADUATE COURSES

411 French Literature of the 16th Century (3) Highlights of 16th-century French literature. Excerpts from Rabelais and Montaigne; readings of poems from Lyon and members of Pléiade. Prereq: 212, 218 or equivalent. 
413 French Literature of the 18th Century (3) Major works of Enlightenment. Prereq: 212, 218 or equivalent. 
416 Survey of Francophone Literature (3) Writing in French outside of France. Prereq: 212, 218 or equivalent. 
420 French Cinema (3) French cinema from earliest days through New Wave directors. Prereq: 212, 218 or equivalent. May apply toward major. 
422 Advanced Grammar (3) Improving one's written French by studying basic and more refined structures of French language. Writing creative free-style compositions. Prereq: 342 or 345. 
423-424 Advanced Conversation (1,1) Informal conversation with native speaker on contemporary topics. Stresses in-class contact rather than outside preparation. Prereq: 301-302 or 313-14 and 6 hrs of upper-division French or 6 hrs of upper-division courses in a modern or ancient language (exclusive of German and French 301-02, courses in literature abroad and general courses in Latin and Greek requiring no knowledge of these languages), or consent of department. (Same as German 425, Russian 425, Spanish 425, and Linguistics 425.)
426 Methods of Historical Linguistics (3) (Same as German 426, Russian 426, Spanish 426 and Linguistics 426.)
429 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. (Same as Spanish 429 and Linguistics 429.)
430 Theatrical French (2-3) Performance in one or more French plays. Prereq: 212, 218 or equivalent and consent of instructor. May apply toward major. 
431 Highlights of French Civilization (3) Survey of French civilization from the Gauls to World War II. Historical events, daily life, all forms of arts. Prereq: 212, 218 or equivalent.
432 Contemporary French Culture (3) French contemporary civilization and culture since World War II. Problems, trends, and organization of French society today. Prereq: 212, 218 or equivalent.
500 Thesis (1-15) P/NP only. E
501 Techniques in Literary Analysis (2) Required for M.A. program. Intensive course in explication de texte, a close stylistic analysis of texts representative of different eras and of different genres.
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student is using University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NCG only. E
512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic language skills and foreign language skills, and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.
515-16 Bibliography and Methods of Research (2,2) Survey of critical research tools and scholarly contributions in French literature and language. Practical exercises on compiling of scholarly data.
531 French Literature of the 16th Century (3) Literature of first half of 16th century. Rabelais and other prose writers, humanists, and poetry of Marot, Lyonnaise group, and young Pléiad poets.
532 French Literature of the 16th Century II (3) Literature of second half of 16th century, major works of Pléiade writers and such poets, as d'Aubigné and Sponde; Montaigne; writers of scientific works and memoirs, drama.
541 French Literature of the 17th Century (3) French poems and prose works of 17th century.
542 French Literature of the 17th Century II (3) Classical French theatre of 17th century.
551-52 French Literature of the 18th Century: the Philosophes (3,3) Textual analysis of works of Voltaire, Diderot, Rousseau, and other major French 18th-century writers. 
559 Problems in Linguistics: Romance Languages (3) Maximum 6 hrs with consent of department. (Same as Spanish 559 and Linguistics 559.)
571-72 Trends in Modern French Literature (3,3) In-depth study of some of most revolutionary, challenging poets, novelists, dramatists of 20th century.
581-82 The French Novel (3,3) French Novel from 17th through 20th centuries.

Languages

Romance Languages
Italian

GRADUATE COURSES

401 Dante and Medieval Culture (3) Introduction to significance of this great Italian writer. Prereq: 212 or consent of instructor.

402 Petrarch and Boccaccio (3) Prereq: 212 or consent of instructor.

403-04 Literature of the Rinascimento (3,3) From Pulci to Tasso. Quattrocento and Cinquecento. Prereq: 212 or consent of instructor.

405 Modern Italian Poetry (3) From Pascoli to Montale. Prereq: Italian 212 or consent of instructor.

406 The Modern Italian Novel (3) From Manzoni to Calvino. Prereq: 212 or consent of instructor.

409 Directed Readings (3)

510-11 Readings in Italian Literature (3,3) Topics vary. May be repeated with consent of department.

512-13 Special Topics (3,3) Topics vary. May be repeated with consent of department.

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

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

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

Portuguese

GRADUATE COURSES

431-32 Directed Readings in Brazilian and Portuguese Literature (3,3) May be repeated with consent of instructor.

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

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

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

Spanish

GRADUATE COURSES

421 Phonetics (2) Prereq: 212, or 218 or equivalent.

422 Advanced Grammar (3) Finer points of grammatical structures. Required of all majors. Native speakers must receive consent of instructor. Prereq: 212, 218 or equivalent.

423-24 Advanced Conversation and Composition (3,3) Advanced conversational and written skills in Spanish for professionals.

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

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

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

431 Spanish Civilization (3) Major social, political, and cultural achievements of Spanish people from origins of their civilization until today. Prereq: 311, 312 or equivalent.

432 Cervantes (3) Selections from Don Quixote and study of shorter Novelas ejemplares. Prereq: 311, 312 or equivalent.

433 Masterpieces of Spanish Literature (3) Selections from both Golden Age and modern period of outstanding works of all genres. Prereq: 311, 312 or equivalent.

435-36 Survey of Spanish Literature (3,3) 435—Spanish literature through Golden Age. 436—Spanish literature since 1700. Prereq: 311, 312.

450 20th-Century Hispanic Theatre (3) Major 20th-century Spanish American dramatists. Prereq: 311, 312 or equivalent.

459 Capstone Colloquium in Spanish (3) Integrative experience. Breadth of range of topics and issues that affect much of Spanish-speaking world and also involve those who specialize in Hispanic studies. Prereq: 311, 312 or equivalent.

460 Capstone Tutorial in Spanish (1) Independent study project supervised closely by faculty member. Prereq: 311, 312, 459 or equivalent.

471 Latin American Civilization (3) Latin America's diverse heritage and major social and political institutions. Prereq: 311, 312, or equivalent.

472 Masterpieces of Spanish American Literature (3) Close reading of selected works by major Spanish American writers, Darío, Paz, Borges, Fuentes and others. Genres and periods vary. Prereq: 311, 312 or equivalent.

473-74 Survey of Spanish American Literature (3,3) 473—Historical survey from Conquest to late 19th century. 474—Major literary movements, writers and works of 20th century. Prereq: 311, 312 or equivalent.

479 Social Protest Literature of Latin American (3) Analysis of literature as means of unmasking social ills that have traditionally beset Latin America. Indigenismo, Black literature, women writers, role of writer in Latin American society. Prereq: 311, 312 or equivalent.

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

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

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

522 Advanced Communication Skills for Teachers and Other Professionals (3) Advancement of oral and written proficiency in Spanish through extensive use of authentic contemporary materials; class lectures and discussions; oral and written presentations and reports. Especially recommended for graduate students, teachers, and other professionals seeking to maintain or enhance high level communicative competency.

531 Old Spanish (3) Old Spanish language and medieval Spanish literature through 13th century.

532 Medieval Spanish Literature (3) Spanish literature of 14th and 15th centuries.

533 The Picarresque Novel (3) Lazarillo de Tormes, Guzmán de Alfarache, and Bécquer.

534 Don Quixote (3)

535 Golden Age Poetry (3) Garcilaso, Fray Luis de León, San Juan de la Cruz, Lope de Vega, Quevedo, and Góngora.

537 The Golden Age Theatre (3) Major dramatists of period: Lope de Vega, Tirso de Molina, Ruiz de Alarcon, Guillén de Castro, Calderón de la Barca, Monto, and Rojas Zorrilla.

541 Galdós and the 19th-Century Spanish Novel (3) Analysis of works by Galdós and other major 19th-century novelists, Pardo Bazán, Valera, Clarín, and Pereda.

542 The Generation of '98 and Ortega (3) Unamuno, A. Machado, Azorin, Valles-Inclán, Benavente, Ortega y Gasset.

543 The 20th-Century Spanish Novel (3) Baroja, Azorin, Valle-Inclán, Pérez de Ayala, Cela, Delibes, Gaytán, Mate, and at least one present day novelist.

545 Modern Spanish Poetry (3) From Becquer, Unamuno, A. Machado, Jiménez, Lorca, Guillén, Aleixandre, and a contemporary, Celaya.

547 Modern Spanish Drama (3) Major playwrights of 20th-century Spain.

550 Techniques of Literary Analysis and Research Methods (3) Theoretical and critical essays on various techniques of literary analysis. Exploration of bibliographical and research materials.

551 Special Topics in Spanish or Spanish American Literature (3) May be repeated. Maximum 6 hrs.

552 Directed Readings (3)

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


573 The Spanish American Novel: Chile and the River Plate Nations (3) Novels from Chile, Argentina, Uruguay and Paraguay. Modern world.


576 Contemporary Spanish American Poetry (3) Major poets of Spanish American from post modernismo to present day.

577 Spanish American Drama (3) Major playwrights of 20th-century Spanish America.


579 The Spanish American Short Story (3) Short story by major writers in Spanish America from Romanticism to present day, theory and criticism of genre.

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

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

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

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

621-22 Seminar in Spanish Literature (3,3) Topics vary in field of Peninsular literature. May be repeated with consent of department. Maximum 9 hrs.

631-32 Seminar in Spanish American Literature (3,3) Topics vary. May be repeated with consent of department. Maximum 9 hrs.
River Practice

(College of Veterinary Medicine)

**MAJOR**

Veterinary Medicine ........................................... D.V.M.

G. M. H. Shires, Head

Professors:


Associate Professors:


Assistant Professors:


Residents:


Interns:


See Veterinary Medicine for Program Description.

**GRADUATE COURSES**

500 Thesis (1-15) P/NP only. E
501 Special Topics in Large Animal Medicine and Surgery (1-4) May be repeated. Maximum 6 hrs. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E
600 Doctoral Research and Dissertation (3-15) P/NP only. E

**Russian**

See Germanic and Slavic Languages

**Social Work**

(College of Social Work)

**MAJOR**

Social Work ........................................... M.S.S.W., M.S.S.W.-M.Div., M.S.S.W.-M.P.A., Ph.D.

Eunice Shatz, Dean

Professors:


Associate Professors:


Assistant Professors:


Field Practice Coordinators:

Betz, Phyllis (Knoxville), M.S.S.W. .......... Tennessee Lunn, Nina (Nashville), M.S.S.W. .......... Tennessee Pomarantz, Edward (Memphis), M.S.W. .......... Barry

**THE MASTER'S PROGRAM**

The Master of Science in Social Work program prepares social workers to provide professional leadership in: 1) the direct provision of social work services and 2) social welfare administration and planning. These objectives are met through a curriculum requiring all students a professional foundation and a concentration in either social work treatment or social welfare administration and planning.

**Admission Requirements**

Admission to the Master's program is based on the following requirements:

1. A bachelor's degree from an accredited college or university with appropriate preparation in the social sciences. At least three-fourths of the applicant's undergraduate work should be in the social sciences, humanities, physical sciences, and other liberal arts subjects. Those with other academic backgrounds should request consultation regarding ways in which they might be admitted.

2. A grade-point average of 2.5 on a 4.0 scale, with preference given to applicants with 3.0 and above. Applicants with less than a 2.5 may be considered for provisional admission on the basis of supplemental evidence of ability to perform at a satisfactory level.

3. Personal qualifications acceptable for entrance into the professional practice of social work.

Preference is given to applicants with a B average in undergraduate work and substantial preparation in the social sciences. Applications should be filed no later than March 1 for the year in which admission is desired.

**Advanced Standing**

The University of Tennessee College of Social Work has an advanced standing program. Admission to advanced standing requires:

1. A B.S.W. from an accredited program, 2) an overall undergraduate GPA of 3.0 or greater, and 3) successful completion of all areas of an examination covering the five foundation areas. Students admitted into advanced standing are required to complete a minimum of 39 hours of study in either of the college's concentrations -social work treatment or social welfare administration and planning. These students will follow the curriculum plan and meet all requirements of the concentration during three semesters of study in the program.

Specific information about the advanced standing program is available from the college. Application for admission to the advanced standing program is through the regular admission process.

**Extended Study**

Planned part-time programs are available in all three branches of the college. Admission requirements are the same as for full-time study. Coursework can be completed over a three- or four-year period. One year of the student's period of study must be on a full-time basis.

**Financial Aid**

Students may apply directly to the University's Financial Aid Office for assistance such as the National Direct Student Loan or the Work Study Program. Other stipends are administered by the College and awarded on the basis of financial need. Applications for these funds must be made to the Branch of the College the student will attend. A student must first apply for University assistance, since College funds are considered supplementary to those of the University. Additional information about College stipends may be obtained from the College of Social Work.

**General Requirements**

1. A minimum of 54 semester credit hours including a) completion of foundation courses and field practice (15 hours), b) the course Social Work with Oppressed Populations (2 hours), and c) at least five courses (15 hours)
and three semesters of field practice (16 hours) in the social work treatment concentration or at least four courses (12 hours) and three semesters of field practice (16 hours) in the social welfare administration and planning concentration.

2. Students may select a thesis or non-thesis option. Those students pursuing the thesis option receive 6 credit hours for successful completion of a thesis. Successful completion of a comprehensive exam or thesis defense.

3. An overall GPA of 3.0 or better on all graded courses and satisfactory performance in field.

The Professional Foundation Curriculum
The foundation curriculum is a 15-semester hour program required of all students before entering either of the concentration programs. As the initial phase of the educational program, the foundation curriculum contributes to the process of professional development by representing a comprehensive and broad knowledge base from which to operate in the future as practitioners, supervisors, administrators, and planners.

Upon completion of the foundation curriculum, students select a concentration in either social work treatment or social welfare administration and planning.

Social Work Treatment: The social work treatment concentration provides the educational basis for practice with individuals, families, and groups in order to enhance their social functioning, ameliorate problems, and prevent social dysfunction. The concentration provides knowledge of theory and methodology basic to individual, family, and group methods applicable to the treatment of diverse client problems.

Social Welfare Administration and Planning: The social welfare administration and planning concentration provides the educational basis for leadership in the design, implementation, and continued delivery of effective human service programs at local, regional, and state levels. This concentration emphasizes the theory and skills related to administration and planning, and permits considerable flexibility in tailoring a program to fit the student's individual interests, capabilities, and career goals.

Field Practice
Field instruction is a critical component of the student's first- and second-year programs. Through cooperation with a wide range of social agencies and human service programs throughout Tennessee, the college is able to provide field placements in a variety of social work practice areas. The faculty works closely with the placement agencies and the field instructors to insure that students have quality field practice experiences, meeting the objectives of the core curriculum and the concentration.

Field placements are a concurrent class and required. All students are in field two days per week during the first year and three days per week in the second year.

First-year agency placements are selected to provide practice experiences related to the foundation curriculum content and beginning concentration. Within the placement, each student's experiences are planned and designed according to educational objectives.

Second-year placements are selected according to the student's area of concentration, individual career interests, and educational needs. The student actively participates with the field practice coordinator and the educational committee in selection of the second-year field assignment. The second-year field placement experience focuses on the integration of social work knowledge and values, and emphasizes the acquisition and development of practice skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over scheduled University breaks and may result in variations in holidays and office hours for the student.

Transfer Credits
Coursework equivalent to the first year of the Master's program, completed in another accredited graduate social work program, is usually accepted toward degree requirements. Applicants must meet the admission requirements of The Graduate School and the College of Social Work. Transfer courses must be approved as equivalent to required and/or elective courses taken for graduate credit and passed with a grade of B or better. An S (earned on an S/N/C system) for the field practicum is also accepted. In addition, transfer courses must be part of an otherwise satisfactory graduate program (B average) and be approved by the dean. This coursework must be completed within the six-year period prior to the receipt of the degree.

A maximum of 6 semester credits from work earned in disciplines other than social work may be transferred as elective credits. The student's academic committee must approve the request and the transfer credit must meet Graduate School requirements.

Proficiency Examination
Students in the Master's program may earn a maximum of nine hours by proficiency examination, with the exception of field practice courses. Students interested in proficiency examinations must complete all requirements of the Graduate School statement describing the procedure for applying for examination.

DUAL M.S.S.W./M.P.A. PROGRAM
The Department of Political Science and the College of Social Work offer a dual degree program leading the both the Master of Science in Social Work and the Master of Public Administration degrees. This program must be part of an otherwise satisfactory graduate program (B average) and be approved by the dean. This coursework must be completed within the six-year period prior to the receipt of the degree.

A maximum of 6 semester credits from work earned in disciplines other than social work may be transferred as elective credits. The student's academic committee must approve the request and the transfer credit must meet Graduate School requirements.

Admission
Applicants for the M.S.S.W./M.P.A. program must be admitted to the College of Social Work and to the Department of Political Science. In applying for examination, with the exception of field practice courses. Students interested in proficiency examinations must complete all requirements of the Graduate School statement describing the procedure for applying for examination.

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The Department of Political Science and the College of Social Work offer a dual degree program leading the both the Master of Science in Social Work and the Master of Public Administration degrees. This program must be part of an otherwise satisfactory graduate program (B average) and be approved by the dean. This coursework must be completed within the six-year period prior to the receipt of the degree.

A maximum of 6 semester credits from work earned in disciplines other than social work may be transferred as elective credits. The student's academic committee must approve the request and the transfer credit must meet Graduate School requirements.

Admission
Applicants for the M.S.S.W./M.P.A. program must be admitted to the College of Social Work and to the Department of Political Science. In applying for examination, with the exception of field practice courses. Students interested in proficiency examinations must complete all requirements of the Graduate School statement describing the procedure for applying for examination.

Students in the Master's program may earn a maximum of nine hours by proficiency examination, with the exception of field practice courses. Students interested in proficiency examinations must complete all requirements of the Graduate School statement describing the procedure for applying for examination.
separately by each school and will apply only to credit being earned at the school providing the aid.

THE DOCTORAL PROGRAM

The College of Social Work offers the Doctor of Philosophy with a major in Social Work.

The focus of social work education at the doctoral level is to foster the development of an attitude of scientific inquiry, knowledge of the scientific method, ability to extend the knowledge-base of social work practice, and effective participation in leadership roles in social work education, research, and practice.

The emphasis of the doctoral program is upon:

--The analysis of direct intervention and social administration and of the relationships among each of them and their social policy, organizational, and community contexts.

--Research-based knowledge to inform and guide social work practice, social policy, and social welfare program development.

The program consists of foundation courses, elective courses, and dissertation research. The courses are designed at the University of Tennessee at Knoxville. Students and their committees can develop a plan for completing their research in Nashville and Memphis based on the availability of dissertation resources.

Admission Requirements

The Ph.D. program is designed for students who have completed a Master’s degree in an accredited school of social work and have post-Master’s social work, social welfare experience. Applicants who do not meet these requirements, but believe they have equivalent credentials should contact the Chair of Ph.D. program for further information regarding admissions criteria.

General Requirements

1. A minimum of 60 semester hours beyond the Master’s degree including a) major, b) advanced electives, at least 12 of which are taken outside the department, and c) completion of at least 24 credits of dissertation research.

2. Successful completion of qualifying and comprehensive examinations.

3. Completion and defense of the dissertation.

Curriculum

The curriculum of the Ph.D. program consists of a foundation course work, electives, and dissertation research. The foundation curriculum consists of 21 hours of coursework in the history and philosophy of social work, issues in direct service and administration and planning, areas of practice, and research methodology and statistics. Upon this foundation, students and their academic committee develop a plan of study consisting of coursework in Social Work and other departments of the University.

Typically, the foundation curriculum is completed and elective coursework begun during the first year of study, the elective requirement is completed and dissertation research begun in the second year of study, and dissertation research is continued in the third year of study. While it is generally expected that the coursework will be completed on a full-time basis, dissertation research can be completed on a planned part-time basis.

Specific courses required are 601, 602, 612, 613, 640, and Statistics 531 and 532. A student working full-time on the dissertation registers for 12 hours of 600 per semester.

Examinations

All doctoral students are required to pass a qualifying examination and a comprehensive examination. The qualifying examination covers the foundation curriculum. The comprehensive examination is administered by members of the doctoral committee and is designed for the student to demonstrate comprehensive knowledge of the major and cognate areas and the dissertation topic. In case of failure of either examination, the student may request a retake.

The result of the second examination is final.

Financial Aid

Financial aid is available to qualified students in the form of fellowships, scholarships, and teaching and research assistantships. Graduate assistantships and other forms of assistance are awarded on the basis of merit and interest to applicants who are accepted into the Ph.D. program.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S.W. and Ph.D. programs in Social Work are available to residents of the state of Arkansas; the Ph.D. to residents of Kentucky or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Graduate students majoring in fields other than social work are admitted to certain social work courses with the approval of the College of Social Work and the student's major professor.

GRADUATE COURSES

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

502 Registration for Use of Facilities (3-15) Required for the student who needs assistance 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

508 Practicum in Social Work Research (3-6) Supervised practice in application of research methods to social work. Prereq: 510 and consent of faculty conducting investigation. May be repeated. Maximum 6 hrs. S/NC only. E

509 Graduate Seminar in Public Health (1) Same as Public Health 509, Nursing 509, Nutrition and Food Science 509, Physical Education 509. E

510 Social Work Research (3) Research methodology applied to problems in social welfare. Problem formulation; research design; ethics; instrument construction; data collection, analysis, and reporting; statistical procedures; research reporting and evaluation of utilization of research. Prereq: Admission to college or consent of instructor. F

512 Social Work Practice (3) Basic theory, values, and methodology generic to social work practice at various system levels presented from ecological perspective. Assessment, planning, treatment, evaluation, and research skills. Classroom and laboratory experiences. Prereq: Admission to college or consent of instructor. F

514 Human Behavior and Social Environment (3) Theories pertaining to individual, family, small group, and community in context of functions, structure, roles, and processes. Systems conceptualized along functional, structural, and normative continua. Prereq: Development and maturation. Open systems approach to understand interrelationships of biological, psychological, and social variables, implications of culture, race, ethnicity, and gender. Prereq: Admission to college or consent of instructor. F

516 Social Welfare Policy and Services (3) Development of conceptual and practical social welfare policy at local, national, and international levels. Contribution of social work professionals to formal policy-making process through social welfare and policy development. Prereq: Admission through which aggregate social welfare services are proposed, authorized, financed, and programmed. Theories and concepts presented, applied to social welfare service delivery systems. Prereq: Admission to college or consent of instructor. F

518 Social Work with Oppressed Populations (2) Social work's professional role in working with individuals and groups in American society whose oppression is based on distinguishing characteristics: age, sex, economic class, religion, sexual preference, handicapping conditions, ethnicity and race. Prereq: Admission to college or consent of instructor. Sp

520 Social Work Treatment with Individuals and Families (3) Nature and process of practice with individuals and families in helping them resolve or cope with problems of living. Working with disadvantaged clients including client confidentiality. Prereq: Foundation or consent of instructor. Sp

522 Social Work Treatment with Groups (3) Theories and practice of social work with small groups. Treatment groups, task groups. Prereq: Foundation or consent of instructor.

524 Psychopathology and Social Deviance (3) Theories and recent research in etiology of psychic dysfunction and social variance. Categorical approach to psychopathology. Prereq: Foundation or consent of instructor.

526 Research for Assessment of Social Work Treatment (3) Application of research methods for assessment of social work treatment. Prereq: Foundation, 520 or 522, or consent of instructor. Sp

530 Seminar in Social Work Treatment (3-5) Topics in therapy and practice of social work treatment with individual, couples, families, and groups. Prereq: Foundation and 520, or consent of instructor. Required for graduate treatment: 522. May be repeated. Maximum 6 hrs.

531 Family Therapy in Social Work Practice (3) Major family therapy models, perspectives on family dynamics and intervention, and techniques and their application to families from diverse social and cultural backgrounds. Prereq: Foundation and 520, or consent of instructor.

532 Short-Term Treatment (3) Theory and practice of planned short-term treatment, emergency treatment, and crisis intervention. Prereq: Foundation and 520, or consent of instructor.

533 Social Work Treatment with Couples (3) Theories regarding contemporary marriage styles, problem areas in relationships, and application of treatment methods and skills for problem resolution. Prereq: Foundation and 520, or consent of instructor.

534 Social Work Treatment with Children and Adolescents (3) Examination of various treatment modalities for assessing and treating children and adolescents. Prereq: 520 and 522, or consent of instructor.

540 Administration of Social Welfare Programs and Services (3) Analysis of organizations and provision of services to individuals. More attention to problems of federal social welfare administration, their historical and philosophical perspectives, context for designing organizational structure and processes, planning, implementing, evaluating, and evaluating of administration. Prereq: Foundation or consent of instructor.

542 Financial Management and Resource Development in Social Welfare Administration (3) Administrative decision-making related to financial planning and resource allocation in the social welfare field. Knowledge and skills in accounting, budgeting, and auditing, techniques in fundraising, grant writing, marketing and other financial management and resource development.
opment techniques. Prereq: Foundation or consent of instructor.

544 Management Information Systems and Evaluative Research (3) Management information systems design, implementation, evaluative research design and methodology; and utilization for organizational decision-making and policy setting. Prereq: Foundation or consent of instructor.

546 Human Resources Development in Social Welfare Administration (3) Administrative and leadership skills required for management and development of human resources within context of organization and its environment. Prereq: Foundation or consent of instructor.

550 Seminar in Social Welfare Administration and Planning (2-3) Areas and issues relating to methods and techniques of social welfare administration and planning. Prereq: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.

551 Seminar in Social Welfare (2-3) Social welfare problem area or field of practice. Prereq: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.

552 Community Organization (3) Locality development, social planning and social action as practice models for development of resources to meet human needs. Prereq: Foundation or consent of instructor.

553 Social Planning (3) Theory, philosophy, implications for programs for planning social change in diverse fields of service. Prereq: Foundation or consent of instructor.

554 Social Policy Analysis (3) Techniques for assessing social, political, and economic implications of social policy proposals. Prereq: Foundation or consent of instructor.

556 Seminar in Human Behavior and Social Environment (2-3) Areas of current importance in understanding human behavior and social environment. Specific theories, research, and issues. Prereq: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.

561 Supervision and Consultation in Social Work (3) Roles, techniques, and practices of social work supervision and consultation. Prereq: Foundation or consent of instructor.

562 Social Work and Black Families (3) Historical and contemporary theories about black family systems. Development of frameworks to assess and plan for black families within service delivery systems. Prereq: Foundation or consent of instructor.

563 Social Aspects of Illness (3) Social, economic, and environmental problems associated with related to illness and disability and their implications for social work. Prereq: Foundation or consent of instructor.

564 Substance Abuse (3) Survey and analysis of social, cultural, medical, and psychological factors underlying alcoholism and drug abuse; addiction; recent research and treatment innovations. Prereq: Foundation or consent of instructor.

565 Roles and Status of Women (3) Causes and consequences of women's social and economic roles and statuses in American society. Variations in women's experiences by race and ethnicity, class, age, and lifestyle. Prereq: Foundation or consent of instructor.

566 Social Gerontology (3) Physical, psychological and social aspects of aging. Major social policies and programs. Prereq: Foundation or consent of instructor.

570 Advanced Standing (12) Twelve-week program providing qualified students with intensive academic and field experience to enter final year of graduate study upon successful completion of term. S/NC only. Su

580 Field Practice (3) Instruction and supervision in social work practice. Prereq or coreq: 512. S/NC only. E

581 Field Practice (4) Instruction and supervision in social work practice; student's selected concentration in social work treatment or social welfare administration and planning. Prereq: Foundation. S/NC only. Sp

582 Field Practice (6) Instruction and supervision in social work treatment or social welfare administration and planning. Prereq: Foundation. S/NC only. F

583 Field Practice (6) Instruction and supervision in social work treatment or social welfare administration and planning. Prereq: 582. S/NC only. Sp

584 Field Practice (2-6) Instruction and supervision in social work treatment or social welfare administration and planning. Prereq or coreq: 512. May be repeated. S/NC only. E

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Educational and Counseling Psychology 585, Nursing 585, Physical Education 585, Psychology 585, Public Health 585, and Sociology 585.)

593 Independent Study (1-6) Individually studied subject, student selects, designs, and completes examination of special issue or problem. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

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

601 Research for Social Work Practice I (3) Epistemological and methodological considerations for both quantitative and qualitative research for social work practice. F

602 Research for Social Work Practice II (3) Epistemological and methodological considerations for both quantitative and qualitative research for social work practice. Sp

604 Research in Social Service Settings (3) Advanced research, under faculty supervision, of practice issues in community agency. Prereq: First year required. Ph.D courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

608 Evaluative Research for Social Work Practice, Programs and Policy (3) Techniques and strategies for quantitative and qualitative analysis for social policy's impact on individuals and groups for evaluating processes and outcomes of social work practice. F


613 Social Work Practice and Its Social Context II (3) Critical analysis of knowledge bases of major practice in administration and planning. Sp

640 History of American Social Work (3) Social, cultural, economic and political contexts for development of social work profession. Development of education for profession, and modern welfare system. F

660 Issues in Social Work Knowledge Building (3) Advanced seminar in theory and model building in direct intervention, administration and planning. Prereq: First year required. Ph.D courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

663 Directed Study in Social Work Research (3) Advanced individual study, under faculty guidance, of social work practice issues. Prereq: First year required. Ph.D courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

Sociology

MAJOR

Sociology ........................................... M.A. , Ph.D.

Thomas C. Hood, Head

Professors:

Beitz, D, Michael, Ph.D. ............. Michigan State
Black, John A., Ph.D. ................. Iowa
Champion, Dean J., Ph.D. .......... Purdue
Clelland, Donald C., Ph.D. ......... Michigan State
Hastings, Donald W., Ph.D. ....... Massachusetts
Hood, Thomas C., Ph.D. ............. Duke
Hoch, Donald R., Ph.D. ............. North Carolina
Shower, Neil, Ph.D. ................. Illinois
Wallace, Samuel E., Ph.D. ......... Minnesota

Associate Professors:

Benson, Michael L., Ph.D. ............ Illinois
Kurth, Suzanne B., Ph.D. .......... Illinois (Chicago)
Perrin, Robert G., Ph.D. ............. British Columbia

Assistant Professors:

Cable, Sherry, Ph.D. ................. Penn State
Gaventa, John P., Ph.D. ............. Oxford

The Sociology Department offers graduate study leading to the Master of Arts and the Doctor of Philosophy. The M.A. program includes a thesis and non-thesis option. The graduate program has concentrations in criminology, energy, environment, and resource policy; and political economy. The criminology concentration includes 505, 551, 653, and 665. The energy, environment and resource policy concentration includes 560, 563, 661, 662, 663, and 665. The political economy concentration includes 504, 540, 541, 643, 644, and 645. Both the Master's and the doctoral program allow for the construction of individualized programs of study. Detailed information may be obtained from the Director of Graduate Studies in Sociology. All incoming students will be advised by the Director of Graduate Studies.

ADMISSION REQUIREMENTS

1. Acceptable scores on the general Graduate Record Examination (GRE scores in sociology are requested but not required).
2. Three letters of recommendation (forms may be obtained from the department).
3. Completion of the appropriate previous degree (baccalaureate, preferably with a major in one of the social sciences, for the M.A. program; Master's degree in one of the social sciences for the doctoral program).

THE MASTER'S PROGRAM

Thesis Option
A minimum of 30 hours beyond the baccalaureate degree, including 24 hours of coursework and 6 hours of Thesis 500, is required. Students must complete Sociology 521, 531, 535, and one of the following: 504, 505, or 560. At or near the end of all coursework, the student must take an oral examination on course material and thesis. The examination will be administered by the student's committee.

Non-Thesis Option
A minimum of 30 hours of coursework is required, including Sociology 521, 531, 535, and one of the following: 504, 505, or 560. Sociology 534, 536, and 622 are recommended. Sociology courses at the 400 level may be taken with the approval of the student's committee. A student's plan of study should follow one of the following approaches: Plan 1, 6 hours in one of the department's concentrations and 6 hours in a second area, including areas outside the department, subject to the approval of the student's committee; Plan 2, 12 hours in a special area of study approved by the student's committee and the department's Graduate Program Committee. Students are encouraged to prepare a paper synthesizing their knowledge of the concentration(s). Students who incorporate supervised field experience in their programs are encouraged to prepare a paper based on those experiences that demonstrates their
understanding of research, theory, and report writing. All students must take final written and oral examinations that include questions on their general coursework in theory and methods and on their special areas of study.

Subject to approval by the student's committee, up to 12 hours may be taken in courses outside the department for either program.

THE DOCTORAL PROGRAM

Coursework

Twenty-four hours of coursework beyond the Master's degree are required (exclusive of S/NC credits). Twelve hours of coursework in Sociology at the 600 level are required. Students who enter the program without the courses required for the M.A. degree (521, 531, 636) or their equivalents must take them as remedial work which does not apply to their residency. Students must complete Sociology 622; 534, 563, 633, or 636; and 536 or another advanced course in statistics. Completion of 9 hours in each of two concentrations is encouraged. A student who cannot achieve his/her educational goals within the department's concentrations may construct an individualized course of study subject to the approval of the student's doctoral advisor and the Graduate Program Committee. Sociology courses at the 400 level may not be taken without the consent of the student's advisor and the Graduate Program Committee. Six hours may be taken in related fields without petitioning the Graduate Program Committee for approval. The student's program may include a minor or cognate field.

Comprehensive Examinations

Written examinations in four areas are required (theory, research methodology, and two substantive areas). Doctoral students are eligible to take the theory and methodology examination whenever offered. Substantive examinations may be taken upon completion of theory and methodology examinations. Detailed information on examinations and examination options (generalist, specialist, and collaboratist) may be obtained from the department.

Dissertation and Final Examination

A dissertation based on original research must be completed (24 hours). The candidate must pass an oral defense of the dissertation, including the theory and methodology related to the research, in accordance with the deadlines specified by the Graduate School.

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 Sociology is available to residents of the state of South Carolina. Additional information may be obtained from the Resident Advisor in the Office of Graduate Admissions and Records.

GRADUATE COURSES

405 Sociology of Sport (3) Social meaning, organization, and process of sport. Prereq: 291 or consent of instructor. (Same as Physical Education 495.)

413 Formal Organization (3) Analysis of organizational structures, typologies, and theories; hierarchies of authority; communication; interpersonal relations in work settings; organizational change.

414 Sociology of Health Care (3) Organization of health care facilities, staff-patient relationships, demographic characteristics, and prevalence of disease.

415 Sociology of Aging (3) How roles and statuses change with age in relation to major social institutions; impact that rapidly increasing number of older people has on society, effect of society on older people.

446 The Modern World System (3) Critical examination of capitalist world-system as social system. Its coherence, boundaries, regions, member groups, cleavages, and patterns of conflict. Analysis of who gets what, why, and how in global political economy.


455 Society and Law (3) How laws and legal processes are affected by social change, social impact of legal sanctions, relations between law and social justice.

459 Organizational and Corporate Crime (3) Analysis of crime and deviance committed by organizations. Case studies of corporate and organizational crime, organization-power and conflict of crime, theories of corporate crime, and organized responses to this type of crime by government regulatory agencies.

462 Populations (3) Demographic factors and social structure: trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

464 Urban Ecology (3) Relation of humans to their urban environment: conservation and use of appropriate technology. (Same as Urban Studies 464.)

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

480 Diffusion of Agricultural Technology (3) (Same as Rural Sociology 480.)

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.

504 Sociological Foundations of Political Economy (3) Survey of contemporary sociological theories of political economy, sources of political and economic power and conflict of crime, theories of corporate crime, and organized responses to this type of crime by government regulatory agencies.

505 Foundations of Criminology (3) Critical overview of contemporary developments in criminology, theories of crime causation and theories of responses to crime. Prereq: 350 or equivalent.

507 Foundations of Social Psychology (3) Current and classical theoretical perspectives in social psychology.

510 Teaching Sociology (3) Art and craft of teaching sociology from curricular considerations through teaching techniques. May be repeated. Maximum 6 hrs.

521 Sociological Theory I (3) Assessment of what sociological theory is; its major figures and their approaches to understanding society.

531 Research Methods in Sociology (3) Research design, measurement, sampling, quantitative and qualitative data collection techniques, data, reduction, and analysis.

534 Advanced Sociological Analysis (3) Underlying assumptions and logical procedures used by sociologists in formulating explanations; foundations of sociological research strategies and techniques.


540 Occupations (3) Occupations in relation to individuals and society, technology, economic stratification, and social organizations.

541 Collective Behavior, Social Movements, Social Change (3) Basic theory and research on conditions of social conflict in human collectivities and efforts of collectives to change existing society.

542 Sociological Aspects of Sports and Physical Education (3) (Same as Physical Education 542.)

543 Sociology of Development (3) Sociological theories and studies of development: modernization, coloni- alism, dependency, capitalism, deforestation, of various development paths upon selected aspects of social structure and change.

551 Delinquency and the Social Structure (3) How study of delinquency and juvenile justice is affected by changing structures of childhood and adolescence, changing demographic and institutional influences, and changing views about responsibility and punishment.

560 Environmental Sociology (3) Systematic treatment of current research in environmental sociology. Social impact analysis and conflicts over environmental issues.

563 Demographic Techniques (3) Standard rates and measures of demographic variables, life table analysis, increment-decrement models, and survey techniques of population analysis.

566 Advanced Rural Sociology (3) (Same as Rural Sociology 560.)


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

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

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

594 Social Theories of Sport (3) (Same as Physical Education 515.)

595 Special Topics in Rural Sociology (1-3) (Same as Rural Sociology 593.)

599 Readings (3) Selected topics. May be repeated. Maximum 6 hrs.

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

611 Complex Organization (3) Selected topics in formal organizations, cases and incident process analysis; examines strategies for dealing with organizational change, authority hierarchies, communication patterns; technology and organizational structure; job satisfaction, motivation, morale and interpersonal phenomena.

622 Sociological Theory II (3) Distinct schools of sociological theory and contributions of their principal exponents. Prereq: 521 or consent of instructor.

629 Supplementary Readings in Sociological Theory (3) Individual guidance. Preparation for comprehensive examination. Prereq: Consent of instructor. S/NC only.

633 Survey Design and Analysis (3) Systematic exploitation of survey problems through participation in design and analysis of survey. Prereq: 531 or consent of instructor.

636 Field Research (3) Research experience in selected field sites using techniques of interviewing, participating observation, and other methods of field research. Prereq: 531 or consent of instructor.

639 Supplementary Readings in Methodology (3) Individual guidance. Preparation for comprehensive examination. Prereq: Consent of department. S/NC only.

643 Class Analysis (3) Critical analysis of theories and research on class structure and conflict.

644 Political Sociology (3) Critical examination of theories of state and political processes.


653 Sociology of Law (3) Intensive examination of selected topics in sociology of law. Prereq: 505 or consent of instructor.
Special Services Education

(College of Education)

MAJORS
Special Education .................................. M.S.
Rehabilitation Counseling .......................... M.S.

Laurence J. Coleman, Head

Professors:

Coleman, Laurence J., Ph.D. .......... Kent State
Doi, E. E. (Emeritus), Ph.D. ....... Pennsylvania
Frey, Roger M., Ed.D. ..................... Illinois
George, Thomas, Ed.D. .............. Tennessee
Hargis, Charles H., Ed.D. ........ Colorado State
Kronick, Robert F., Ph.D. ........... Tennessee
McClain, T., Ph.D. ....................... South Carolina
Miller, James H., Ed.D. .......... Auburn
Schindler, W. Jean, Ph.D. ......... Kent State
Woodrick, William E., Ed.S. ...... Mississippi
Woodsie, M. R., Ed.D. ................. VPI

Association Professors:

Bennet, Susan M., Ed.D. .......... Columbia
Cassell, Jack L., Ph.D. .............. Kansas
Colvin, Craig R., Ed.D. .......... Virginia
Hannum, Michael C., Ed.D. ......... Northern Colorado
Kopp, Katherine H., Ph.D. .......... George Peabody
Mulkey, S., Wayne, Ph.D. ...... Florida State
Welch, Olga, Ed.D. ................. Tennessee

Instructors:

Ashmore, Don L., M.S. .......... Tennessee
Barnes, Wendell W., Jr., M.Ed. .. Georgia
Griffin, M., M.S. ..................... Tennessee

Lecturer:

Byrd, H. L., Jr., M.S. ............... Tennessee

The Department of Special Services Education offers graduate programs leading to the Master of Science with a major in Special Education or in Rehabilitation Counseling. The department also participates in the Doctor of Philosophy program in Education as described under Education.

THE MASTER'S PROGRAMS

The Master's program in Special Education offers concentrations in the following areas: 1) hearing impaired; 2) gifted; 3) learning disabilities; 4) mental retardation; 5) multiple disabilities; 6) socially or emotionally maladjusted; 7) early childhood special education; and 8) general special education.

Teacher certification can be obtained while working toward the Master's degree. Course offerings are available that lead to general special education teacher certification and to certification to teach hearing impaired children.

The Rehabilitation Counseling program enables counselors to acquire competencies which facilitate the movement of a person with disabilities toward optimal functioning in the three broad areas of living, learning, and working. The rehabilitation counselor works primarily with adults who are being served in various public and private settings. Students should expect to spend four semesters, including summer, in classroom and in internship. The program requires 54 semester hours.

Both majors have a thesis and non-thesis option. If a student elects to do a thesis, the Master's program in Special Education will contain a minimum of 30 semester hours including 6 hours of Thesis 500. Eighteen semester hours in special education coursework is required.

The non-thesis option requires a minimum of 36 semester hours total with a minimum of 18 in special education. In the non-thesis option, a final written comprehensive with an oral examination is required.

ADDITIONAL PROGRAMS

Under the sponsorship of the Office of Special Education and Rehabilitative Services (R.S.A.), specialized institutes for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people are provided. A federally supported Educational Consortium provides staff development and technical assistance for post-secondary programs serving hearing impaired students in a 13-state southeastern region.

Details concerning each program can be obtained by writing to the department head.

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 Special Education is available to residents of the states of Kentucky and West Virginia; the M.S. in Rehabilitation Counseling is available to residents of Louisiana. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Special Education

GRADUATE COURSES

410 Pre-Internship Seminar (1) Orientation, objectives, and policies of internship program. Must be completed term immediately preceding internship. Prereq: Admission to teacher education program. SNC only. Sp, Su

423 Communication Processes for the Hearing Impaired (3) Expressive and receptive vocabulary development in sign communication. Fingerspelling and educational applications of sign language.

424 Nature of Hearing Impairments (3) Basic principles of audiology, anatomy and physiology of hearing; nature and causes of hearing loss; methods and instrumentation for assessment of hearing level; interpretation of audiologic services to medical and other rehabilitative disciplines.

425 Introduction to the Psychology and Education of the Hearing Impaired (3) Formally for those planning to teach hearing impaired. Overview of research related to psychology, social adjustment, communication meth-
odology, language development and education of hear-
ing impaired. Survey of literature. Visits to programs.

433 Clinical Practice in Speech-Language Path-
yology I (1-4) (Same as Audiology and Speech Pathology 433.)

434 Clinical Practice in Speech-Language Path-
yology II (1-4) (Same as Audiology and Speech Pathol-
yogy 434.)

440 Voice Disorders (3) (Same as Audiology and Speech Pathology 440.)

451 Psychology and Education of the Mildly Handi-
capped (3) Nature and characteristics of mildly handi-
capped students with learning disabilities, emotional dis-
turbance, and mental retardation. Instructional ap-
proaches, techniques, and evaluation and development of
resources. Coreq: 480, F

452 Psychology and Education of the Moderately and Severely Handicapped (3) Nature and character-
istics of children and youth with moderate and severe
handicapping conditions, and educational strategies
necessary to accommodate them. Traditional and inno-
vative trends and approaches. Coreq: 480. Sp

454 Education of the Gifted and Talented Children (3) Orientation to psychometric and behavioral studies of
giftedness. Identification and placement of gifted and
learning disabled students. Prerequisites: consent of
instructor. Coreq: 480. Sp

456 Speech and Language Basis of Learning Dis-
abilities (3) Theoretical and biological basis of speech
and language development; understanding of speech and
language impairments in school-age children; integra-
tion of oral/ written language into existing curriculum,
especially for high incidence special education students.

470 Psychology of the Exceptional Child (3) Varieties
of exceptional children; general characteristics and
educational needs. Implications of developmental varia-
tions for functioning as adults. Opportunity to expand
study upon particular exceptionality. Enrollment limited
to non-special education majors.

471 Internship I: Special Education (3-15) Intensive
design to allow student to practice art and science of teaching exceptional children under supervi-
sion of experienced teachers. Prereq: 480.

473 Audiology II (3) (Same as Audiology and Speech Pathology 473.)

480 Field Experience with Mildly Handicapped Stu-
dents (3) Practicum in teaching mildly handicapped
persons. Planning, developing, implementing, and

481 Policies, Procedures, and Practices in Special
Education (3) Comprehensive review of Federal and
State laws and regulations which direct implementation of
services for students with disabilities. Facilities and
agencies. Multiple service delivery models. Sp

482 Speech and Language Services in the Schools (3) Comprehensive overview of the functions and
implementation of speech and language programs in schools. IEP process as it affects assessment, case-selection, and programming for stu-
dents age 4-21. Procedures and materials, group inter-
tervention, and classroom consultation.

483 Clinical Practice in Communication Disorders in
Schools (3) Supervised practice with children with
communication disorders. Prereq: 433, 434 (80-100
clinical contact hrs), 482.

484 Internship with Hearing Impaired Children (6)
Supervised practicum with preschool, day school and
residential students.

490 Field Experience with Moderately and Severely
Handicapped Students (3) Note: required experience
with moderately and severely handicapped chil-
dren and youth. Coreq: 452. S/N or letter grade. Sp

500 Thesis (1-15) S/N or letter grade.

502 Registration for Use of Facilities (3-15) Required
for students not otherwise registered during any
semester when student uses University facilities and/or
faculty time before degree is completed. May not be used
towards degree requirement. May be repeated. S/N or
letter grade. Only.

503 Problems in Lieu of Thesis (1-9) May be repeated.
Maximum 9 hrs. S/N or letter grade.

504 Clinical Experience in Teaching and Super-
vision of Students with Learning Disabilities (3-10) Placement in professional settings in public schools or agencies under supervision of master practitioners. Enrollment limited to those in
fifth-year program. S/N or letter grade.

506 Internships in Teaching in Special Education and
Rehabilitation (3-15) Placement in professional
settings in public schools or agencies under supervision of
master practitioners. Enrollment limited to those in
fifth-year program. S/N or letter grade.

509 Vocational Guidance and Career Planning
With Handicapped Students (3) Orientation to psy-
chological, social and vocational, diagnostic materials
and resources appropriate for handicapped persons
who may require guidance in career decisions and individualized
rehabilitation plan.

519 Speech Development of Hearing Impaired (4)
Therapy of speech development, approaches in training
perception and production of speech, and aural habilita-
tion. Practicum experiences.

521 Language Development of Hearing Impaired (3)
Language problems of hearing impaired contrasted with
scope and sequence of normal language development.
Formal linguistic systems used to describe language
development problems.

522 Language Development of Hearing Impaired II (3)
Developmental and remedial systems of teaching
language to hearing impaired children. Comprehension
and production differences, idiomatic and figurative
structures. Prereq: 521.

523 Practicum in Hearing Impairment (3) Receptive
and expressive language capabilities of hearing im-
paired student. Designing, teaching, and post-testing
unit of instruction for remediation of specific language
to errors. Prereq: 521.

524 Linguistics in the Education of the Hearing
Impaired (3) Recent research and developments in
theoretical and applied linguistics. Prereq: 521, 522, 523,
529.

525 Manual Communication (3) American Sign Lan-
guage (ASL) and culture of American deaf community.
Acquisition of basic linguistic properties of ASL. cultural
differences between hearing and deaf community, and
vocabulary development. Prereq: Prior sign language
experience or consent of instructor.

526 Advanced Sign Language (3) Intermediate ASL
stressing fluency of expressive and receptive com-
munication with deaf people and structure and history of
language. Prereq: 525 or equivalent.

528 Curriculum Development Applied to Programs
for the Hearing Impaired (3) Current curriculum trends
adapted for hearing impaired individuals. New curricu-

530 Orientation to Rehabilitation (3) History, philoso-
phy, legal and economic bases, current issues, and
practices in public and private rehabilitation programs.
Qualifications of service providers. Assessment, plan
development, and provision of services to people who
have disabilities and vocational handicaps. Identifica-
tion, mobilization, and utilization of rehabilitation re-

532 CaseLoad Management in Rehabilitation (3)
Techniques and procedures involved in management of
case loads in Federal-State vocational rehabilitation
agencies and assisting clients in securing, obtaining, and
retraining employment. Job analysis, job modification and re-engi-
neering, marketing, and employer-servicing techniques;
legislation impacting job placement; supported work and
use of occupational information.

535 Vocational Evaluation: Statistical Methods (3)
Processes and statistical tools to be used in evaluating
vocational assets and liabilities to people with disabilities.
Functional analysis of biographical and interview data;
selection and application of appropriate instru-
ment; integration of statistical data into diagnostic
reports; application of computer-generated reporting
systems.

537 Vocational Evaluation: Clinical Methods (3)
Process, principles, and techniques used to assist indi-

dividuals in determining and understanding their ownwork
behavior and vocational potential. Selection and use of
occupational exploration programs and work samples;
application of situational tasks, job tryouts, and simulated
work experiences in vocational education. Clinical inter-
pretation of data through formal staff conferences, voca-
tional counseling, and report writing.

539 Transition from School to Work (3) Development
of programs and procedures to facilitate adjustment of
exceptional persons to independent living. Exploring
perspectives of work, attributes of effective programs, and
interaction between school-based programs and re-
habilitation agencies.

541 Psychosocial Aspects of Exceptionalities (3)
Psychosocial impact of exceptionality on person and
family. Reaction to loss, coping with disability, and socia-
tal implications.

543 Medical Aspects of Disability (3) Etiology
and clinical symptoms related to disabling conditions served
by special education and rehabilitation personnel. Re-
straining measures to minimize pain resulting handicaps.
Skills necessary to communicate with lay and professional
persons.

545 The Rehabilitation Interview (3) Interview as
used in the present and planning with people who have dis-
abilities and vocational handicaps.

547 Practicum in Rehabilitation (3) Supervised expe-
rience in area of rehabilitation; application of concepts,
principles, and skills. Prereq: Consent of instructor.

549 Internship in Rehabilitation Counseling (12)
Supervised practice in rehabilitation counseling. Full
time clinical experience for second-year students (600
contact hrs required).

551 Psychology of Learning Disabilities (3) Overview of learning disabilities; historical and current per-
pectives and emerging direction; basic theories of learning
disabilities, medical aspects of research, as-
sessment, treatment, characteristics of children and
youth, educational implications. Prereq: 451 and 452
or equivalent or consent of instructor.

552 Instructional Systems for Learning Disabilities
(3) Informal assessment and diagnosis and how to
achieve intervention goals. Understanding
and apply assessment and treatment; characteristics of children and
youth, educational implications.

553 Assessment of Exceptional Students (3) Histori-

cal and legal issues related to assessment; concepts
of assessment models; test instruments and assessment
processes demonstrated, practiced, results applied
to educational programming: basic statistics relative to norm
and criterion-referenced testing centered.

554 Assessment in Early Childhood Special Educa-
tion (3) Development of knowledge and skills in appro-
piate formal and informal assessments of handicapped
infants and young children: screening; identification;
diagnosis, placement and programming assessment
issues. Prereq: 533 or consent of instructor.

555 Characteristics of Social and Emotional Distur-
bances in Children and Youth (3) Identification,
identification, symptoms of disturbed child and
contrasted to normal social and emotional growth.
Prereq: 451 and 452 or equivalent or consent of instruc-
tor.

556 Instructional Systems for the Emotionally Dis-
turbed and Delinquent (3) Educational strategies and
models of instruction for children and youth with
social, emotional, and learning disabilities. Prereq:
theatre, music, arts, and group interaction. Prereq or cor-

557 Special Services Education
155
652 Instructional Systems for the Mentally Retarded (3) Special educational environments, behavior management strategies and techniques, curricular design techniques and evaluation. Educational needs of mentally retarded children and youth. Prereq or coreq: 561 or consent of instructor.

654 Psychosocial Development of Gifted and Talented Children (3) Phenomena of talent development in context of home, school, and society. Implications of maladjustment. Practices for promoting social and emotional development. Prereq: 451 and 452 or equivalent or consent of instructor.

655 Instructional Systems for the Gifted and Talented (3) Instructional methods and systems evaluated in light of effectiveness in various educational environments. Prereq or coreq: 564 or consent of instructor.

560 Early Intervention for Handicapped Children (3) Exploration of characteristics and needs of young handicapped children. Program and curriculum development of early intervention system.

575 Creative Problem-Solving Strategies for Special Educators (3) Techniques for solving problems encountered by special educators in any setting.

579 Special Topics (1-3) Prereq: Admission to graduate program. May be repeated. Maximum 6 hrs. S/NC or letter grade.

585 Seminar in Research Techniques in Special Education (3) Evaluation of appropriate research methodologies with supervised research.


590 Application of Microcomputer Technology in Special Education and Vocational Rehabilitation (3) Application of microcomputer technology with all categories of exceptionalities and across all chronological and functioning age ranges. Microcomputer adaptive software, special switch access, authoring systems, telecommunication, and strategies for cognitive development.


595 Clinical Experience in Assessment and Instruction (3) Academic remediation applied in lab/field setting: tasks related to teaching: assessment, preparation of lessons, and delivery of instruction. Coreq: 553. S/NC or letter grade.

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

601 Seminar in Educational Theories in Special Education and Rehabilitation (3) Education theories: educational and rehabilitation of exceptional persons. Theory applications in educational settings. Prereq: Admission to doctoral program or consent of instructor.

602 Seminar in Social Processes in Special Education and Rehabilitation (3) Social phenomena which influence the education and rehabilitation of persons with disabilities and on significant others. Implications for habilitation. Prereq: Admission to doctoral program or consent of instructor.

603 Seminar in Research in Special Education and Rehabilitation (3) Development and implementation of research. Independent research studies, Research proposals. Prereq: 9 hrs of research core and consent of instructor.

610 Internship in College Teaching and Supervision (3-9) Supervised practice in college teaching and supervision. Prereq: Admission to doctoral program or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

620 Internship in Research in Special Education and Rehabilitation (3-9) Placement with professional engaged in theoretically-based research: public school, institutions, agencies or university settings. Prereq: 9 hrs in statistical and research methods. May be repeated. Maximum 9 hrs. S/NC only.

630 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level field experiences under supervision of practitioner. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

679 Special Topics (1-3) Prereq: Admission to doctoral program. May be repeated. Maximum 9 hrs. S/NC or letter grade.

Speech Communication

(College of Liberal Arts)

Lorayne W. Lester, Head

Professors:

Julian, Faye D., Ph.D. ....................... Tennessee
Lester, Lorayne W., Ed.D. ................... Tennessee
Yeomans, G. Allan (Emeritus), Ph.D. .............. Louisiana State

Associate Professors:

Ambrester, M. L., Ph.D. ....................... Ohio State
Buckley, J. E., Ph.D. ......................... Northwestern
Cook, N. C., M.A. ........................... Alabama
Glen, Robert W., Ph.D. ....................... Northwestern

Assistant Professor:

Ambler, R. S., Ph.D. ......................... Ohio State
Haas, John W., Ph.D. ....................... Kentucky

Graduate courses in Speech Communication provide opportunities for students in a variety of disciplines to investigate how oral language can effect changes in the knowledge, the understanding, the ideas, the attitudes, or the behavior of other human beings.

GRADUATE COURSES

420 Communication and Conflict (3) Communication as significant factor in development, management, and resolution of conflict at interpersonal, small group, organizational or societal levels.

440 Organizational Communication (3) Organizational setting and variables of communication process that affect quality of human interaction both within and outside organization.

450 History of Rhetorical Theory (3) Western rhetorical theory from Plato to present.

465 Studies in Rhetorical History and Criticism (3) May be repeated. Maximum 6 hrs.

466 Rhetoric of the Women's Rights Movement (3) Historical and critical study of public address in campaigns for women's rights from 1830's to present. (Same as Women's Studies 466.)

470 Theories of Argumentation (3) Studies of conceptual bases of argumentation from classical to contemporary theorists. Prereq: Consent of instructor.

480 Ensemble Interpretation (3) Study and presentation of literary texts through group performance.

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

502 Registration for Use of Facilities (3-16) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

505 Fundamentals of Graduate Research in Speech Communication (3) Techniques of historical, descriptive and experimental research.

510 Studies in Persuasion (3) Prereq: 310 or equivalent or consent of instructor.

530 Topics in Group and Interpersonal Communication (3) Prereq: 320, 330, 420, or consent of instructor. May be repeated. Maximum 6 hrs.

550 Communication Theory (3) Analysis of contemporary theories of human communication; similarities and differences of communication processes in intrapersonal, interpersonal, small group, organizational, and public communication. Prereq: 350 or equivalent or consent of instructor.

560 Studies in Rhetoric (3) Content varies. Prereq: 460 or consent of instructor. May be repeated with consent of department. Maximum 9 hrs.

570 Legal and Ethical Issues of Communication (3) Communication rights and responsibilities. Prereq: Consent of instructor.

575 Directing the Forensics Program (3) Philosophy and methods of directing competitive and extracurricular forensic activities in high schools and colleges: competitive and noncompetitive approaches to directing debate, oral interpretation and public speaking events.

580 Theory and Production Techniques of Oral Interpretation (3) Literary, psychological, communicative, and aesthetic approaches to collection, adaptation, and oral presentation of literature. Prereq 380, 385, 480, or consent of instructor.

590 Directed Reading and Research (3) May be repeated. Maximum 6 hrs.

591 Foreign Study (1-15) See page 51.

592 Off-Campus Study (1-15) See page 51.

593 Independent Study (1-15) See page 51.

Statistics

(College of Business Administration and Intercollegiate Program)

MAJORS

Statistics ........................................ M.S.

Business Administration .................. MBA

David L. Sylwester, Chair

Professors:

Downing, Darryl L. (Adjunct), Ph.D. .......... Florida
McLean, Robert A., Ph.D. ..................... Purdue
Parr, William C., Ph.D. ....................... Southern Methodist
Philpot, John W., Ph.D. ............ VPI
Sanders, William L. (Adjunct), Ph.D. ........ Tennessee
Sylwester, David L., Ph.D. .................. Stanford
Thompson, Charles O., Ph.D. ............... VPI

Associate Professors:

Guess, Frank M., Ph.D. ...................... Florida State
Mee, Robert W., Ph.D. ....................... Iowa State
McGuire, Stephen S. (Adjunct), Ph.D. .... Kansas State
Ranney, Gipsie B. (Adjunct), Ph.D. ........ NC State
Sanders, Richard D., Ph.D. ................. Texas
Wright, Tommy (Adjunct), Ph.D. .......... Ohio State
Younger, M. S., Ph.D. ...................... VPI

Assistant Professors:

Leitnaker, Mary G., Ph.D. .................. Kentucky
Lin, Dennis K. J., Ph.D. .................... Wisconsin
Walker, Esteban, Ph.D. ..................... VPI

Lecturer:

Schmidhammer, James L., Ph.D. .......... Pittsburgh
**Curriculum**

A minimum of 33 credit hours must be completed for the Master's degree. Required of all students are 6 hours in statistical methods, 6 hours in statistical theory, 1 hour in statistical computing, and 3 hours in either supervised consulting or internship. Students must complete a minimum of 21 hours in approved statistics courses, exclusive of consulting, internship, independent study, or thesis.

**Thesis or Independent Study**

The thesis option for the Master's degree requires the student to complete 6 hours for the thesis. Alternatively, the non-thesis option requires a minimum of 3 hours for an independent study project.

**Comprehensive Examination**

Students must pass a two-part written comprehensive examination covering 1) theory and 2) methods. Upon failing either part of the examination, the student may retake it. The result of the second examination is final. For students writing a thesis, this examination must be passed before the thesis is defended.

**INTERCOLLEGIATE GRADUATE STATISTICS PROGRAM**

The Intercollegiate Graduate Statistics Program is a formal University of Tennessee academic program established to recognize graduate students for completing the requirements of a major or minor in Statistics as part of their degrees. The program enables a student to obtain the M.S. in Statistics simultaneously with the Ph.D. or Ed.D. in another department. The program also enables a student to obtain a Statistics minor along with the M.S., Ph.D., or Ed.D. in another department. The program is administered by an executive committee with advisory input from the program faculty. The program is open to well-qualified graduate students in all departments which have an approved Statistics minor and/or joint major curriculum offered through the program. The program is designed to provide a well-rounded education in statistics.

Curriculum requirements for the statistics component of each joint degree are specified in terms of completion of alternative sequences of course options. Course options consist of courses in statistics, offered either by the Department of Statistics or by other departments, that have been approved and supervised by the Executive Committee. Interested students should contact their major department head for information on specific course requirements.

**General Admission Requirements**

1. The student's sponsoring department must have established with the executive committee an approved joint degree program along with specified sequences of statistics courses taught by the Statistics Department and/or other departments.
2. The student's Admission to Candidacy form must contain all courses required for the Statistics minor/major set off in a group and labeled "Statistics courses required for the minor/major."
3. In many cases, a student may not decide to apply for participation in the program until he/she has completed two or three statistics courses. In that case the student's major professor should file a program change with the cooperating departments and assist the student in obtaining a Statistics Department faculty member to serve on the student's committee.

**Degree Requirements**

The program offers the M.S. in Statistics with a minor in another department, a joint major program in which the student earns a Master's or doctoral degree in the student's sponsoring department along with the M.S. in Statistics, and a joint major and minor program in which the student earns a Master's or doctoral degree in the student's sponsoring department along with a minor in Statistics. The table below presents the minimum number of semester hours in statistics for each of these alternatives. The hours do not represent the minimum required for the degree program. The student selects courses to satisfy the requirements established by the student's sponsoring department and approved by the Program Executive Committee.

The student's committee must include a faculty member of the Statistics Department at the rank of Assistant Professor or above. The student's formal examination procedure as established by the sponsoring department must include an appropriate section on statistics. Successful completion for the Statistics minor/major is recognized by appropriate documentation on the student's transcript. Students who do not complete all requirements for the Statistics minor/major will still receive academic credit for statistics courses they have successfully completed.

**Degree Program:**

- M.S. in Statistics, minor outside of Statistics
  - Hours*
    - M.S. in Statistics, minor outside of Statistics: 21
    - M.S. outside of Statistics, minor in Statistics: 8
    - M.S. outside of Statistics, usual separate Statistics requirements for both degrees: 16
    - Doctorate outside of Statistics, minor in Statistics: 24
    - Doctorate outside of Statistics, minor in Statistics: 24
    - M.S. in Statistics: 4

*Approved Statistics courses from the Department of Statistics and/or other departments.

**Course taken for the minor or the Master's degree in Statistics may fulfill requirements for the doctoral degree. Contact the home department for details.

**BUSINESS ADMINISTRATION CONCENTRATION**

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

**MBA Concentration: Statistics.**

Minimum course requirements are 571, 566, 572 with prerequisite coreq of 561.

**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 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 semesters' coursework as established by the degree program for part-time students.
GRADUATE COURSES

411 Introduction to Statistical Computing (3) Use of computer operating system commands and packaged programs for statistical analysis and file management. Not available for credit for statistics majors. Prereq: 201 or 251.


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

501 Statistics for Management (3) Fundamentals of descriptive and inferential statistics. Introduction to probability models, statistical inference: statistical process control, correlations and regression, basic time series. Open only to MBA students.

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

531 Statistical Methods for the Social Sciences I (3) Probability, sampling distributions, parametric and nonparametric estimation and hypothesis testing, simple linear regression and correlation. Credit not given for both 531 and 537. Prereq: 1 yr of undergraduate mathematics and 1 course in statistics.

532 Statistical Methods for the Social Sciences II (3) Multiple regression and correlation, use of dummy variables, General Linear Model, analysis of variance and covariance. Prereq: 531.

537 Statistics for Research in the Behavioral and Biological Sciences I (3) Principles and applications of statistical methodology, introduced with considerable use of major statistical computing system. Probability and probability distributions, forming and testing hypothesis, emphasis on nonparametric and nonparametric inference methods. Matrix-based simple linear regression and correlation. Career in research. Credit not given for both 531 and 537. Prereq: 1 yr undergraduate mathematics and 1 undergraduate statistics course.

538 Statistics for Research in the Behavioral and Biological Sciences II (3) General linear model as applied to multiple regression and analysis of variance, Diagnostic and influence techniques. One-way, factorial, blocking, and nested designs, planned versus post hoc contrasts. Random factors and repeated measures. Prereq: 537.

561 Introduction to Computing for Data Management and Analysis (1) UTK computing environment for beginning graduate students; use of operating system commands, system software, utility programs and major statistical package, SAS, for data entry and editing, file management, and statistical analysis in interactive and batch environments. IBM CMS, and MVS. Use of main computers for statistical analysis. Coreq: 531, 537, or 571, or consent of instructor.


564 Theory of Statistical Inference (3) Introductory theory underlying common statistical procedures of hypothesis testing and estimation. Prereq: 563.

566 Statistical Techniques in Industrial Processes (3) Applications of control charts and other statistical techniques in industrial setting. Attributes and variables control charts, process capability analysis, aspects of sampling, statistical tolerance, estimation of variance components, problems of measurement, special industrial applications. Prereq: 571 or equivalent.


572 Applied Linear Models (3) Simple and multiple linear regression using matrix algebra and general linear model; polynomial regression, weighted least squares regression, variable selection techniques, multicollinearity, regression diagnostics, general linear model approach to analysis of data from designed experiments. Use of standard computer packages. Prereq: 571 and matrix algebra.

573 Design of Experiments (3) One-way ANOVA, multiple range tests, equal and unequal variances, transformations; factorial experiments, completely randomized designs, analysis of covariance, split-plot and nested designs, fractional factorials, sequential designs. Prereq: 571.

585 Principles of Statistical Process Management (3) Control charts and other statistical techniques applied to management of business processes. Prereq: Consent of department head.

587 Graduate Seminar (1) Directed readings and active participation in colloquium program of Department of Statistics and of student's minor program. Prereq: Consent of statistics department director of graduate studies. May be repeated. Maximum 2 hrs. S/NC only.

592 Internship (1-6) Supervised off-campus experience in application of statistical principles and methods in business, industry, or government. Written and oral report. Prereq: 1 course in graduate-level statistics and consent of statistics department director of graduate studies. May be repeated. Maximum 6 hrs. S/NC or letter grade.

593 Independent Study (2-6) Faculty directed readings and investigation of specified topic in probability or statistics. Written report and oral presentation. Prereq: 2 courses in statistics and consent of the statistics department director of graduate studies. May be repeated. Maximum 6 hrs. S/NC only.

595 Statistical Consulting Practicum (1-6) Supervised experience helping on-campus researchers plan, manage data, and develop and perform analyses specific to designs and hypotheses. Discussion of activities in regular seminar meetings. Final written reports and/or detailed diaries. Prereq: 572 or 573. May be repeated. Maximum 6 hrs. S/NC or letter grade.

671 Applied Multivariate Methods (3) Methods based on multivariate general linear model: analysis of covariance, discriminant analysis and classification, multivariate analysis of variance, and multivariate analysis of variance, experience using SAS or SPSS from terminals.

673 Linear Models (3) Review of full rank models and methods of variance component estimation from unbalanced designs; factorial experiments, completely randomized designs, analysis of covariance, split-plot and nested designs, fractional factorials, mixed model; polynomial regression, weighted least squares regression, variable selection techniques, multicollinearity, regression diagnostics, general linear model approach to analysis of data from designed experiments. Use of standard computer packages. Prereq: 571 and matrix algebra.

675 Categorical Data Analysis (3) Log-linear analysis and analysis of variance component estimation from unbalanced data. Prereq: Analysis of variance.

679 Catagorical Data Analysis (3) Log-linear analysis of multidimensional contingency tables. Logistic regression. Theory, applications, and use of statistical software. Prereq: 1 yr graduate-level statistics, regression analysis and analysis of variance and familiarity with CMS or VAX, or consent of instructor.

681 Special Topics in Probability (1-3) Presentation of specialized topics in probability and stochastic processes. May be repeated. Maximum 6 hrs.

683 Special Topics in Statistics (1-3) Presentation of specialized topics in statistics. May be repeated. Maximum 6 hrs.

694 Biostatistics (3) Biostatistical methods. Applications in medical and health sciences. Seminar in biostatistics. Prereq: Consent of instructor.

697 Graduate Seminar (2-6) Seminar in advanced topics of current interest to students. Prereq: 2 courses in graduate-level statistics and consent of the statistics department director of graduate studies. May be repeated. Maximum 6 hrs. S/NC or letter grade.

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

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

MAJORS

DEGREES

Technological and Adult Education

(College of Education)

MAJORS

DEGREES

Technological and Adult Education

M.S.

Ed.D.

Vocational-Technical Education

Ed.S.

Education

Ph.D.

Gerald D. Cheek, Head

Professors:

Cameron, W. A., Ph.D.................Ohio State

Campbell, G. P., Ph.D...............Maryland

Cheek, Gerald D., Ph.D.............Kansas State

Coakley, Carroll B., Ph.D........Wisconsin

Craig, D. G., Ed.D..................Cornell

Haskell, R. W., Ph.D..............Purdue

Matthews, John L., Ph.D...........Arizona State

Peterson, John M., Ed.D...........NC State

Reed, J. L. (Emeritus), M.S........Oklahoma State

Wagoner, George A. (Emeritus), M.S........Indiana

Woodin, R. J. (Emeritus), Ph.D....Ohio State

Associate Professors:

Brewer, Ernest, Ed.D..............Tennessee

Brockett, Ralph, Ph.D...............Syracuse

Hanson, R., Ph.D....................Purdue

Kasworm, Carol, Ed.D..............Georgia

Ledford, B. J., Ed.D..............Tennessee

Mann, E. C., Ed.D.................Penn State

Petty, G., Ph.D....................Georgia

Raddcliffe, B. J., M.S..............West Virginia

Assistant Professors:

Pierce, R., Ph.D...........Ohio State

Powell, Terrence L., M.S............Oklahoma

Reynolds, Eunice, Ed.D............Tennessee

THE MASTER'S PROGRAM

The Department of Technological and Adult Education offers graduate programs leading to the Master of Science with a major in Technological and Adult Education. The program is available with concentrations in adult education, business and marketing education, industrial education, industrial training, and vocational-technical education. The thesis option requires the completion of 33 semester hours including 6 hours of thesis. The nonthesis option requires the completion of 36 hours of coursework. Details and specific requirements for the various degree options may be obtained from the coordinators of the service areas.

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 technological and adult education.

THE DOCTORAL PROGRAM

The comprehensive Ed.D. program in the department is designed to provide opportunities for graduate students to achieve professional objectives, develop needed competencies, and gain desirable experiences and understanding of technological and adult education.
and adult education. Review of studies unique to technological and adult education. Prereq: 12 hrs of graduate credit. F,Su
505 Selection, Placement, and Follow-up Procedures in Technological and Adult Education (3) Methods and procedures utilized in establishing criteria for trainee selection and placement in instructional programs and in evaluating, analyzing, and reporting follow-up data appropriate for making program improvements. Prereq: Consent of instructor. Sp,Su
506 Adult Continuing Education: A General Survey (3) Historical development, philosophies of adult education agencies, associations, programs, issues, and literature illustrating process of adult education and diversity of continuing education. Prereq: Consent of instructor. F,Su
509 Internship in Technological and Adult Education (3) Practical field experiences in selected settings under supervision of practitioner and departmental representative. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
510 Foundations of Technological and Adult Education (3) Theoretical, philosophical, economic, social, and psychological foundations of vocational, technical and adult education; fundamental principles and contemporary objectives. Prereq: Consent of instructor. F
511 Issues and Trends in Technological and Adult Education (3) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E
514 Individual Study in Technological and Adult Education (3) Prereq: Consent of supervising instructor. Approval form must be filed in office of department head. May be repeated. Maximum 6 hrs. E
516 Microcomputer Operations and Programming in Education (3) Operating procedures and BASIC programming for education and training applications. Hands-on experience in operating and programming microcomputers, writing, debugging, and running educational programs using sequential data files. Prereq: Teaching, administrative, or related experience in education or training, or consent of instructor. E
518 Education Specialist Research and Thesis (3) Selective research problems in teaching of business and marketing education and related areas. Prereq: Consent of instructor. E
532 Improvement of Instruction in Business and Marketing Education (3) Issues, research findings, methods, and models; improved instruction of both secondary and post-secondary levels. Prereq: 12 hrs of graduate credit. Sp,Su
533 Improvement of Instruction in Office Technology (3) Research, principles of learning issues, and methods of evaluating trade associations, employment agencies, business groups, and advisory committees in program implementation. Prereq: Consents of instructor. F,Su
535 Curriculum in Business and Marketing Education (3) Curriculum designs in career, secondary, post-secondary education. Legislation, technology, social, economic and research results that affect business and marketing education. Prereq: Consent of instructor. Sp,Su
536 Organizing and Teaching Adult Business and Marketing Education (3) Planning, organizing, promoting, teaching and evaluating continuing education programs in business and marketing education; utilizing trade associations, employment agencies, business groups, and advisory committees in program implementation. Prereq: Consents of instructor. F,Su
537 Measurement in Business and Marketing Education (3) Testing and evaluation of learner performance in business and marketing education, and preparation of teacher-made tests. Prereq: Consent of instructor. Sp,Su
540 Special Topics in Business and Marketing Education (1-3) Specific objectives, activities, and evaluations vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
541 Practicum in Business/Marketing Education (3) Preceptor supervision. Student applying theory to practice, and interfacing with business and marketing teachers. Prereq: 15 hrs of graduate credit. E
542 Problems in Business and Marketing Education (3) Specific research problems in teaching of business and marketing education and related areas. Prereq: Consent of instructor. E
550 Administration of Industrial Education Programs (3) Developing, staffing, administering and evaluating trade, industrial and technical education programs in secondary and post-secondary school settings. Prereq: Consent of instructor. Sp,Su
551 Supervision of Industrial Education Programs (3) Principles used to improve industrial education programs, staff development, curriculum improvement and program updating techniques. Prereq: 455 or equivalent. F,Su
552 History and Philosophy of Industrial Education (3) Social, political, and economic events that impact development of industrial education. Philosophical problems: justification, values, principles and concepts of industrial education. Prereq: Consent of instructor. F,Su
553 Planning Technical Education Facilities (3) Preparation of educational specifications, site selection, and working relationships with other professionals involved in planning of training-technical education facilities. Prereq: Consent of instructor. Sp,Su
554 Technical Program Planning (3) Instructional systems attending to analysis, design, development, implementation, and evaluation of technical education programs. Prereq: 112 or consent of instructor. Sp,Su
555 Curriculum Planning for Industrial Education Programs (3) Developing performance-based, criteria-referenced instructional programs. Prereq: 374 or 554 or consent of instructor. Sp,Su
556 Staff Development Programs (3) Strategies for assessing, planning, and implementing programs for professional development of vocational-technical personnel. Prereq: 551 or consent of instructor. Sp,Su
557 Advanced Methods of Teaching Technical Subjects (3) Proper selection and effective application of innovative methods and teaching specialized skills and

Technical and Adult Education 159
TEXTILES, MERCHANDISING AND DESIGN

MAJORS

INTERIOR DESIGN

The Department of Textiles, Merchandising and Design offers a Master's degree in Interior Design. This program is accredited by the Foundation for Interior Design Education Research (FIDER). The program of study will provide a balance between creative and theoretical foundations of the field. The goal of the graduate program in interior design is to provide the student with scholarly and professional experiences through seminars, studio work, and research. Interdisciplinary thrusts will increase the depth of understanding of the field of interior design essential to function as educators or as independent professionals.

Areas of emphasis within interior design may include: history and theory of interior design, computer-aided design, and human environment interaction. Supporting courses are available in lighting, furniture design, business practices, etc.

ADMISSION REQUIREMENTS

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

In addition to specified entrance requirements stipulated by The Graduate School, admission to the graduate program in Interior Design requires: 1) a background in interior design, 2) a cumulative GPA of 3.0 or above (on a 4.0 scale), and 3) a portfolio of undergraduate studio work (and professional work, if applicable) submitted to the department. The portfolio may include slides or original work. It is recommended that deficiencies in preparation, as identified in the admission process, be removed prior to full admission to the graduate program. Superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the department's graduate faculty.

ACADEMIC STANDARDS

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

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

THE MASTER'S PROGRAM

Major (Required courses: 510, 552, 562, 564, 690) 18-21 hours

Cognate Area 9 hours

Research Methods 3 hours

Thesis 6 hours

TOTAL 36 hours

A comprehensive oral examination, administered by the thesis committee, will occur upon completion of thesis research.

A non-thesis option is not available.

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 Interior Design is available to residents of the states of Kentucky or Louisiana. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records. For the Ph.D., see Human Ecology.

GRADUATE COURSES

410 Environment as Code (3) Advanced theoretical issues in considering environment as medium of human communication. Prereq: 200, 400 or consent of instructor. Sp, A

475 History of American Interior Architecture (3) Major styles of interior architecture, decoration, and...
Textiles and Apparel

The Department of Textiles, Merchandising and Design offers the Master's degree. Students are expected to have a good foundation in one of these areas to enter the program. The program of study will prepare students for careers in industry, business, public and private agencies, and educational institutions. Interested students should contact the department head for more information.

ADMISSION REQUIREMENTS

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

ACADEMIC STANDARDS

Each graduate student will be evaluated at the end of the second semester (or after completing a minimum of 18 graduate hours). If the student's GPA is below 3.0, the faculty may recommend probation with specific goals set for a specified time or termination.

THE MASTER'S PROGRAM

Major (Required courses: 540, 550/552*, 580, 590)

Cognate Area

Statistics 3 hours

TOTAL 15 hours

*Students with textile science background must take 550; students without it must take 552.

A comprehensive oral examination, administered by the thesis committee, will be given upon completion of the thesis research.

A non-thesis option is not available.

THE PH.D. CONCENTRATION

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

1. Nineteen hours in required textiles and apparel courses: 550, 552, 540, 590, 641, 685, and 695;

2. College Professional Seminar, Human Ecology 610;

3. Research Seminar, 590. Attendance at seminar is required for all full-time students;

4. Nine credit hours in research methods including 6 hours of 500-level statistics;

5. Nine hours of University electives;

6. Textiles and apparel courses in area of specialization (16-20 hours); and

7. Dissertation (24 hours).

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

592 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 International Retail Systems (3) Acquisition and management of information for retail decision; analytical decision making skills; and retail management. May be repeated. Maximum 9 hrs. F

520 Textile Microscopy and Physical Testing (3) Optical and electron microscopic techniques for textile fibers, yarns and fabrics. Methods and equipment used in physical testing following approved textbook standards. prerequisite: 522 or consent of instructor. May be repeated. Maximum 9 hrs. Sp

522 Fiber Chemistry (4) Chemistry of textile fibers; structure, preparation and reactions; dying and finishing of fabrics. Introduction to color science. Prerequisite: Organic chemistry 2. 8 hrs and 4 labs. Sp

524 Advanced Textile Dyeing and Finishing (4) Chemistry, processing and fastness of chemical finishes and various classes of dyes on different fibers. Prereq: 522 or consent of instructor. 2 hrs and 4 labs. Sp

525 Physical Properties and Processing of Textiles (3) Methods and mechanics of processing staple and continuous filament yarns; mechanics of deformation of fibers, yarns and fabrics; physical behavior and textile structure. Prereq: Engineering Science and Mechanics 321, Mathematics 142, or equivalent.

530 New Technology in the Textile/Apparel Industry (3) Innovations in equipment which affect textile and apparel industries; computer-aided design and computer applications; improvements which give U.S. industry competitive edge. Field trips. Prereq: Computer literacy.

540 Socio-Psychological Aspects of Apparel (3) Apparel and human behavior in social situations. Prereq: 6 hrs or equivalent from sociology and psychology.

546 Fashion Development in Historic Perspective (3) Style in relation to contemporary conditions (cultural determinants): commerce, economics and social phenomena.

548 International Textiles (3) Development of traditional and historic textiles; influence of culture, economics and commerce. Prereq: 3 hrs textiles.

550 Consumer Economics and Market Choices (3) Economic framework for evaluating consumer behavior and consumer choice within market system. Theory of consumer decision making and consumer behavior; economic and psychological demand models for individuals and households; international consumer economics, issues and policies. Prereq: 330 or consent of instructor. Maximum 9 hrs. E

552 Textile Economics and Technology (3) New developments in processing textile fibers, yarns and fabrics into consumer products. Economic development and analysis of textile complex; economic and functional performance and consumer issues; U.S. and international focus.

560 Research Methods in Textiles, Apparel and Design (3) Fundamentals of scientific research methods; issues of applied research in textiles, apparel and interior design.

590 Research Seminar (1) Research topics in textiles and apparel. S/NC only. E, Sp
563 Directed Study (1-3) Individual problems in textiles, merchandising or apparel. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 3 hrs.

565 Advanced Topics in Textiles and Apparel (1-3) Lecture, group discussion on specialized topics: apparel production management, functional design, handi-
crafted/elderly, historic textiles, international issues, non-wovens, thermal properties. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs. Su

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

625 Physical Chemistry of Fibers (3) Physical chemistry of fibers and fiber forming polymers; surface chemistry and thermal properties. Prereq: 522, Mathematics 231, or equivalent.

626 Physics of Fiber Structures (3) Morphology of polymeric structures; thermal and processing history on mechanical, electrical and chemical properties of fibers. Prereq: 522, Physics 231 and Mathematics 231 or equivalent.

641 Social and Psychological Theories of Apparel Consumption (3) Theories and concepts from social science, fashion; consumer behavior in relation to app-
arel. Prereq: 540 and 6 hrs of sociology and/or psychol-
ogy, or consent of instructor.

651 The Consumer and Public Policy (3) Economic, social, legal and political framework for policy decisions; economic evaluation of policies that affect consumer. Economic implications for societal groups, disadvan-
taged. Prereq: 550 or 552, or consent of instructor.

685 Integrative Design: Development and Marketing (3) Systems-oriented approach to strategies involved in product development; methods for identifying critical fac-
tors central to decision making and techniques for syn-
thesizing information. Prereq: 24 hrs graduate course-
work. May be repeated. Maximum 3 hrs.

695 Advanced Topics in Textiles and Apparel (3) Lecture, group discussion, individual research on advanced topics and research areas of current signifi-
cance: future direction, professional issues, theoretical approaches. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs.

The Department of Theatre offers the Master of Fine Arts in Theatre with area concentrations in acting/directing, playwriting/dramaturgy, and design/technical production. Applicants must have completed under-
graduate degrees approximately equivalent in requirements to those specified for degrees conferred by The University of Tennessee, Knoxville.

The Graduate Record Examination is re-
quired of all applicants as well as a written comprehensive exam, usually administered in the second year of residence. All M.F.A. applicants must submit three letters of rec-
ommendation. Interviews with appropriate fac-
ulty are required of all applicants. Applicants for admission to M.F.A. design/technical theatre and playwriting/dramaturgy programs must submit samples of their work.

For detailed information about the graduate program, contact the Director of Graduate Stud-
ies, Department of Theatre.

THE MASTER'S PROGRAM

At least 60 semester hours, 40 of which must be at the 500 level or above are required for the degree. The Master of Fine Arts with a major in Theatre, which normally is to be completed in three consecutive years of full-time residence. Theatre 501 is required for the first semester of residence. Also required are Theatre 401, 310-11, and at least 3 hours in dra-
matic theory and criticism. 310-11 may be wa-
ived by proficiency examination. Students passing this examination must complete 6 hours in advanced theatre history and dramatic theory/ criticism, including at least one course from each of the two areas.

Students in the MFA program are evalu-
ated annually by juried performance or portfolio submission. The program is with the approval of the faculty committee for the MFA program. Satisfactory completion of the comprehensive examination is prerequisite to entry into the third year. Thesis or oral defense (Theatre 500, 6 hours) must be completed satis-
factory before the degree is conferred.

In addition to the core requirements listed above, each area of concentration has specific requirements.

Design/Technical Production

Required courses are at least 12 hours of 580 Design and Technical Production Seminar, and at least 3 hours in the projects courses. Theatre 401 Principles of Design is required the first year of residence. Theatre 430 Play Direct-
ing is required of scene design students lacking an appropriate undergraduate foundation in di-
recting.

Acting

Theatre 520-21-22-23-24-25 Master Class are required, along with one course in directing and two hours each in voice and dance.

Directing

Required are 430 Directing, 520-21-22-23-
24-25 Master Class, and 3 hours of 536 Projects.

Playwriting

Required are 470-71 Playwriting, at least 12 hours of 573 Playwriting Seminar, and at least 3 hours of 585 Production Workshops.

Dramaturgy

An additional two courses in dramatic the-
ory and criticism are required as are Theatre 570 Dramaturgy: Theory and Practice, at least 6 hours of 585 Production Workshops, 430 Play Directing, 3 hours of 536 Projects in Directing, and 12 hours of 573 Seminar and Projects. In addition, students must select an arts and humanities specialization comprising at least one year of language study plus 6 hours in the selected area.

REQUIREMENTS FOR SECOND MASTER'S DEGREE

Students admitted to the MFA program who have already earned a Master's or a doctoral degree may apply up to 12 credit hours from the previous graduate program to the MFA degree with approval of the student's committee, the Dean of the College of Liberal Arts, and the Dean of The Graduate School.

Any such credits applied from a previous graduate program would be from courses that are directly relevant to the student's MFA curriculum and must have been earned within the time limit (6 years) established for comple-
tion of the MFA degree.

GRADUATE COURSES

401 Principles of Theatrical Design (3) Fundamental principles of design; visual and structural relationships. Projects assigned to develop understanding and percep-
tions.

409 Stage Make-up (3) Problems in make-up design and application, character analysis, physiognomy and chiaroscuro. Prereq: 100

410 Dramatic Theory and Criticism (3) Theatre aesthetics from Aristotle to present.

420 Special Studies in Acting (3) Content varies. Exercises in selected acts concentrated on styles, techniques, approaches, e.g., Shakespeare, movement, humor. Prereq: Advanced Acting and cons-
sent of instructor. May be repeated. Maximum 9 hrs.

426 Applied Phonetics (3) Development of skills in transcription and reproduction of principal varieties of English Language in North America and Great Britain and selected foreign languages in North America. Prereq: Consent of instructor.


445 Advanced Costume Construction (3) Advanced studies in construction technique, tailoring, vacuum forming, plastic molding, and cobbling. Prereq: 345 or consent of instructor.

446 Costume Pinning (3) Draping patterns for pe-
riod costumes. Corsetry and study of historical patterns 1500-1900. Prereq: 345 or consent of instructor.

450 Advanced Scenory Technology I (3) Study and practice of theatre woodworking; production participa-
tion required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

451 Advanced Scenory Technology II (3) Study and practice of metalworking and plastics for theatrical pro-
ductions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

452 Advanced Scenory Technology III (3) Study and practice of stage rigging for theatrical productions; pro-
duction participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

454 Scenory Painting (2) Introduction to materials, techniques, and principles of craft. Gaining skill and understanding through studio experience. Prereq: Con-
sent of instructor.

460 Advanced Lighting and Sound Technology (3) Projects in lighting and sound coordination. Opera, dance, musical theatre, and "rock videos." Final projects of live productions. Developing artistic sensitivity and subtleties in control. Prereq: 260 or consent of instructor.

461 Special Effects in Lighting and Sound (4) Projects in special effects, creative application of technology. Problem solving, drafting, and execution of effects for production. Production participation required. Prereq: 260 or consent of instructor.

462 Advanced Lighting Design (3) Advanced problems in lighting design and theory, lighting musical theatre, opera, and dance. Prereq: 362 or consent of instructor.

463 Sound Design (3) Sound design for performing arts. Review of equipment and acoustical factors that affect sound production. Sound design plotted from selected plays. Final projects mixed, edited, and cues for production.

465 Introduction to Lighting Design for Non-Designers (3) Theory and practice of stage lighting design, relationship between designers and non-practitioners: directors, actors, choreographers, architects, etc.

470-71 Playwriting (3,3) Advanced instruction in writing of plays. Prereq. Consent of instructor.

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

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


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

501 Introduction to Graduate Research in Theatre (3) Research tools and methods for theatre artist and scholar.

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 Studies in Theatre History (3) Intensive study of selected topics in theatre history. May be repeated. Maximum 9 hrs.

520-21-22-23-24-25 Master Classes in Acting (4,4,4,4,4,4) Master classes in acting techniques, voice, and movement. Theatre MFA students only.

536 Projects in Play Directing (3) Practical work in play directing involving various lengths and kinds of scripts. May be repeated. Maximum 9 hrs.

539 Play Production in the Secondary Schools (3) Principles and methods for directing high school dramatic programs.

542 The Social History of Costume (3) Study and analysis of costume as related to society's manners and mores, architecture and furniture.


544 Millinery for the Stage (2) Pattern making and construction techniques for hats from antiquity to present. Prereq: Consent of instructor.

546 Advanced Costume Pattern Making (3) Advanced studies in patterning period costume. Development of historical patterns through flat pattern method. Prereq: 446.

549 Projects in Costume Technology (1-3) Individualized studies in costume technology in theatre production. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


553 Projects in scenic design (1-3) Conception and completion of major projects, both hypothetical and actual, in scenic design. May be repeated. Maximum 9 hrs.

554 Studies in Scenic Design (3) Advanced scenic design techniques and approaches to design for complex dramas and varied dramatic forms. May be repeated. Maximum 6 hrs.

560 Projects in Lighting Design (1-3) Conception and completion of major projects, both hypothetical and actual, in lighting design. Prereq. Consent of instructor. May be repeated. Maximum 9 hrs.

562 Special Problems in Lighting Design (3) Advanced problems in lighting design and theory, problems in Broadway production and touring. Prereq: 462 or consent of instructor. May be repeated. Maximum 9 hrs.

563 Projects in Sound Design (1-6) Production assignment as sound designer on approved play and/or relevant projects in field of sound design/history/methodology. Prereq: 463 or approval of instructor. May be repeated. Maximum 9 hrs.

570 Dramaturgy: Theory and Practice (3) Methods and materials. Prereq: Consent of instructor.

571 Seminar & Projects in Dramaturgy (3) Directed study and experience. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

573 Seminar in Playwriting (3) Exercises and projects tailored for advanced students in playwriting. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

575-76 Studies in Dramatic Theory and Criticism (3,3) Broad-based study of major ideas about drama.

580 Design and Technical Production Seminar (1-6) Selected aspects of scene design and technical production. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

585 Production Workshops (1-6) Directed experience in production collaborations. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


599 Project and Thesis (1-6) Available to theatre MFA students only. Prereq: Minimum of 30 hrs toward MFA degree and consent of advisor. May be repeated. Maximum 9 hrs.

Transportation

See Marketing, Logistics and Transportation

Urban Practice

(College of Veterinary Medicine)

MAJOR

Veterinary Medicine D.V.M.

D. J. Krahkinkel, Head

Professors:

Brace, J., D.V.M. California (Davis)
Bright, R. M., D.V.M. Ohio State
Dorn, A. S., D.V.M. Illinois
Krahkinkel, D. J., D.V.M. Auburn
Legendre, A. M., D.V.M. Auburn

Associate Professors:

DeNovo, R. C., Jr., D.V.M. Illinois
Gompf, R. E., D.V.M. Ohio State
Paddiford, R. R., D.V.M. Missouri
Seiler, R. G., D.V.M. Texas A&M
Wiegel, J. P., D.V.M. Colorado State

Assistant Professors:

Bright, J. M., D.V.M. Purdue
Brooks, D. E., D.V.M., Ph.D. Florida
Daniel, G. B., D.V.M. Auburn
Harvey, R. C., D.V.M. Tennessee
Jenkins, C. C., D.V.M. Tuskegee
Laratta, L. J., D.V.M. Michigan State
Pardo, A. D., D.V.M. California (Davis)
Schmeitzel, L. P., D.V.M. Auburn

Clinical Associate:

Avgeris, S., D.V.M. Auburn

Clinical Research Associate:

Sackman, J. E., D.V.M. Michigan State

Residents:

Abrams, K., D.V.M. Oklahoma State
Cook, S., D.V.M. Minnesota
Grachler, R., D.V.M. California (Davis)
Hawks, D., D.V.M. California (Davis)
Hodges, R., D.V.M. Tuskegee
Hoskinson, J., D.V.M. Washington State
Okrasinski, E., D.V.M. Georgia
Purvis, D., V.M.D. Pennsylvania
Ross, W., D.V.M. Tufts
Thompson, L. D., D.V.M. Auburn

Intern:

Bradley, D., D.V.M. Ohio State

See Veterinary Medicine for program description.

GRADUATE COURSES

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

501 Special Topics in Small Animal Medicine and Surgery (1-4) May be repeated. Maximum 6 hrs. E

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

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

Veterinary Medicine

(College of Veterinary Medicine)

MAJOR

Veterinary Medicine D.V.M.

Comparative and Experimental Medicine M.S., Ph.D.

THE PROFESSIONAL PROGRAM

Admission Requirements

To qualify for admission to the professional program of the College of Veterinary Medicine, a candidate must have completed at least the minimum pre-veterinary requirements listed below. These may be met at any accredited college or university that offers courses equivalent
to those at The University of Tennessee, Knoxville, and must be completed by the end of spring term of the year in which the student intends to enroll. Biochemistry requirements must have been satisfied within five years of the time the student wishes to enter the program.

**Subject Area**  
**Semester Hours**

- **Calculus:** 6
- **Physics:** 8
- **General Chemistry:** 8
- **Organic Chemistry:** 8
- **Biochemistry:** 4
- **General Biology:** 8
- **Genetics:** 3
- **Cellular Biology**: 3

**TOTAL:** 72

*May include, for example, courses in English literature, speech, music, art, philosophy, religion, language, history, economics, anthropology, political science, psychology, sociology and geography.

**Exclusive of laboratory.

**It is expected that this requirement will be fulfilled by a course in cellular or molecular biology. An appropriate microbiology course may be approved if cellular or molecular biology is not offered.

**Admission Procedures**

Admission of new students is for the fall semester, with first priority given to residents of Tennessee.

Forms and instructions for making application for admission may be obtained, after September 1 each year, from Director of Admissions, 201 Student Services Building, The University of Tennessee, Knoxville, TN 37996-0200.

Applications must be completed and mailed in time to reach the UT Knoxville Director of Admissions by January 15 each year. All supporting documents, official transcripts, Veterinary College Admission Test (VCAT) (formerly VAT) results from a test taken with 24 months of the January 15 application deadline date, and letters of reference must arrive not later than 30 days after the application deadline date. NON-TENNESSEE APPLICANTS MUST HAVE A MINIMUM CUMULATIVE GRADE-POINT AVERAGE OF 3.2 ON A 4.0 SCALE.

Applications are accepted only from U.S. citizens or permanent residents of the U.S.

**D.V.M. Curriculum**

The curriculum of the College of Veterinary Medicine is a nine-semester, four-year program. Each class begins in August and graduates four months of the January 15 application deadline date. NON-TENNESSEE APPLICANTS MUST HAVE A MINIMUM CUMULATIVE GRADE-POINT AVERAGE OF 3.2 ON A 4.0 SCALE.

Applications are accepted only from U.S. citizens or permanent residents of the U.S.

The curriculum of the College of Veterinary Medicine is a nine-semester, four-year program. Each class begins in August and graduates four months of the January 15 application deadline date. NON-TENNESSEE APPLICANTS MUST HAVE A MINIMUM CUMULATIVE GRADE-POINT AVERAGE OF 3.2 ON A 4.0 SCALE.

Applications are accepted only from U.S. citizens or permanent residents of the U.S.

The final year (three semesters) is devoted to intensive training in the solving of animal disease problems, including extensive clinical experience in the CVM Teaching Hospital. The final year consists of a series of clinical blocks through which each student will rotate.

An innovative feature of this curriculum is the designation of semester six as one in which the individual student may select his or her courses of study. This format allows select students with an interest in advanced or dual-degree programs to enroll in all, some, or none of the regularly scheduled courses during that semester. Students will be required to complete at least 16 hours in the last hour and three hours will be credited toward the D.V.M. The semester of elective study offers a unique educational alternative for select students in the CVM which is intended to enhance professional growth, concentration and additional career choices.

In addition to education in the science and art of veterinary medicine, students receive instruction in preclinical subjects such as animal behavior, medical communications, professional ethics, jurisprudence, economics, and practice management.

The curriculum requires successful completion of 154 semester credits.

**Extramural Programs**

The opportunity to participate in off-campus learning experiences may be available for a limited number of students during the latter half of the final year of the professional curriculum. Selection of an extramural learning experience requires approval by the department concerned and the College of Veterinary Medicine Curriculum Committee. The extramural program identified by the student and three hours will be a learning experience not available within The University of Tennessee, Knoxville.

**THE GRADUATE PROGRAM**

The College also administers a graduate program involving all departments and leading to the Master of Science and the Doctor of Philosophy degrees. The interdisciplinary departmental administration of the College of Veterinary Medicine, the faculty have opportunities in the graduate programs of other instructional units, including Animal Science (nutrition and physiology), Microbiology (bacteriology, virology and immunology), Ecology (environmental toxicology), Public Health, and Comparative and Experimental Medicine. (Refer to other sections of this catalog for a full description of these programs.) The majority of the graduate students and graduate faculty of the College of Veterinary Medicine are enrolled in the Comparative and Experimental Medicine program (see page 64). This program provides a wide spectrum of interdisciplinary training that prepares graduates to assume positions in biomedical environments and in teaching or research capacities involving humans or animals.

**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. and Ph.D. programs in Comparative and Experimental Medicine are available to residents of the state of Kentucky. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

**PROFESSIONAL COURSES**

811-12 Microbiology II (5.4) Pathogenesis of bacterial, fungal and viral diseases. Study relating microbial structure, metabolism and disease and mode of action of antimicrobials, antibiotics and vaccines. Immunology, study of mechanisms of immune response, infection, diagnostic immunology, and role of immune response.

817 Special Problems in Microbiology (1-8) Extramural and specially designed study for students interested in select topics in bacteriology, mycology, virology and immunology.

821-22 Anatomy II (4.4) Gross and applied anatomy; neural structures of common domestic animals: dog, cat, horse, cow. Dissection of emblamed specimens, prosections, slides, models, and living animals.

823-24 Physiology II (4.4) Introduction to concepts and problems in pharmacology which form base for clinical applications and for formal training in pharmacology, medicine, pathology, and surgery. Cellular, neural, cardiovascular, renal, respiratory, digestive, endocrine, and reproductive physiology.

825-26 Histology/Organology (3.3) Histology and organology of animal body systems, structural and functional interrelationships. Embryonic development from fertilization through organogenesis. Correlated with 823-24.

827 Special Problems in Animal Science (1-4) Extramural and specially designed study for students interested in select topics in anatomy, histology, and physiology.

830 Art of Veterinary Medicine I (1) Preclinical subject important to veterinary practice: practice management, interpersonal relations, communications, jurisprudence, ethics, careers, animal behavior and veterinary history. May be repeated 15C only.

831 Physical Diagnosis (1) Basic care, feeding, restraint, and handling domestic animals. Introduction to physical examination and diagnostic techniques used by veterinarians.

832 Anesthesiology (2) Principles of anesthesiology: pharmacology of anesthetic agents, and introduction to anesthetic techniques in veterinary medicine.

833 Epidemiology/Public Health (4) Principles of epidemiology and public health. Host agent relation ships, public health aspects of veterinary medicine, and risk of veterinary disease to man and livestock.

834 Hemato poetic System (3) Pathophysiology, special pathology, and clinical management of diseases of the hemopoietic and lymphoid organs and tissues. Principles, methods, and laboratory evaluation of diseases from other organ systems.

835 Medical Interaction (2) Multidisciplinary laboratory and lectures of physiologic, pharmacologic and surgical concepts. Applied techniques in animal handling to facilitate anesthesia, surgery, post-surgical recovery and wound healing. Demonstration of physiological processes and drug effects.

836 Toxicology (2) Principles of toxicology, molecular mechanisms, pathologic processes and clinical features of animal diseases caused by common toxic agents.

840 Integumentary System (3) Pathophysiology, special pathology, medicine and surgery of diseases of the integumentary system of all species of animals. Laboratory examination, pathology, diagnosis and treatment.

841 Reproductive System (4) Pathophysiology, special pathology, medicine and surgery of diseases of female reproductive systems and mammary gland of all species of animals.

842 Alimentary System (5) Pathophysiology, special pathology, medicine and surgery of diseases of alimentary tract of all species of animals.

843 Musculoskeletal Systems I (3) Pathophysiology, special pathology, medicine and surgery of diseases of muscular and skeletal systems of all species of animals. Basic principles, pathologic changes and radiographic interpretation.
844 Musculoskeletal System II (3) Pathophysiology, special pathology, medicine and surgery of diseases of musculoskeletal systems of all species of animals. Advanced principles, radiographic interpretation and surgical procedures.

845 Principles of Medical Science (2) Physiologic and pathologic principles underlying mechanisms of disease. Selected examples of human and animal diseases; recent scientific advances in biomedical sciences.

846 Multispecies Medicine (4) Anatomy, pathophysiologic medicine, and surgery of avian species, laboratory and zoo animals and reptiles. Species and diseases seen by practicing veterinarian. Current topics on foreign animal diseases.

847 Current Topics in Veterinary Medicine (1-3) Elective subjects in veterinary medicine: basic sciences, clinical specialties and issues related to veterinary practice.

848 Art of Veterinary Medicine II (1) Paramedical subjects important to veterinary practice; practice management, interpersonal relations, communications, professionalism, ethics, care of animal behavior and veterinary history. May be repeated. S/NC only.

849 General Elective in Clinics (2) Special rotation with clinical training in urban practice, rural practice, environmental practice and pathology. S/NC or letter grade.

850 Introduction to Clinics (1) Clinical veterinary practice with discussions and practical experience. Problem-solving and integration of basic sciences with clinical applications. Problem-oriented veterinary medical record.

851 Urinary System (3) Pathophysiologic, special pathology, medicine and surgery of diseases of urinary system of all species of animals. Urinary-renal system in health and disease.

852 Cardiovascular System (2) Pathophysiologic, special pathology, medicine and surgery of diseases of cardiovascular system of all species of animals. Anatomic, physiologic and pharmacologic principles which provide basis for treatment.

853 Endocrine System (2) Pathophysiologic, medicine and surgery of diseases of endocrine system of all species of animals. Mechanisms of endocrine and metabolic diseases: therapy and prevention.

854 Respiratory System (3) Pathophysiologic, special pathology, medicine and surgery of diseases of respiratory system of all species of animals. Upper and lower respiratory system: infections and noninfectious diseases.

855 Radiology (3) Basic, advanced and special techniques of the interpretation and use of radiologic and related techniques in diagnosis and treatment of diseases of all species.

856 Special Senses (2) Pathophysiologic, special pathology, medicine and surgery of diseases of visual and auditory systems of all species of animals.

857 Nervous System (3) Pathophysiologic, special pathology, medicine and surgery of diseases of nervous system of all species of animals: clinical neurology and neuropathology.

858 Clinical Rotation in Specialties (2) Clinical training in specialty services: anesthesiology, ophthalmology or dermatology. Direct responsibility for diagnosis, patient care, and treatment of clinical cases in both urban and rural practice.

859 Clinical Clerkship (2) Advanced clinical training in urban practice, rural practice, environmental practice, and pathology. S/NC or letter grade.

861 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamic properties of veterinary drugs: mode of action, pharmacologic effects, chemical and physical properties of pharmacologic agents, important idiosyncrasies and clinical application.

865 Clinical Rotation in Environmental Practice (2) Clinical training in avian medicine, laboratory animal and zoo animal medicine, epidemiology, public health, and other related disciplines.

867 Special Problems in Environmental Practice (1-8) Extramural and specially designed study for students interested in select topics in avian medicine, laboratory animal medicine, zoo animal medicine, epidemiology, public health, pharmacology or toxicology.

871 General Pathology (4) Principles of pathobiology: causes of disease, disturbances of cell growth, inflammation, and neoplasia.

872 Parasitology (3) Principles of parasitology: protozoology, helminthology, and entomology and relationship to diseases.

875 Clinical Rotations in Pathobiology (2) Clinical training and demonstrations in laboratory diagnosis: post-mortem examination and clinical pathologic, parasitologic and microbiologic techniques.

876 Clinical Rotations in Pathobiology II (2) Clinical training and demonstrations in laboratory diagnosis: post-mortem examination and clinical pathologic and microbiologic techniques.

877 Special Problems in Pathobiology (1-6) Extramural and specially designed study for students interested in select topics in morphologic pathology, clinical pathologic, clinical microbiology and parasitology.

881 Clinical Rotations in Urban Practice I (4) Clinical training for diemurine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, patient care, and treatment of clinical patients.

882 Clinical Rotations in Urban Practice II (4) Clinical training in medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, patient care, and treatment of clinical patients.

883 Clinical Rotations in Urban Practice III (4) Clinical training in medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, patient care, and treatment of clinical patients.

884 Clinical Rotations in Urban Practice IV (4) Clinical training in medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, patient care, and treatment of clinical patients.

885 Clinical Rotation in Radiology I (2) Clinical training in radiographic techniques and interpretation of radiographs as part of diagnostic process.

887 Special Problems in Urban Practice (1-8) Extramural and specially designed study for students interested in select topics in medicine, surgery, anesthesiology, radiology, and medical specialties of companion animals.

891 Clinical Rotations in Rural Practice (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, patient care and treatment of clinical patients.

892 Clinical Rotations in Rural Practice II (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, patient care and treatment of clinical patients.

893 Clinical Rotations in Rural Practice III (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, patient care and treatment of clinical patients.

894 Clinical Rotations in Rural Practice IV (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, patient care and treatment of clinical patients.

895 Clinical Rotation in Radiology II (2) Clinical training in radiographic techniques and interpretation of radiographs as part of diagnostic process.

897 Special Problems in Rural Practice (1-8) Extramural and specially designed study for students interested in select topics in medicine, surgery, herd health, reproduction, radiology and medical specialties of large animals.

GRADUATE COURSES


536 Toxicology (2) Principles of toxicology: molecular mechanisms, pathologic processes and clinical features of animal diseases caused by common toxic agents. Prereq: Consent of instructor.

537 Multispecies Medicine (4) Anatomy, pathophysiologic medicine, and surgery of birds, reptiles and laboratory and zoo mammals. Common species and diseases. Prereq: Consent of instructor.

545 Principles of Medical Science (2) Physiologic and pathologic principles underlying mechanisms of disease. Selected examples of human and animal diseases; recent scientific advances in biomedical science. Prereq: Consent of instructor.

Zoology (College of Liberal Arts)

MAJOR DEGREES

Zoology ......................................................... M.S., Ph.D.

Arthur C. Echternacht, Head

Professors:

Bagby, R. M., Ph. D. ........................................... Illinois

Bunting, Dewey L., Ph. D. ..................................... Oklahoma State

Carlson, J. G. (Emeritus) (Distinguished Prof.), Ph. D. ........................................... Pennsylvania

Echternacht, Arthur C., Ph. D. ................................ Kansas

Etnier, D. A., Ph. D. .............................................. Minnesota

Handel, Mary Ann, Ph. D. ..................................... Kansas State

Jeon, K. W., Ph. D. .............................................. London

Joy, D. C. (Distinguished Scientist), Ph. D. ........................................... Oxford (UK)

Kennedy, J. R., Ph. D. ........................................... Iowa

Liles, J. N., Ph. D. .............................................. Ohio State

MacCabe, J. A., Ph. D. .......................................... California (Davis)

Pimm, S. L., Ph. D. .............................................. New Mexico State

Riechert, Susan E., Ph. D. ..................................... Wisconsin

Roth, L. Evans, Ph. D. ........................................... Chicago

Shivers, C. A., Ph. D. ........................................... Michigan State

Tanner, J. T. (Emeritus), Ph. D. ................................ Cornell

Vaughan, G. A., Ph. D. .......................................... Duke

Welch, H. G. (Emeritus), Ph. D. ................................ Florida

Whiston, G. L., Ph. D. ........................................... Iowa

Associate Professors:

Burnham, K. D. (Emeritus), Ph. D. ................................ Iowa

Chen, T. N., Ph. D. .............................................. Florida

Fox, David J., Ph. D. ............................................ Johns Hopkins

Greenberg, Neil, Ph. D. ........................................ Rutgers

McCracken, G. F., Ph. D. ....................................... Cornell

Pan, M. L., Ph. D. ................................................ Pennsylvania

Research Associate Professor:

Ashley, T., Ph. D. .............................................. Florida State

Assistant Professors:

Boake, C. R. B., Ph. D. ........................................ Cornell

Drake, J. A., Ph. D. ............................................. Purdue

Ganguly, R., Ph. D. .............................................. Nebraska

Gittleman, J. L., Ph. D. .......................................... Sussex

Hall, J. C., Ph. D. ................................................ Illinois

The Department of Zoology offers the Master of Science and Doctor of Philosophy with concentrations in aquatic biology, ecology, cell and molecular biology, physiology, genetics, and reproductive and developmental biology.
166 Zoology

REQUIREMENTS FOR ADMISSION

Applicants for graduate study are expected to have a baccalaureate degree, with no less than 30 semester hours of work beyond the bachelor’s degree from a regionally accredited institution. The minimum GRE scores are 260 for the General Test in Verbal and Quantitative Reasoning, and 3.0 for the Subject Test in Zoology. All applicants must submit official scores of the General Test and Subject Test of the Graduate Record Examination. The minimum score in the Graduate Record Examination is 300 overall. Acceptable scores may be repeated with consent of instructor. No specific GRE requirement is placed on applicants from the state of Georgia.

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 Zoology is available to residents of the states of Georgia or South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

403 General Genetics Laboratory (2) Experiments designed to illustrate basic principles of inheritance; primary organisms—Drosophila. Prereq: Biology 200. 2 labs.

404 Cytological Technique (2) Practical experience with variety of techniques: microscopy, embedding and sectioning, chromosome preparations, autoradiography, in situ hybridization, histochemistry, and immunohistochemistry. Prereq: Biology 210. 2 labs.

405-06,11-12 Minicourse in Zoology (2,2,2) Select advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for topics offered. Prereq: As announced. May be repeated. Maximum 4 hrs may apply toward zoology major.

410 Advanced Cell Biology (3) Molecular and supramolecular structure and functions of eukaryotic cells: regulatory mechanisms, physiology, behavior and cellular interactions. Prereq: Biology 210, 220. 2 hrs and 1 lab.

420 Cell and Tissue Structure and Function (4) Study of animal cells and tissues at light and electron microscope levels. Prereq: Biology 210, 2 hrs and 2 labs.

430 Immunology (2) (Same as Microbiology 430.)

439 Immunology Laboratory (1) (Same as Microbiology 439.)


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

450 Comparative Animal Behavior (3) Principles and methods of ethology; ecological, developmental, physiological and evolutionary aspects. (Same as Psychology 450.)

459 Comparative Animal Behavior Laboratory (3) Introduction to observational and experimental research in ethology. Coreq: 450. (Same as Psychology 459.)


465 Human Genetics (2) Genetic and molecular principles and problems of human inheritance. Prereq: Biology 220.

470 Aquatic Ecology (3) Introduction to physico-chemical nature of inland waters with description of biotic communities and their interrelationships. Prereq: Chemistry 120-30 and Biology 230. 2 hrs and 1 lab.

472 Archnology (3) Biology of spiders, mites, scorpions and relatives. Prereq: 360 or 380. 2 hrs and 1 lab.

473 Herpetology (3) Biology of amphibians and reptiles, ecology and adaptive radiation. Prereq: Biology 230. 2 hrs and 1 lab.

474 Ichthyology (3) (4) Evolution, classification, collection and identification, distribution and biology of fishes, freshwater fauna of Eastern North America. Prereq: Biology 230 or consent of instructor. 2 hrs and 2 labs.

475 Ornithology (3) Behavior, ecology, populations, evolution and identification of birds. Prereq: Biology 230, 2 hrs and 1 lab.

476 Spermatology (3) Evolution, classification, bio- geography, ecology, behavior and functional anatomy of mammals. Prereq: Biology 230 or equivalent. 2 hrs and 1 lab.

480 Physiology of Exercise (3) (Same as Physical Education 480.)

490 Comparative Endocrinology (3) Comparative analysis of physiology and morphology of endocrine glands in vertebrates and invertebrates, their role and interaction in maintenance of organism and species. Prereq: 440 or equivalent.

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

501 Graduate Research Participation (3) Advanced research techniques studied under supervision of staff research director. Open to all graduate students in good standing. Prereq: Consent of department and research director. S/NC only.

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

503 Zoology Seminar (1) Advanced topics in zoology. Senior zoology majors encouraged. Required of all first- and second-year graduate students. May be repeated. Maximum 4 hrs. S/NC only.

504 Special Topics (1-2) Selected directed readings or special course in topics of current interest. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 6 hrs. S/NC only.

506 Research Methods (1-5) Instruction in methods and techniques of research. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 9 hrs.

507 Animal Cell Culture (2) Techniques for culture of animal tissues and organs. 1 hr and 1 lab.

508 Methods of Taxonomy (2) Specification, taxonomic decisions, approaches to systematics and rules of nomenclature. Prereq: Consent of instructor.

513 Advanced Developmental Biology (3) Molecular and genetic aspects of differentiation and morphogenesis, current literature. Recommended prereq: Life Sciences 511-12.

516 Colloquium in Ethology (1) (Same as Psychology 516.)

520 Advanced Mammalian Physiology (5) Cellular and organ systems physiology. Prereq: Undergraduate general anatomy and physiology. Prereq: Biochemistry 410, or equivalent or consent of instructor.

521 Experimental Physiology (2) Laboratory principles and techniques in modern physiology; principles of physiological recording. Prereq: 520 or consent of instructor. 2 labs.

522 Advanced Muscle Physiology (3) Cellular and molecular aspects of muscle contraction and nerve control of contraction, and their relationship to locomotor adaptations in whole animals. Prereq: 440 or 445.

523 Physiology of Hormones (3) Cellular and organismal action of hormones in invertebrate and vertebrate animals. Prereq: 450 or consent of instructor. Recommended prereq: Biochemistry 410, 2 hrs and 1 lab.

524 Physiological Ecology of Animals (3) Adaptive physiological response of animals to natural changes in or extremes of physical and biotic environment. Terrestrial vertebrates. Prereq: Undergraduate courses in animal physiology and ecology, 440 and Biology 230 or equivalent.

525 Physiological Ethology (3) Behavioral endocri- nology and neurology from ethological perspective; reciprocal relationships of physiology and behavior in natural context. Term paper, review of assigned topic, creative development of special aspect. Prereq: 450 or equivalent. Consent of instructor. Undergraduate physiology, or consent of instructor.

526 General Vertebrate Neuroanatomy (3) (Same as Psychology 526.)

540 Insect Taxonomy I: Major Orders (3) Survey of classification of major orders of insects, with practical experience in identification of insects at family level. Prereq: Consent of instructor. 4 hrs combined lecture and lab.

541 Insect Taxonomy II: Minor Orders (3) Survey of classification of minor orders of insects, with practical experience in identification of insects at family level. Prereq: 540 or consent of instructor. 4 hrs combined lecture and lab.

542 Insect Structure and Function (3) Integrated study of morphology and physiology at tissue and cellu- lar level of insects. Prereq: Consent of instructor.

543 Aquatic Insects (3) Taxonomy and biology of aquatic insects, immature forms. Prereq: Consent of instructor. 2 hrs and 1 lab.

544 Fresh Water Invertebrate Zoology (3) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Prereq: 360. 3 hrs lab and field study.

545 Advanced Animal Behavior (2) Second-level course in ethology, emphasizing the field research. Prereq: Undergraduate zoology and psychology, or consent of instructor. Prereq: 450 or equivalent. (Same as Psychology 545.)

555 Seminar in Quaternary Studies (3) (Same as Geology 555 and Botany 555.)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>560</td>
<td>Biometry (3)</td>
<td>Statistical methods in analysis of quantitative biological data. Prereq: Statistics course or consent of instructor.</td>
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<tr>
<td>573</td>
<td>Population Biology (3)</td>
<td>Genetics and ecology of natural populations of plants and animals and aspects of behavior in determining population structure. Prereq: Introductory courses in ecology and genetics. (Same as Botany 573 and Ecology 573.)</td>
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<tr>
<td>583</td>
<td>Zoogeography (3)</td>
<td>Processes determining geographic distribution of animals and distribution and composition of animal communities. Prereq: Ecology course or consent of instructor.</td>
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<tr>
<td>591</td>
<td>Foreign Study (1-15)</td>
<td>See page 31.</td>
<td></td>
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<tr>
<td>592</td>
<td>Off-Campus Study (1-15)</td>
<td>See page 31.</td>
<td></td>
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<tr>
<td>593</td>
<td>Independent Study (1-15)</td>
<td>See page 31.</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>Doctoral Research and Dissertation (3-15)</td>
<td>P/NP only.</td>
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<tr>
<td>601</td>
<td>Advanced Topics (1-3)</td>
<td>Readings and discussion of recent advances. Consult the departmental listing for offerings. May be repeated with consent of department. Maximum 9 hrs.</td>
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<tr>
<td>602</td>
<td>Seminar in Cell and Molecular Biology (1)</td>
<td>Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.</td>
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<tr>
<td>603</td>
<td>Seminar in Genetics (1)</td>
<td>Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.</td>
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<tr>
<td>604</td>
<td>Seminar in Developmental Biology (1)</td>
<td>Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.</td>
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<tr>
<td>605</td>
<td>Seminar in Physiology (1)</td>
<td>Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.</td>
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<tr>
<td>606</td>
<td>Seminar in Aquatic Biology (1)</td>
<td>Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.</td>
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<tr>
<td>607</td>
<td>Seminar in Ecology (1)</td>
<td>Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.</td>
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<tr>
<td>608</td>
<td>Seminar in Ethology (1)</td>
<td>Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.</td>
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<tr>
<td>610</td>
<td>Current Topics in Cell and Developmental Biology (1)</td>
<td>Critical analyses of current literature in journal club format. May be repeated. Maximum 10 hrs. S/NC only.</td>
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