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 & Whinney Prof.), CPA, Ph.D..... Arkansas

Associate Professors:
Borthick, A. Faye, CPA, DBA...... Tennessee
Herring, Hartwell C., III, CPA, Ph.D., Alabama
Izard, C. Douglass, CPA, Ph.D., Mississippiposey, Imogene A., CPA, M.S..... Tennessee
Reeve, James M., CPA, Ph.D.................. Oklahoma State
Roth, Harold P., CPA, Ph.D................... VPI
Stagle, Warren L., CPA, M.S............. Tennessee
Townsend, Richard L., CPA, Ph.D........ Texas

Assistant Professors:
Anderson, Kenneth E., CPA, Ph.D........ Indiana
Letsinger, M. Clyde, CPA, M.S..... Tennessee
Turpen, Richard A., CPA, Ph.D........ Alabama

Distinguished Lecturer:
Wolfe, Singleton B. (Emeritus), B.S........ VPI

Lecturers:
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, or 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 course work. 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, 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
BUSINESS ADMINISTRATION

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 qualification 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 accounting 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 as established by the degree program for part-time students.

GRADUATE COURSES


502 Registration for Use of Facilities (3-15) Required for all students who are 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/J/N/C only. E

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


565 Taxation for Business Decisions (4) Conceptual foundation for knowledge and skills in taxation; impact on use and management of financial and investment information applied to individual, corporate, partnership, and fiduciary taxpayers. Prereq: 564 and Finance 501.


513 Seminar in Advanced Auditing (3) Theory and concepts underlying application 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 management 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 non-profit organizations. Prereq: 521 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 taxpayer 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 about organizations. Prereq: 503, 501, 521 or 503, 541, 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.

593 Individual Research in Accounting (3) Directed research in topic of mutual interest. Prereq: Consent of M.Acc program advisor. May be repeated. Maximum 6 hrs.

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 accountancy. Prereq: Consent of Ph.D. program advisor. May be repeated. S/J/N/C only.

Business Law

Professors:

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

Assistant Professor:

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

COMMUNICATIONS

DEGREE

M.S.

Ronald E. Taylor, Head

Associate Professors:

Jackson, DeForrest, M.S. Tennessee
Stankey, Michael J., Ph.D. Illinois
Taylor, Ronald E., Ph.D. Illinois

Assistant Professors:

Hovland, Roxanne, Ph.D. Illinois
Hoy, Marica, Ph.D. Oklahoma State

The Department of Advertising offers a concentration area for the Master’s with a major in Communications. 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 institution in a free-enterprise democratic society
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. Only 6 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 in 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 in 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 available 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/NC 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 lay 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 for 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, 523, 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 Mechanics (3) Teaching techniques; determining needed competencies, organizing and managing agricultural mechanics facilities. Prereq: 436, 438 or consent of instructor.

529 Supervised Occupational Experiences in Agricultural Education (3) Historical and philosophical bases for supervised occupational experience programs and organization patterns and procedures for conducting programs for farm and off-farm agricultural occupations. Prereq: 435, 438 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 American agriculture, key figures, issues, legislative movement, farmer organizations and programs, 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 Personnel (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 (1-6) Special research and/or special reports based on supervised independent study. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
The Department of Agricultural Economics and Rural Sociology offers programs of graduate study leading to the Ph.D. and M.S. The doctoral program includes concentrations in agricultural marketing and price analysis, agricultural policy, farm management and production economics, natural resource economics, and rural development. The M.S. program may be completed under a thesis option with concentrations in agricultural economics or rural sociology. A non-thesis option is available with a concentration in agricultural economics only. For specific information, contact the department head.

THE MASTER'S PROGRAM

Thesis Option

A candidate for the Master's degree must complete a minimum of 30 hours of graduate credit in courses approved by the student's Master's committee. Only 6 hours of thesis credit may be counted toward this requirement. At least 24 hours of graduate credit must be earned in courses numbered at or above the 500 level. In the agricultural economics concentration, 12 hours of graduate economics, 6 hours of economic theory and 6 hours of quantitative methods are required. In the rural sociology concentration, 12 hours in the department (9 hours rural sociology), 6 hours of sociological theory, 3 hours of research methods and 3 hours of statistics are required. Each student must successfully complete a final oral examination.

Non-Thesis Option

A minimum of 36 hours of graduate coursework is required. At least 27 hours must be in courses numbered at or above the 500 level. The program must include a minimum of 18 hours in agricultural economics, 6 hours of economic theory, and 6 hours of quantitative methods. Each student must successfully complete both written and oral comprehensive exams.

Minor

A minor will include 6 hours of coursework in the department, with at least 3 hours in 500-600 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 Courses 210 and 493). Comprehensive exams include four written exams and one oral exam. The written exams 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.

Minor

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 500-600 level courses.

Agricultural Economics

Graduate Courses

412 Agricultural Finance (3) Macro-finance, financial objectives, capital structure, debt and equity funds, capital investments, capital allocation, credit analysis, and financial intermediation. Prereq: Economics 201; junior standing 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. F

440 Agricultural Production Economics (3) Application of microeconomic theory to problems of resource allocation, enterprise selection, and operation of agricultural firms; economic interpretation of technical agricultural production relationships. Prereq: 210 and Economics 311. F

442 Farm Business Management I (3) Advanced topics and methods for analyzing micro and mainframe computer. Linear programming applications in farm planning, spreadsheet analysis of whole farm business data, computer analysis and management control; risk analysis and management; income tax management; farm growth and intergeneration 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 perspectives on problems facing rural communities; linkages between farm and nonfarm sectors; models and tools for analyzing rural development. Prereq: 210 or consent of instructor. F

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

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

503 Independent Study in Agricultural Economics (1-3) Directed individual or team research and report writing. Off-campus intern experiences and projects. Special courses in specific topics. Student must arrange with instructor before registering. Graduate credit for non-residency only. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

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

525 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

526 Mathematical Programming Methods in Agricultural Economics (3) Linear, integer and quadratic programming techniques with empirical applications to problems of firm and region; profit 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; constructing and interpreting 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; government policies; economic models; issues; decision theory with application to agricultural firms; aggregate impact of firm decisions on industry. Prereq: 440 or equivalent. Sp

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

550 Advanced Rural Economic Development (3) Theoretical and historical perspectives on process of economic development; analyze role of agriculture, sectoral interdependence and trade in 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 issues; applied welfare economics, external effects and evaluation of public policy. Prereq: 470 and Economics 511 or consent of instructor. F

593 Special Topics in Agricultural Economics (1-3) Topics to be assigned. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs. S/JNC only. E

600 Doctoral Research and Dissertation (3-15) P/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 theoretical models 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

650 Operations Analysis in Marketing (2) Components, functions, acquisition of debt and equity funds, cost minimization, transportation, risk allocation over space and time. Prereq: Economics 510. E

726 Consumer Demand and Food Consumption (2) Multiinstitutional and multiobjective decision-making; food demand, standards and multiinstitutional demand system.
660 Seminar in Rural Economic Development (2) Current topics in economic development of rural areas. Current literature; evaluation of issues in both international and national development. Prereq: 560 or consent of instructor. (Same as Sociology 480.) Spring.

670 Seminar in Natural Resource Economics (2) Issues related to allocation of natural resources. Prereq: 570 or consent of instructor. (Same as Sociology 580.) Spring.

GRADUATE COURSES

480 Diffusion of Agricultural Technology (3) Analysis of diffusion and communication processes whereby new technology spreads from scientists to change agents and then to farmers. Innovation-decision process; communication behavior, mass media, role of professional change agents, opinion leadership and consequences of technological change. Prereq: 380 or consent of instructor. (Same as Sociology 480.) Spring.

580 Advanced Rural Sociology (3) Application of sociological concepts and theory to analyze changing structure and function of rural life in U.S. and developing countries. Demographic changes, rural social and community indicators, and rural development processes. Prereq: 360 or equivalent. (Same as Sociology 580.) Fall.

593 Special Topics in Rural Sociology (1-3) Current sociological issues involving application of sociological theory. Prereq: 360 or consent of instructor. May be repeated. Maximum 6 hrs. (Same as Sociology 593.)

Agricultural Engineering

GRADUATE DEGREES

MAJORS

Agricultural Engineering M.S., Ph.D.
Agricultural Engineering Technology M.S.

Professors:

Bledsoe, B. L., PE, Ph.D. Oklahoma State
Houston Luttrell, Head
Bobby L. Bledsoe, Associate Head
Luttrell, D. Houston
McDow, John J., PE, Ph.D. Michigan State
Sewell, J. I., PE, Ph.D. Ohio State
von Bernuth, R. D., PE, Ph.D. Nebraska

Assistant Professors:

Baxter, D. O., M.S. Missouri Freeland, Robert S., Ph.D. Tennessee

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, mathematics, or one of the physical sciences in biological sciences. A graduate program leading to the Master of Science in Agricultural Engineering Technology is available to graduates in a recognized curriculum in agriculture 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 his/her 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 and related areas. The minimum requirements are 12 hours in agricultural engineering; 9 hours in other engineering, mathematics, physical and biological science, agricultural, or business 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.

3. A Master's thesis comprising at least 6 hours of Agricultural Engineering 500.

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 530 included in the 24 hours credit of #1) and must attend the graduate seminar each semester whether registered or not.

3. A Master's thesis comprising at least 6 hours of Agricultural Engineering Technology 500.

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 credit 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 500 or greater. These courses must be numbered 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

GRADUATE COURSES

430 Mobile Hydraulic Power System Design (2) Functional and operational characteristics of mobile hydraulic system components; pumps, valves and actuators; analysis and synthesis of system and control circuits. 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 plane 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 quantity and quality, 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 raw materials; conveying product characteristics, energy and mass balance, storage, handling and economic merit. Prereq: 350. 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


460 Design of Agricultural Structures (2) Design fundamentals for wood, steel and concrete components, compression and tension members, beam and column design; pole structure design; fasteners and joint design. Prereq: 320. 1 hr and 1 lab. Sp, A
Agriculture

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/JCN only. E
506 Physical Phenomena (3) Properties of materials, fundamentals of hydrodynamics, principles of electricity and electronics, thermal phenomena, applications in agricultural systems. Prereq: Consent of instructor. F
512 Agricultural Machinery Systems Analysis (3) Analysis of current agricultural machinery, adaptation planning for sequential operations, machinery for unique and alternate production and harvesting systems, operational management. Prereq: 452 and 508, 2 hrs and 1 lab. F/A
522 Processing and Environmental Systems (3) Environmental systems in plant and animal production; application of electric power; mechanical equipment, structures, control processing and materials handling. Prereq: 506. 2 hrs and 1 lab. F/A
526 Selected Topics in Agricultural Chemical Application Technology (3) Theoretical and experimental studies relating to current problems in agricultural engineering. May be repeated. Maximum 6 hrs. E
600 Doctoral Research and Dissertation (3-15) P/NP only. E
610 Seminar (1) Current research and literature. May be repeated. Maximum 3 hrs. E
620 Computer Simulation of Agricultural Systems (3) Scientific approach to digital simulation; system definitions and boundaries, formulation of models, algorithms and solution techniques, encoding of prediction equations. Prereq: Basic Engineering 101, 201 or equivalent. 2 hrs and 1 lab. F/A
630 Feedback and Control Systems (3) Differential equations for physical systems: solutions, transforms, and system response. Types of control, frequency response, system optimization, and system analysis. Application to agricultural systems. Prereq: Basic Mathematics 231, Basic Engineering 101, 201, Electrical Engineering 302 or equivalent. 2 hrs and 1 lab. F/A
640 Research Problems in Agricultural Engineering (2) Research and manuscript preparation for a technical meeting presentation and submission to refereed journal. Manuscript content significantly different from thesis/dissertation and other reports. Student first author. E
650 Selected Topics in Agricultural Engineering (3) Lecture, group discussion, and individual study on specialized developments. May be repeated. Maximum 6 hrs. Sp

Agricultural Engineering Technology

GRADUATE COURSES

442 Agricultural Waste Management and Pollution Control (3) Waste renovation fundamentals; characteristics of animal manure; techniques for collection, transporting, storing, and utilizing livestock waste. Prereq: Mathematics 121. 2 hrs and 1 lab. F
482 Agricultural Chemical Application Technology (3) Equipment for application of liquid, solid, and gasous sprayers; system components; operational characteristics; calibration; selection and management; safety considerations; materials handling and application. Prereq: Basic Engineering 121 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 not be used toward degree requirements. May be repeated. S/JCN only. E

The Department of Animal Science offers graduate programs leading to the Master of Science and Doctor of Philosophy with a major in Animal Science. 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 Agriculture, particular interest is in 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 the 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; may continue on a probationary
(non-degree) basis and a minimum of 12
hours of graduate coursework must be com-
pleted 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 com-
pletion 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 a minimum of 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 Intercollegiate Graduate Statistical Pro-
gram (ICGSP). The remainder 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 a minimum of two other fac-
ulty members, one of whom may be outside
the Animal Science Department. The
advisory committee approves the student’s
coursework and research problem and con-
ducts the final oral examination which
consists of a comprehensive oral examina-
tion and a defense of the thesis.

THE DOCTORAL PROGRAM

The doctoral program requires a
minimum of 48 semester hours of course-
work 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
concentration must complete at least 12
hours at the 500 and 600 level in the respec-
tive area and closely related area.

Students in the management concentration must complete Animal Science 581 and 9
hours at the 500 or 600 level in two non-
management concentrations for a total of 12
hours (including 581).

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.

5. A minimum of five faculty members will
constitute the student’s advisory committee,
of which at least 2 must be outside Animal
Science. The major professor will be the
chairperson. The student and the major pro-
fessor select a program of study depending
on the student’s area of concentration and
professional goal. The advisory committee
approves the coursework and the disserta-
 tion research proposal and determines if
there is to be a foreign language require-
ment. The advisory committee conducts the
comprehensive written and oral examination
and the final dissertation defense examina-
tion.

GRADUATE COURSES

481 Beef Cattle Production and Management (3)
Integration of principles of nutrition, physiology, and
breeding into complete beef cattle management pro-
gram. Structure of industry, enterprise establishment,
systems of production, production practices and herd
improvement programs. Alternatives evaluated: pro-
duction response and economic returns. Prereq: Animal
Science sophomore and junior core courses or con-
sent 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 pro-
gram. Structure of industry, enterprise establishment,
systems of production, production practices and herd
improvement programs. Alternatives evaluated: pro-
duction response 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 selection, nutrition, breeding, physi-
ology, and marketing into complete pork production
and management program. Structure of industry, enter-
prise establishment, systems of production, production
practices, and herd improvement program. Alternati-
vess evaluated: production responses and economic
returns. Prereq: Animal science sophomore and junior
core courses or consent of instructor. 2 hrs and 1 lab.
F

484 Poultry Production and Management (3) Struc-
ture of poultry enterprises: rearing, housing, feeding,
and marketing of poultry. Systems of production and
processing and marketing. 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, breed-
ning, physiology, and marketing into complete lamb
and wool production and management programs. Struc-
ture of industry, enterprise establishment, systems of
production, production responses and economic returns.
Alternatives evaluated: production responses and eco-
nomic returns. Prereq: Animal science sophomore and
junior core courses or consent of instructor. 2 hrs and 1 lab. 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 repeat-
ed. S/NC only. E

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

520 Animal Physiology (4) Major body systems and
interrelationships: nervous, muscle, blood, cardiovas-
cular, kidney, respiratory, gastrointestinal, and endocrine.
Concepts of metabolism, temperature regulation, and
acid-base balance. Prereq: General undergraduate
anatomy and physiology, and biochemistry, or con-
sent 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) Develop-
ment, anatomy, and function of mammalian glands;
endocrine interactions associated with mammary devel-
opment, and function; factors affecting yield, and
composition of mammary secretions. Prereq 322 or
consent of instructor. Sp,A

531 Analytical Techniques in Animal Sciences (3) Phys-
ical and chemical analyses of feeds, ingredients, tissues,
and products 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 experimental techniques and concepts for growth,
digestion, balance and radioisotope tracer studies. Prereq:
531. 1 hr and 2 labs. Sp

533 Nonruminant Animal Nutrition (3) Physiological
development and digestive processes of nonruminant
animals during the life cycle. Concepts and methodology
concerning nutrient requirements, interrelationship,
availability and deficiencies of nutrients. Nonruminant
additives and environmental effects on nutrient utili-
zation; nutritional effects on products. Prereq: 332 or
consent of instructor. F

534 Ruminant Animal Nutrition (3) Digestive physiol-
ogy of ruminant stomach, rumen fermentation,
determination of nutrient requirement and feed intake
regulations of ruminant animals. Prereq: 332. Sp

541 The Genetics of Populations (2) Application and
extension of principles and concepts learned in basic
courses in genetics. breeding and statistics to convey
useable comprehension of the genetics of popula-
tions. Prereq: Basic courses in genetics, breeding and
statistics. 1 hr and 1 lab. F,A

542 Applied Animal Breeding (3) Procedures for estimat-
ing population parameters, determination of response
to variation selection methods and breeding system,
estimation of genetic and phenotypic interrelation-
ships among metric traits, estimation of breeding values,
optimum methods of simultaneously altering several
metric characters, industrial application of animal breed-
ng methodology. Prereq: 541 or equivalent. Sp,A

571 Design and Analysis of Biological Research (3)
Experimental design and analysis of experi-
mental units; analysis and interpretation of data;
statistical models and contrasts, analyses of vari-
ce, covariates, treatment arrangements, mean separation and regression. Prereq: Plant and Soil Sci-
ence 471 or equivalent; knowledge of software package on
micro or mainframe computer. (Same as Plant and
Soil Science 571.) Sp

572 Least Squares Analysis (2) Least-squares esti-
mation and hypothesis testing procedures for linear
models with possible singular covariance structures;
maximum likelihood, variance component models;
estimability. Prereq: 571 or equivalent. 2 hrs and 1 lab. F

573 Intermediate Statistical Computing (2) Applica-
tion 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 UTK mainframe and software package.
2 hrs and 1 lab. F

581 Advanced Livestock Management (3) Objective
functions to evaluate alternative livestock production
management policies. Applications of linear program-
ing methodology. Prereq: 541 or equivalent. 2 hrs and
integration of reproductive management
program, 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
research and extension programs. Consideration of
economic, computer science, statistics. 2 hrs and 1 lab. F

595 Colloquium in Animal Science (1) Orientation:
teaching, research and extension programs. Guid-
ance in preparation of students for master's study and
research plans. Required of beginning graduate stu-
dents in animal science program. S/NC only. E

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

597 Commodity Oriented Seminar (1) Required of all
animal science graduate students. Presentations: beef
and sheep, dairy, poultry, swine and veterinary ses-
sions. May be repeated. Maximum 5 hrs. S/NC only. Sp

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

601 Advanced Topics in Animal Physiology (1-4)
Recent advances and concepts, research tech-
niques, current problems. May be repeated. Maximum
5 hrs. E

602 Advanced Topics in Animal Physiology (1-4)
Recent advances and concepts, research tech-
niques, current problems. May be repeated. Maximum
5 hrs. E
651 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 (3) 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 and principles related to normal function of central and peripheral nervous systems. Special senses and current electrophysiological procedures for evaluating neural systems. Prereq: Advanced course in animal physiology or an equivalent and an advanced neuroanatomy course, or Psychology 526, and consent of instructor. Sp.A

Anthropology
(College of Liberal Arts)

MAJOR

DEGREES

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

William M. Bass, Head

Professors:

Associate Professors:
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

Assistant Professors:
Bass, Mary Ann, Ph.D..............Kansas State Galloway, Alison, Ph.D...........Arizona Simek, Jan F., Ph.D..............Tennessee Willey, P. S., Ph.D.................Tennessee

Research Associate Professor:
Chapman, Jefferson, Ph.D........North Carolina

Research Assistant Professors:
Smith, Maria Q., Ph.D...............Tennessee Tardif, Suzette D., Ph.D...........Michigan State

THE DEPARTMENT OF ANTHROPOLOGY

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.

THE DOCTORAL PROGRAM

An incoming student should possess an M.A. in Anthropology. Students with an M.A. in another discipline may be admitted under special circumstances. The student must complete 36 semester hours, or the equivalent, of graduate courses in the departmental or interdisciplinary program prescribed by the student and the advisory committee. The student must complete a total of 120 semester hours (of which at least 30 must be in the Department of Anthropology) and pass the Graduate Evaluation Examination (GEE) before degree is completed. May not be repeated. Maximum 6 hrs.

The student must complete the following:

1. Successful performance on a language examination administered by the appropriate graduate department.
2. Written and oral comprehensive examinations. Specific courses taken are determined by students and their advisory committees. The student should elect courses with a grade of B or better.
3. Demonstration of competency 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 discretion of the thesis committee. Research required for the M.S. program in Anthropology requires the following:
5. Successful completion of a dissertation and defense 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 UTK on an in-state tuition basis. The M.A. program in Anthropology is available to residents of the states of Kentucky.
South Carolina, or Virginia. The Ph.D. program is available to residents of Alabama, Arkansas, Kentucky, Louisiana, Mississippi, South Carolina, or West Virginia. Additional information may be obtained from the Residence 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 relationships between language and culture. 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, political, and social development. Continuity and change in diverse cultural settings through use of archaeological, ethnological, and historical methods. 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, 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 Anthropology (3) Regional or theoretical issues in archaeology for undergraduate 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 recorded 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 studies 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 (3) Intensive examination of human skeleton. Prereq: 110 and consent of instructor. 3 hrs and 1 lab.

481 Museology I: Museums, Purpose and Function (3) (Same as Art 481.)

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 cohesion, size, and structure; patterns of mating; other social interactions; communication; and cultural behavior. Application of primate studies to human ethology. Prereq: 110 or consent of instructor.

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

501 Graduate Research (1-6) 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 in which the student is enrolled or during any semester in which he/she is taking part time before degree is completed. May not be used toward degree requirements. May be repeated. S/J/N only. E

510 Method and Theory in Cultural Anthropology (3) Development of theoretical frameworks in cultural anthropology; elaboration 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: ethnodynamics, psychological anthropology, comparative social organization, etc. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


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 diseases, theories of disease causation, and models of therapy. Theoretical 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 selected case populations. Prereq: 110, 120, 130, or consent of instructor. Recommended prereq: Basic nutrition course.

520 Seminar in Zooarchaeology (3) Approaches to analysis and interpretation of archaeological fauna. Intensive review and evaluation of major fauna studies, guides to identification, methods of presenting faunal data. May be repeated. Maximum 6 hrs.

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 archaeological sites; use of comparative collections. May be repeated. Maximum 8 hrs.

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

530 Fieldwork in Archaeology (3-6) Practicum in surveying, excavating, processing, and analysis of archaeological data. Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs.

531 Quantitative Methods in Archaeology (3) Application of quantitative techniques to archaeological data critically examined through literature and problem solving, including correlation and 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, state, and local regulations affecting identification, protection, and management of archaeological resources. Professional ethics and responsibilities and relationship of federal, state, and local governmental agency leg- est regimes, and professional archaeologists in conduct of federally supported archaeology. May be repeated. Maximum 6 hrs.

562 Problems of 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 Archaeology of Southeastern United States (3) Archaeological research on prehistoric American Indian cultures in Southeastern United States; Tennessee prehistory.

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


568 Paleoanthropology (4) Fossil record from origin of hominids to appearance of anatomically modern humans. Functional morphology and phylogenetic relationships of fossils. Prereq. 480.

573 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.

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

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

586 Bone Anatomy and Physiology (3) Examination of bone structure, cellular anatomy, hormonal regulation and micro and macroanatomical response to loading. Prereq: 480 or consent of instructor.

587 Laboratory in Forensic Anthropology (3) Discussion and lab experience with forensic anthropological techniques: radiographic analysis, dental examination, hair analysis, bone microstructure. Prereq: Human Origins, 480, 581 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 E0, level requirement.

610 Seminar in Cultural Anthropology (3) Selected topics, primarily for doctoral students in cultural anthropology. May be repeated. Maximum 6 hrs.

611 Theory in Cultural Anthropology (3) Critical examination of current issues in theory and data interpretation, primarily for doctoral students in cultural anthropology.
Architecture

(Office of the Provost)

J. William Rudd, Dean
William J. Lauer, Associate Dean
Jon Coddington, Assistant to the Dean

Professors:

Anderson, G. I., M.Arch.................................. Illinois
Conley, G., B. Arch...................................... Harvard
Griene, F. R., M. Arch.................................... Tennessee
Kelso, R. M., M.S......................................... Pennsylvania
Kersavage, J. A., D. Sc.................................. Southern Cal
Lauer, W. J., M. S. Arch. Engr................................ Iowa State
Lester, A. J., M. Arch...................................... Virginia
Lizon, P., Ph.D.............................................. Pennsylvania
Robinson, M. A., M. Arch.................................. Pennsylvania
Shell, W. S., M. S. Arch.................................. Columbia
Watson, J. S., M. Arch..................................... Pennsylvania
Wodhouse, L. M., Ph.D.................................... St. Andrews

Associate Professors:

Herz, M. D., B. Arch......................................... Columbia
Kinzy, S. A., M. Arch...................................... Illinois
Martella, W. E., B. Arch.................................. California
Moffett, M. S., Ph.D........................................ MIT
Narancic, V., B. Arch...................................... Belgrade
Rabun, J. S., M.A............................................ Texas

Assistant Professors:

Bovill, C. H., M. Arch...................................... Hawaii
Coddington, J., M. Arch................................... Pennsylvania
French, R. C., B. Arch.................................... Tennessee
Kaplan, M., M. Arch...................................... Harvard
Livingston, M., M.F.A..................................... Wisconsin
Reno, J. E., M. Arch....................................... UCLA
Stucky, H., B. Arch........................................ Kansas State
vonBeulow, P., B. Arch................................... Tennessee
Ware, S. M., B. Arch...................................... Tennesse
Wells-Bowie, L., M. Arch.................................. California
Wooley, D. L., M. Arch.................................... Washington

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 semes-
ters' 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 prior learning 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 Architecture the summer before entering the second degree program and take an intensive drawing course which will fulfill the prerequisites.

Please consult The University of Tennessee Undergraduate Catalog for the minimum requirements of the Second Degree Program.

GRADUATE COURSES

403 Introduction to Preservation (3) History, theory, and legal aspects of architectural preservation and restoration.

404 Preservation Technology (3) Techniques of preservation: methods of analysis, history of materials and technology used in old buildings.

405 Descriptive Analysis of Historic Buildings (3) Identification and analysis of characteristic elements of buildings from various architectural periods, American architecture. Survey techniques.

410 History and Theory of Urban Form (3) Patterns of community development. Historical and contemporary examples. Basic urban design issues and exemplary design approaches through lectures, readings, essays, and sketch studies. Historical change in urban form and design.

411 Architecture Since 1945 (3) Recent architectural developments and views of future.

412 Non-Western & Indigenous Architecture (3) Building responsive to climate, material availability, and economic level, as designed by anonymous builders. Pre-historic times to present throughout world. Fer-tile Crescent; Indus Valley; Hindu, Buddhist, and Mughal architecture of India, China, and Japan.

413 Tennessee Architecture (3) History of settlement patterns and building in Tennessee. Reading assignments, working drawings, and legal aspects of architectural preservation and restoration.

414 History of Architectural Technology (3) Building materials and construction techniques from antiquity to present.

415 Medieval Architecture (3) History of architecture from decline of Rome to beginning of Renaissance.


420 American Architecture II (3) Stylistic periods from Gothic Revival through twentieth century.

421 History of Landscape Architecture (3) Intellectual, social, and geographical influences that provide theoretical basis for design throughout history. Selected topics include landscape architecture analyzed in terms of design.

422 Modern East European Architecture (3) Twentieth century architecture in Russia, Czechoslovakia, Poland, Hungary, East Germany, Romania, Bulgaria, Yugoslavia.

426 Special Topics in History, Theory and Criticism (1-4) Special topics in history-related subjects. May be repeated. Maximum 6 hrs.


443 Building Energy Analysis (3) Balancing heat flow through external skin of residential and small and large commercial buildings. Local climate evaluation. Site planning, building size and orientation, window area, wall treatment, infiltration control, and other design elements. Energy use quantification methods and economic analysis of energy efficient design features. Architectural program analysis of external and internal load dominated buildings. Prereq: 341.

444 Advanced Environmental Control Systems (3) In-depth analysis and innovative concepts in design of heating, ventilating, and air conditioning. Prereq: 341.

445 Advanced Lighting (3) In-depth analysis and innovative concepts in design of lighting. Prereq: 342.

473 Architectural Photography (3) Photography as design, research, and presentation medium. Application of photographic techniques, printing and processing. Color and black and white.

Art

(College of Liberal Arts)

MAJOR

DEGREE

Art.......................................................... M.F.A.

Professors:

Blain, Sandra J., M.F.A.......................................... Wisconsin
Brakke, P. M., M.F.A......................................... Yale
Clarke, R.A., M.S.............................................. Wisconsin
Cleaver, Dale G. (Emeritus), Ph.D............................... Chicago
Falsetti, Joseph S., M.S........................................ Ohio State
Kennedy, William C., M.F.A..................................... Wisconsin
Kurka, Don F., Ph.D.......................................... New York
Leeland, W. E., M.F.A........................................ Tennessee
Livingston, P. R., M.F.A...................................... Wisconsin
Martinson, Fred, Ph.D......................................... Chicago
Nichols, P. G., M.F.A.......................................... Michigan
Peacock, D., M.F.A............................................. Iowa
Stewart, F.C., M.F.A............................................. Claremont

Associate Professors:

Daehnert, R. H., M.F.A......................................... Wisconsin
Darrow, J. F., Ed.D.............................................. Illinois State
Goldstein, M. B., M.F.A....................................... Nebraska
Habel, Dorothy, Ph.D.......................................... Michigan
Lee, B., M.F.A.................................................... Yale
LeFevre, Richard, M.F.A....................................... Rochester
Moffett, F., Ph.D. ........................................ Chicago
Neff, A., Ph.D. ........................................ Pennsylvania
Riesing, T. J., M.F.A .................................. Nebraska
Saupe, T., M.F.A ....................................... Wisconsin
Yates, S., M.F.A ........................................ North Carolina (Greensboro)

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 degree in studio art. It is offered in the concentration areas of ceramics, graphic design/illustration, printmaking, painting, and criticism. 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 requires the following:

1. A detailed letter of intent.
2. Three letters of recommendation from former professors or professionals in the field.
3. An undergraduate major in art or evidence of equivalent proficiency.
4. A portfolio to be evaluated by the faculty. Application forms and further information are available by writing to the Department of Art.

M.F.A. Requirements

A minimum of 54 hours is required:

1. Successful completion of 20 hours of studio in a concentration area. An inter-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.
4. Art 599, Project in Lieu of Thesis (20 hours). A third year of semi-independent study. Student must have completed all other coursework prior to registration.
5. A student with the permission of the area faculty can petition to take 3 hours of outside academics as a substitute for 3 hours of art history or 3 hours of concentration area. The petition is to be presented to the graduate committee for final approval and should clearly address the need and relevance of this substitution to the student's concentration.

Four semesters beyond the Bachelor's degree are required in residence. 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 criticism.

The candidate's committee will consist of a minimum of 3 members and a maximum of 6 members and will be appointed prior to registration 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 studio discipline outside the concentration area.

Exhibition and oral examination: With the completion of all requirements for the M.F.A., the student must produce an exhibition and, under supervision of faculty, 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 program.
2. Second-year evaluation: With completion of all coursework, the student must present work for evaluation by the faculty and receive permission to register for Projects in Lieu of Thesis.
3. If, 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, probation with specific goals set for a specific time, or dismissal.

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. A minimum of 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 arranged 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: 304 or consent of instructor. May be repeated. Maximum 12 hrs.
406 Goldsmithing (3-6) Metalsmithing techniques: granulation, electroforming, electroplating, electrolysis, anodization, and photo processes with individual studio problems to develop personal style of expression. Prereq: 6 hrs of metalsmithing or consent of instructor. May be repeated. Maximum 12 hrs.
409 Special Topics in Fiber/Fabric (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
411 Drawing IV (6) Individualized pursuit of personal drawing techniques and concepts; supplemented by individual and group critiques; weekly life drawing sessions. Prereq: 311. May be repeated. Maximum 12 hrs.
413 Painting IV (6) Individual concepts and personal expression with varied media. Prereq: 313. May be repeated. Maximum 12 hrs.
419 Special Topics in Drawing and Painting (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
424 Ceramics: Clay and Glazes (3) Clay chemistry, clay bodies, glaze theory, glaze calculation, intensive formulating, 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 assessment as sculpture and interdisciplinary. Individual seminars. May not be used toward art history requirement. Prereq: 321 and 322.
426 Kilns: Design, Construction and Operation (3) Designing 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 instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
439 Special Topics in Photography (3) Student- or instructor-initiated course offered at convenience of department. 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 instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
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 and illustration field. Only by rearrangement with department. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 12 hrs.
459 Special Topics in Graphic Design/Illustration (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.
462 Intaglio III (3-6) Individual projects through advanced color printing methods and combinations with other print media. Prereq: 362. May be repeated. Maximum 12 hrs.

47 Art
481 Museology I: Museums, Purpose and Function (3) Development of museums of art, history, natural 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, matting and framing, 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 selected 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.

495 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.

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. E

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 (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 Byzantium 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/or 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 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. E

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 UTK, a student may apply certain graduate courses taken at Arrowmont toward the degree, subject to the approval of the student's graduate committee.

400 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.

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

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

476 Fabricating (2-4) Intermediate to advanced. May be repeated.

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

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

517 Studies in Medieval Art (3) Art and architecture of Middle Ages: major monuments from Byzantium 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/or 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.
A three credit research problem and three extra hours coursework in Music Education may be substituted for Thesis. If a larger thesis problem is desired, the thesis credit may be increased to 9 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.

550 Curriculum Development and Evaluation in Music Education (3) Principles of curriculum development applied to music education programs. Formulating objectives; construction of evaluation instruments; survey of appropriate literature. Prereq: Consent of instructor.

555 Administration and Supervision of School Music (3) Problems of supervision, research, and in-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. May be repeated. Maximum 6 hrs.

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

Music Education

The Master of Science program requires Music Education 510 and 520; 9 hours of 500-level courses in music theory or history; 9 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 practices and procedures in art education: unit planning, sequential organization and teaching methods. Prereq: Consent of instructor.

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

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

Music Education

The Master of Science program requires Music Education 510 and 520; 9 hours of music education electives at the 500 level; 8 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.
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 processes;
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 the minimum two 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.

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.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The Ph.D. program in Speech and Hearing Science is available to residents of the states of Alabama, Arkansas, Georgia, 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

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 453.)
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 440.)
440 Voice Disorders (3) Etology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 304, 306, or consent of instructor. (Same as Special Education 440.)
445 Problems in Speech Pathology (1-3) Prereq: Consent of instructor.
463 Practical Applications of Language Habilitation Techniques (4) Various methods and procedures in treating delayed/disordered preschoolers. Alternative augmentive systems. Prereq: 461 or consent of instructor.
465 Speech and Language of the Culturally Different Child (3) Speech and language differences of children of various cultural backgrounds. Different attitudes and class membership and from different geographic regions.
473 Audiology II (3) Basic principles of clinical audiometry; pure tone, speech, and environmental overview of special audiology tests. Prereq: 471. (Same as Special Education 473.)
494 Introduction to Aural Rehabilitation (3) Rehabilitation of acoustically impaired having communication difficulties, residual hearing and other sensory modalities. Prereq: 473.
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
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 (2) Analysis of research techniques, application of statistics, and completion of pilot research project. Prereq: Psychology 385 or equivalent or consent of instructor.
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, 595, 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 instrumention in audiology and speech pathology; laboratory assignments for familiarization of student with instruments for measuring speech and hearing processes.
520 Aphasia (3) Historical review of aphasia literature, theories of brain functioning, aphasic classification and terminology, tests and rationale for testing, etiology, therapy considerations and prognosis for recovery. Prereq: 506 or equivalent or consent of instructor.
522 Seminar: Articulation and Voice Disorders (3) Current research in diagnosis and management of articulation and voice disorders. Prereq: Undergraduate courses in articulation and voice disorders or consent of instructor.
531 Seminar on Stuttering (3) Current significant research in stuttering. Prereq: 431 or consent of instructor.
532-33-34 Advanced Clinical Practice in Speech-Language Pathology (1-4, 1-4, 1-4) Prereq: 434 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.
536-37 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.
539 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.
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 audiometry; 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. 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: 5 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 6 hrs.
557 Management and Supervision for Speech-Language Hearing Professionals (3) Management systems, accountability, performance appraisal and clinical super-
vision for audiologists and speech language pathologists interested in private practice, supervisory or administrative positions.

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

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

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

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

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

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

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

595 The Verbo-Tonal System (3) Theory, procedures, and instrumentation of Verbo-Tonal System in habilitation, communication, diagnosis, speech management, and foreign languages. Prerequisite: 371. Recommended prerequisite: 305, 473, and 494.

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

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

602 Psychoacoustics (3) Auditory perception and reception of nonspeech and speech stimuli. Prerequisite: 601, 517.

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

606 Advanced Speech Physiology (3) Physiology of speech production and theories of speech motor control. Techniques involved in physiological analysis of speech. Prerequisite: 506.

607 Advanced Anatomy and Physiology of the Ear (3) Anatomical and physiological correlates in hearing science. Cochlear mechanical function, neurophysiological response, and theoretical considerations. Prerequisite: 507.

608 Advanced Clinical Concepts and Models in Hearing Science (3) Theoretical concepts of clinical manifestations in pathological condition of ear. Electrical, mechanical, and mathematical models of normal and abnormal auditory mechanism function. Prerequisite: 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. Prerequisite: 601 or consent of instructor. May be repeated. Maximum 6 hrs.

610 Seminar in Hearing Science (2) Advanced study of perception of nonspeech acoustic signal, detectability, pitch, loudness, differential threshold, adaptation, and fatigue. Prerequisite: 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. Prerequisite: Consent of instructor.

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

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

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

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

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

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

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

659 Directed Study in Hearing Science (1-3) Prerequisite: Consent of instructor. May be repeated. Maximum 8 hrs.

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

Aviation Systems

(UT Space Institute)

MAJOR

DEGREE

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

R. D. Kimberlin, Program Chair

Professors:


Associate Professors:

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

Assistant Professor:

Solles, U. P., Ph.D. ................................. Tennessee

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

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

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

THESIS OPTION

The thesis program involves satisfactory completion of the following requirements:

Research and Development Specialization

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

Administration Specialization

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

NON-THESIS OPTION

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

Research and Development Specialization

1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Six hours in industrial engineering (engineering management).
3. Twelve hours of 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 UTK on an in-state tuition basis. The M.S. program in Aviation Systems is
available to residents of the states of Arkansas, Kentucky, Mississippi, South Carolina, or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

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


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 counted as three degree requirements. May be repeated. S/NC only. E

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

504 Airports and the Community (3) Structure of airports and their communities. Technology and economics of cargo, baggage, ticket and passenger handling, airport management, economics and logistics. Interfaces with community. Plans, programs and developments for collecting and distributing passengers and freight from various types of airports. Types of airport developments and their projections. Prereq: 501.

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

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

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


Biochemistry

(Dean of Liberal Arts)

MAJOR DEGREES

Biochemistry.................................................. M.S., Ph.D.

Wesley D. Wicks, Head

Professors:

Churchich, Jorge E., Ph.D.................................... Sheffield

Huang, Leaf, 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:

Fairfield, Frederic R., Ph.D................................. SUNY Stony Brook
Feinberg, R. H. (Emeritus), Ph.D......................... California
Howell, Elizabeth E., Ph.D................................. Lehigh
Serperu, Engin H., Ph.D................................. Hacettepe University

Adjunct Faculty:

Constantinides, P., Ph.D................................. Brown
Farkas, W., Ph.D............................................ Duke
Georgiou, S., Ph.D......................................... Manchester
Kneeloni, S., Ph.D.......................................... California (Davis)

THE MASTER’S PROGRAM

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

THE DOCTORAL PROGRAM

1. Introductory Organic Chemistry*, Introductory Physics*, Differential and Integral Calculus*, approved physical chemistry, and at least 12 hours of biology beyond the introductory level and including the subjects of genetics and physiology.
2. Biochemistry 511-12 and 515-16.
3. At least 3 hours of approved graduate courses in chemistry, physics, or other physical science; for example, Chemistry 550, 551, 552, Physics 521, 522, 551. No survey courses will be accepted.
4. At least 6 hours of topics offered in 521 and 621.
5. Participation in 601 and 603 during the entire period of residence.
6. Comprehensive examination, taken 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 conducted primarily with the student’s dissertation.

Petitioning for Master’s Degree

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

The additional requirements for such a degree are:

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

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

GRADUATE COURSES

410 Cellular and Comparative Biochemistry (4) Electrolyte behavior, chemistry and structure of proteins; enzyme behavior and biological function; catabolism and energy capture; synthetic metabolism; nucleic acid function, protein synthesis, and biochemical genetics; regulation of biological processes. Prereq: Chemistry 350-50, 60-69 and Biology 116-20. 3 hrs and 1 discussion. F,Sp


430-40 Introduction to Physical Biochemistry (3,3) Development of concepts from physical chemistry for application to biological problems. 430—Thermodynamics; intermolecular bonding; transport; shape and motion of macromolecules; kinetics of enzyme-catalyzed reactions. 440—Quantum mechanics; molecular orbitals; interactions of light with biological molecules; macromolecular studies through nuclear magnetic resonance and electron spin resonance; case studies of studies of selected macromolecules. Prereq: Mathematics 141-42, Chemistry 350-50,69, and Biology 110-20. F,Sp

500 Thesis (1-15) F/PNP 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 Intermediate Metabolism (4) Protein structure and dynamics; regulation of enzyme activity; intermediary metabolism; membrane structure and function. Original literature and review articles; contemporary experimental approaches. Prereq: 410, 420 or consent of instructor. 3 hrs and 1 discussion. F,Sp

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

515 Experimental Techniques I (3) Modern experimental methodology and instrumentation. Lab. 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 (3-12) Tutorial laboratory experience. May be repeated. Maximum 12 hrs. E
561 Environmental Toxicology (3) Basic concepts in toxicology; molecular toxicology and detoxification; reproductive toxicology; mutagenesis, teratogenesis, carcinogenesis, pathologic changes and environmental impact. Prereq: 410, Chemistry 350-360-69 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 methodologies and toxicological studies. Prereq: 419 or quantitative analysis, 561 and Chemistry 350-360-69. (Same as Ecology 562.) Sp.

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


603 Current Topics in Biochemistry (1) Seminars and lectures dealing with current advances in fields of chemical biology. 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 and toxicological research. Prereq: 562. May be repeated. Maximum 6 hrs. (Same as Ecology 604.) S/NC only. F.Sp.

605 Current Topics in Regulation of Protein Function (1) Covalent modifications of proteins by phosphorylation-dephosphorylation allosteric interactions. Prereq: 410 or equivalent. May be repeated. Maximum 6 hrs. S/NC only. F.Sp.

606 Current Topics in Biological Membrane Research (1) Prereq: 410 or equivalent. May be repeated. Maximum 9 hrs. (Same as Microbiology 506) S/NC only. F.Sp.

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

Biomedical Sciences
(Office of the Provost)

MAJOR DEGREES
Biomedical Sciences M.S., Ph.D.

Raymond A. Popp, Acting Director

Professor:

Olins, Donald E., Ph.D. Rockefeller

Research Professor:

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

Research Associate Professor:

Uberbacher, Edward C., Ph.D. Pennsylvania

Shared Faculty:

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

Bunick, Gerald J., Ph.D. Pennsylvania

Cook, John S., Ph.D. Princeton

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

Fujimura, Robert K., Ph.D. Wisconsin

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

Hartman, Fred C., Ph.D. Tennessee

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

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

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

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

Lee, Kai-Lin, Ph.D. Tulane

Littlefield, Gerald, Ph.D. Georgia

Marchok, Ann C., Ph.D. Connecticut

Mazur, Peter, Ph.D. Harvard

Mitra, Sankar, Ph.D. Wisconsin

Mural, Richard, Ph.D. Georgia

Niyogi, Salli K., Ph.D. Northwestern

Popp, Raymond A., Ph.D. Michigan

Preston, R. Julian, Ph.D. Reading

Regan, James D., Ph.D. Hawaii

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

Rinchik, Eugene M., Ph.D. Duke

Russell, Liane B., Ph.D. Chicago

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

Shugart, Lee H., Ph.D. Tennessee

Snyder, Frank, Ph.D. North Carolina

Solomon, A., M.D. Duke

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

Terzaghi-Howe, Peggy, D.Sc. Harvard

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

Wei, C. H., Ph.D. Wisconsin

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

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

degrees are also encouraged to apply. Completed applications, Graduate Record Examination scores and letters of reference should be sent to the address below. The student will need to prepare in biology, calculus, physics, and physical chemistry. A course in physical chemistry is offered by the school in order to meet the last requirement. It is recommended that deficiencies in preparation, as identified in the admission process, be eliminated prior to entrance.

Requests for application forms, information on admission, financial support, and housing should be sent to:

Director, Department of University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, 21 South, Oak Ridge, Tennessee 37831-8077.

THE DOCTORAL PROGRAM

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

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

3. Participation in at least one of the seminars during each term of residence after the first year is strongly recommended.

4. Satisfactory completion of formal advanced courses in the areas of the student's interests. The number and nature of the required advanced courses will vary depending upon the student's background and area of specialization.

5. Passing both written and oral comprehensive examinations.

6. A dissertation reporting the results of original and significant scientific research. A minimum of 24 semester hours of course work 600 is required.

7. A final oral examination on the dissertation.

8. A formal seminar presentation of the dissertation research.

SPECIAL MASTER OF SCIENCE DEGREE PROGRAM

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

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

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

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

**College of Liberal Arts**

#### MAJOR

<table>
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<th>DEGREES</th>
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Karen W. Hughes, Head

**Professors:**

Caponetti, J. D., Ph.D. .... Harvard
Clebsch, E. E. C., Ph.D. .... Duke
DeSelm, H. R., Ph.D. .... Ohio State
Evans, A. M., Ph.D. .... Michigan
Harmon, W. G. (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
McNamack, J. F., Ph.D. .... Emory
Norris, F. H. (Emeritus), Ph.D. .... Ohio State
Petersen, R. H. (Distinguished Prof.), Ph.D. .... Columbia
Sharp, A. J. (Emeritus), (Distinguished Prof.), Ph.D. .... Ohio State
Smith, W. O., Ph.D. .... Duke
Wain, P. L. (Distinguished Prof.), Ph.D. .... Tennessee

**Associate Professors:**

Amundsen, C. C., Ph.D. .... Colorado
Heilman, A. S., Ph.D. .... Ohio State
Henke, R. R., Ph.D. .... Miami (Ohio)
Mullin, B., Ph.D. .... NC State
Schilling, E. E., Ph.D. .... Indiana
Schwarz, O. J., Ph.D. .... NC State
Smith, D. K., Ph.D. .... Tennessee
Wofford, B. E. (Curator), Ph.D. .... Tennessee

**Lecturer:**

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

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

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

For further information, contact the Department Head or the Graduate Coordinator.

### ADMISSION REQUIREMENTS

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

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

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

3. Advanced botany or closely allied biological sciences: 12 semester hours.

4. Physical sciences: general inorganic chemistry: 8 semester hours; organic chemistry: Physics highly recommended.
5. College mathematics: 6 semester hours including 1 term of calculus.

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

THE MASTER'S PROGRAM

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

Thesis Option

The thesis program is the normal route taken by botany students for the M.S. In accordance with the emphasis of the University and the department on research, it involves writing and defending a thesis to describe the results of a completed research project of original work. It is important that the entering student promptly identify a major professor and a suitable research project. 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.
3. Demonstrated reading proficiency in one modern foreign language or in the use of computers for data analysis. Proficiency in a foreign language may be demonstrated by satisfactory completion with a grade of A or B of the following courses or their equivalent: French 302 or German 332.
4. Satisfactory completion of two hours at the 600 level.

Non-Thesis Option

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

2. Satisfactory completion of two hours at the 600 level.
3. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.
4. Satisfactory performance on a final written examination on all work offered for the degree. The student's committee may also require that an oral examination follow the written examination.

THE DOCTORAL PROGRAM

The Doctor of Philosophy program is patterned to provide training that involves extensive independent research within the student's area of concentration. Although there is no formal program of coursework, the student's area of concentration 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 problem by means of a written proposal and an oral defense to the student's committee. This must be completed before enrollment in Botany 600.
2. Satisfactory performance on a written 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. are as follows: 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, ichnology, pléctology, agrostology, mycology, phycology, aquatic vascular plants, synanthropology, woody plants, and botanical photography. May be repeated under different topic. Maximum 8 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 Plant 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

541 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, 412; Microbiology 310 or 319; Ornamental Horticulture and Landscape Design 330; and Plant and Soil Science 331.

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

501 Mycology (4) Intensive survey of fungi, all major classes, lecture laboratory and field information. Occasional field trips. 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 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 Non-Thesis Research (2) Library, field, or laboratory research projects. Not for thesis candidates. May be repeated. Maximum 4 hrs. E

506 Phylogeny (4) Comparative study of major animal phyla, both freshwater and marine: morphological, biochemical, and cellular physiology of asexual 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) photomicroscopy, drawing, graphics and video for recording and presentation for research and publication of data in pictorial and graphic form.

509 Morphology and Evolution of Basidimycetes (4) Structure and functions of somatic and sexual 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, phylogeny of the grass subfamilies 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 and cladistics.

521-22 Advanced Plant Physiology I, II (3,3) 521—Water and solute uptake, loss and movement; translocation; and fundamentals of mineral nutrition. Prereq: Biochemistry 140-10 and plant cell physiology course. Recommended prereq: 1 yr Physics. 522—Physiophylogeny, response of plants to light; Photochemistry, and photobiome mediated responses. Prereq: 521 or Biochemistry 410 and a plant cell or physiology course.

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.

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

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

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

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

565 Phytoplankton Ecology (3) Interaction between environment and phytoplankton. Nutrient uptake, primary productivity, ecological theory applied to phytoplankton communities, and physiological adaptations by 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.A.

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

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

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

583 The Field Research Problem (3) Conceptualization, planning, and implementing field research. Criteria for choosing instruments, sampling methods, and locations for study of populations, communities, and ecosystem. Field practice. Development and critique of formal research proposal like those required by granting and contracting agencies. Prereq: 431, or 535 or 536.

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/N/C only.

590 Developmental Plant Morphology (3) Developmental morphology of cultivated and wild plants from vegetative and reproductive organism, 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 (3-18) P,N,P only. E.

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

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

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

682 Seminar in the History of Botany (2) History of botanical exploration and advances from early civilization to modern periods. May be repeated. Maximum 4 hrs.
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 may complete an internship with a company using those skills acquired during the fall semester of the MBA program.

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

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

Admission Requirements

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

To be considered for admission, the applicant’s file must be complete. A complete file includes the Graduate School Application, transcripts of prior college work, the MBA program application, two completed applicant recommendation forms, and the Graduate Management Admission Test (GMAT) score report. The first items should reach The Graduate School ten days before the MBA application deadline to allow for processing. Additional information is required by The Graduate School for international students (see page 14).

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

Prerequisites

College-level mathematics through at least one course in college-level calculus, taken within the past 2 years, with a grade of B or better, is the only prerequisite requirement for entry into the program. Students whose undergraduate training does not include calculus should arrange to take it at UTK or at another accredited institution prior to the fall semester of entry into the program. Those electing the management science or statistics concentration must have completed two years of college-level calculus.

MBA Core


The same courses, but in a different sequence, comprise the core for part-time students.

Concentration and Electives

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

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

Controllership

Economics

Finance

Forest Industries Management

Management

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 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. (exception 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

This MBA concentration has been designated a Center of Excellence by the Tennessee Higher Education Commission. The concentration is comprised of three specifically designed courses which are interdisciplinary in nature. This concentration strives to build a strong academic foundation for both entrepreneurial and intrapreneurial activities. The new venture analysis and entrepreneurship concentration courses may be combined with two elective courses in another area (finance, management, etc.) to achieve a dual concentration.

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

PRE-MBA PROGRAM

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

Admission requirements are higher than those normally expected of MBA applicants. Desired qualifications include a minimum 3.4 GPA and a GMAT score of 550 or higher. Students interested in the program are counseled initially in the Liberal Arts Advising Center regarding admission standards and Liberal Arts requirements. At the end of their second year, there is 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 senior 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 conferral of both the Doctor of Jurisprudence and the Master of Business Administration. The dual program saves the student one semester over the time that would be required to earn both degrees independently.

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

**Admission Requirements**

Applicants for the J.D.-MBA program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D., the Graduate School 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 determine eligibility and assign students to advisors who will be responsible for course approval and supervision of the student's progress through the dual program.

**Curriculum**

A dual program candidate must satisfy the graduation requirements of each college. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual program.

The College of Law will award up to 8 semester hours of credit toward the J.D. for acceptable performance in approved graduate-level courses offered by the College of Business Administration. The College of Business Administration will award up to 9 semester hours of credit toward the MBA for acceptable performance in approved courses offered in the College of Law. The approval of courses is the responsibility of the Dual Program Committee and the student's assigned advisor.

Students may begin their studies in either the J.D. or the MBA program, but may not enroll in MBA coursework while completing the first year of the law curriculum and must not enroll in J.D. coursework while completing the first year of the business curriculum. During the first year in the J.D. program, students register through the College of Law. For any college in which students take MBA courses, even though they are also taking law courses, they must register through The Graduate School. The Graduate School registration form must be approved by the Associate Dean for Graduate Business Programs.

**Awarding of Grades**

Grades for graduate business courses accepted by the College of Law and grades for law courses accepted by the College of Business Administration will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college in which such grades are so converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for a law course in which the student has earned a 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 503 or a more advanced graduate accounting course and 6 semester hours approved by the College of Law. Law courses to be counted toward the MBA must be selected from those approved by the Associate Dean for Graduate Business Programs.

**THE DOCTORAL PROGRAM**

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

**Admission Requirements**

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

Under exceptional circumstances, a student may be considered for acceptance into the Ph.D. program without having a Master's degree. An applicant in this situation should have an outstanding undergraduate background and should represent a deep and sincere commitment to the pursuit of a career in research and instruction.

**Program of Study**

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

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

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

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

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

More detailed information concerning these specific areas is available by writing directly to each department chairperson and by
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 and is subject to Graduate Council 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 residency 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: Economics 510 (or approved substitute) is required, except that Management 567 (or equivalent) may be substituted with prior approval.

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

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 and strategic management), marketing, and transportation/logistics. See the appropriate fields of instruction for specific course requirements.

6. A minimum of 9 semester hours of graduate coursework is required in an area outside, but complementary to, the concentration. The student may choose the cognate from one of the following: one of the five concentration business areas listed above, economics, statistics, or a related area in another school or college of the University.

Comprehensive Examinations

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

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

Doctoral Committee

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

Admission to Candidacy

Students may apply for admission to candidacy for the Ph.D. after maintaining at least a "B" average during the fall and spring terms, successful completion of comprehensive examinations, and acceptance of a research proposal for the dissertation by the student's doctoral committee.

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

Dissertation

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

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

Graduate Courses

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 management 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 integrating all functional areas in formulation and implementation of strategy that enables organization to reach objectives. Prereq: MBA core.

599 Executive-In-Residence (3) Interaction with corporate executives with 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)

DEGREES

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

Joseph J. Perona, Head

Professors:

Bogue, Donald C., Ph.D............... Delaware
Byers, Charles H. (Adjunct), Ph.D........California
Clark, Edward S., Ph.D............... California
Crawford, Lloyd W. (UTSI), Ph.D........Cincinnati
Cuilverst, Oran L. (Emeritus), Ph.D....Texas
Fellers, John F., Ph.D............... Akron
Frazier, George C., Jr., D.Eng............Johns Hopkins
Hines, John M. (Emeritus), Ph.D........Tennessee
Hsu, Hsiuen-Wen, Ph.D............... Wisconsin
Johnson, Homer F. (Emeritus), Ph.D.....Yale
Moore, Charles F., Ph.D............... Louisiana State
Perona, Joseph J., Ph.D............... Northwestern
Prados, John W., Ph.D............... Tennessee
Scott, Charles D. (Adjunct), Ph.D....... Tennessee
Thomas, Cari O., Ph.D............... Tennessee
Watson, Jack S., Ph.D............... Tennessee

Associate Professors:

Bienkowski, Paul R., Ph.D...............Purdue
Blackburn, James W. (Research), Ph.D....Tennessee
Brans, Duane D., Ph.D............... Houston
Cochran, Henry D. (Adjunct), Ph.D.......MIT
Counce, Robert M., Ph.D............... Tennessee
Donaldson, Terry L., Ph.D...............Pennsylvania
Sheeh, Atul C. (UTSI), Ph.D...............Northwestern
Weber, Frederick E., Ph.D...............Minnesota

Assistant Professors:

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

Graduate programs lead to the degrees of Master of Science and Doctor of Philosophy in Chemical Engineering with concentrations in chemical engineering, chemical bioengineering, advanced control
systems, and polymer science and engineering.

THE MASTER’S PROGRAM

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

1. A total of at least 21 hours in graduate coursework in chemical engineering and related areas excluding thesis. The minimum requirements are 18 hours in chemical engineering; 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 580).

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

THE DOCTORAL PROGRAM

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

Department requirements consist of the satisfactory completion of:

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

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

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

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

GRADUATE COURSES

401 Chemical Engineering Data Analysis (3) Experimental data; identification of system extremums; 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 optimization, dynamic programming, and geometric programming. Prereq: Mathematics 241.

415 Computer Applications in Chemical Engineering (3) Computer solution of chemical engineering problems; Application of existing personal computer programs. Flow sheet simulators, statistics, spreadsheets, graphics and process modeling.


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

486 Coal Processing to Liquid Fuels (3) Characterization of various coals with respect to current gasification and liquefaction technologies; modeling of conversion processes and estimation of product yields and associated water, oxygen, and energy requirements; catalytic hydrogenation; reaction kinetics; economic 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/NC only.

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

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

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


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 microscopic approach to thermodynamics.

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

542 Diffusive and Stagewise Mass Transfer Operations (3) Analysis of mass transfer phenomena, coupled mass transfer and chemical reaction processes, packing and agitation, mass transfer in packed columns, membrane separations. Equilibrium stage concepts applied to mass transfer operations; mass transfer in nonisothermal and multidisciplinary systems.

551 Chemical Reactor Analysis (3) Rate models for homogeneous reactions, properties of porous catalysts, catalyst deactivation, fluid-fluid and fluid-liquid reactions.

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

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

576 Principles of Chemical Separations (3) Fundamental aspects of chemical processes or products selected as basis for methods with emphasis on separations as unified field; several chemical separation techniques with application, examples from several fields; development of predictive mathematical models.


580 Technical Review and Assessment (3) Preparation of critical review of literature in area related to chemical engineering. May be repeated. Limited to candidates in nonthesis option. Prereq: Consent of advisor.

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

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

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 586, Mechanical Engineering 589, and Aerospace Engineering 589.)

590 Special Topics in Chemical Engineering (3) May be repeated. Maximum 6 hrs.

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

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

631 Advanced Topics in Statistical Thermodynamics and Molecular Dynamics (3) Statistical thermodynamics, molecular based computer simula-
Students majoring in Chemistry for the Master's or doctoral degree are required to present as a prerequisite one year each of general, analytical, organic, and physical chemistry with a satisfactory record. At least one-half year of inorganic chemistry is also recommended. Students lacking any of these prerequisites may be admitted with appropriate deficiencies that must be removed without graduate credit. Applicants are required to take the General Graduate Record Examination.

Students minoring in Chemistry are required to present as a prerequisite two years of chemistry including quantitative analysis.

**THE MASTER'S PROGRAM**

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

The requirements for the M.S. in Chemistry consist of the satisfactory completion of:
1. Research and a thesis to give a minimum of 6 hours of graduate credit in Chemistry 500.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar. (No more than 2 hours may be applied to the course requirements.)
3. Prescribed remedial courses based on performance on entrance examinations.
4. Sufficient graduate coursework in chemistry (at the 400 level or above) and/or a related field to make an overall total of 30 hours, including one of the following sequences: 510-11-12, 530-31-32, 550-51-52, 570-72-73, 590-94-95. At least 14 hours of this graduate coursework must be at the 500 level or above.
5. A final oral examination.

**THE DOCTORAL PROGRAM**

The department offers concentrations in eight areas for the Ph.D.: analytical chemistry, chemical physics (in cooperation with the Department of Physics), environmental chemistry, inorganic chemistry, organic chemistry, polymer chemistry, and theoretical chemistry.

The requirements for the Ph.D. in Chemistry (except for the chemical physics concentration) consist of the satisfactory completion of:
1. Research and a dissertation to give at least 24 hours of graduate credit in Chemistry 600. Registration must be continuous over the entire period of graduate study. (No more than 2 hours may be used toward degree requirements.)
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar.
3. Prescribed remedial courses based on performance on entrance examinations.
4. Completion of the comprehensive examination series and defense of an original research proposal to give 2 hours of credit in Chemistry 601.
5. Demonstration of a reading knowledge of French, German, Russian, or an alternative approved by the Chemistry faculty.
6. Eighteen additional hours in courses at the 500 level or above including at least one course above 601 and one of the following sequences: 510-11-12, 530-31-32, 550-51-52-53-54, 570-71-72-73, 590-94-95.
7. A final oral examination.

The Ph.D. program with concentration in chemical physics is conducted jointly with the Department of Physics. The general requirements depend on the choice of the major department. Chemistry departmental requirements include passing the above degree requirements in chemistry with concentration in physical chemistry plus 6 additional hours in physics at the 500 level or above. Three of the additional physics hours can be used to satisfy the 18 hours requirement in item 6.

**GRADUATE COURSES**

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

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


470 Advanced Physical Chemistry (3) Chemical dynamics, statistical thermodynamics, quantum mechanics of atomic and molecular systems, crystal structure and solid state. Prereq: 360 or 381. Sp

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

501 Chemistry Seminar (1) Lectures and discussion on current research. May be repeated. Continuous registration required for resident graduate students. S/JNC 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 repeat- ed. S/JNC only. E

505 Special Problems (3) Specially assigned theoretical or experimental work on problems not covered in other courses. Prereq: 1 yr of department. May be repeated. Maximum 6 hrs. S/JNC only. E

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

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

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

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

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

531 Characteristics of Inorganic Compounds (3) Description of chemical behavior of 6 elements, structure, reactions, kinetics, mechanisms, equilibria, and spectra of coordination, organometallic, bioorganic compounds. Prereq: 530. Sp
Child and Family Studies

(College of Human Ecology)

MAJORS

Child and Family Studies...................... M.S. Human Ecology...................... Ph.D.

Mick Nordquist, Acting Head

Professors:

Cunningham, Jo Lynn, Ph.D. ................. Michigan State University
Fox, Greer L., Ph.D. .......................... Michigan State University

Twardosz, Sandra, Ph.D. ............................ Kansas State University

White, Priscilla, Ed.D. ............................ Pennsylvania State University

Associate Professors:

Allen, J., Ph.D. ............................. Purdue University
Buehler, C., Ph.D. .............................. Minnesota State University

Molnins, Jackie H., Ph.D. ............................. Florida State University

Assistant Professors:

Barber, B., Ph.D. ............................ Brown University
Young Blinn, L., Ph.D. ............................. Ohio State University

Catron, D., Ed.D. ............................... Vanderbilt University
Hallstroms, R., Ph.D. ............................. Ohio State University

Pettit, G., Ph.D. ............................... Indiana University

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 areas creates a unique perspective for the study of individuals and families. Each graduate student's program of study is carefully planned in consultation 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 Curriculum of Human Ecology 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 study. 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, undergraduate/graduate 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 development, and family science. 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 students are required to take the following: 3 hours of 500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in the area of specialization, 6 hours of thesis credit and an oral comprehensive examination. Non-thesis students are required to take the following: 3 hours of 500-level research methods, statistical methods, or interpretation of methods and statistics; CFS 564, 565; 9 hours of CFS courses in the area of specialization, 6 hours of thesis credit and an oral comprehensive examination. Non-thesis students are required to take the following: 3 hours of 500-level research methods, statistical methods, or interpretation of methods and statistics; CFS 564, 565; 9 hours of CFS courses in the area of specialization, and a written comprehensive examination.

Students in the family studies concentration must enroll in CFS 550, 571, and 540 or 541 for at least 6 hours in a cognate area outside the department are required. Thesis students are required to take the following: 3 hours of 500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in an area of specialization, 6 hours of thesis credit and an oral comprehensive examination. Non-thesis students are required to take the following: 3 hours of 500-level research methods, statistical methods, or interpretation of methods and statistics; CFS 564, 565; 9 hours of CFS courses in the area of specialization; and a written comprehensive examination.

Students seeking the M.S. in Child, Youth, and Family Studies are required to file a plan of study with the department head after 15 hours of graduate credit have been completed.

THE PH.D. CONCENTRATION

The doctoral program in Human Ecology prepares scholars in the concentration areas of child development and of family studies. The strength of the doctoral program is based on three major components: the inte-
530 Families of Handicapped Children (3) Developmental nature of families' experiences in caring for handicapped children, especially during infancy and early childhood. Prereq: 510 or consent of instructor.

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

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

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

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

561 Family Resource Management and Decision-making (3) Family resource management and decision-making, family economics, family communication. Prereq: 560c and consent of instructor.

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

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

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

565 Practicum in Human Development or Family Studies II (3) School and community programs concerned with education for human development and family living. Prereq: 564 and consent of instructor. E

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

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

570 Research Methods in Child and Family Studies (3) Presentation and critique of research projects. Prereq: Departmental major or consent of instructor. May be repeated. S/NC only. E

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

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

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

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

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

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

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

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

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

632 Advanced Study in Family Interaction (3) Human communication and conflict management within family context. Theoretical perspectives for family processes, adjustments, decision-makings, and problem solving. Prereq: 550 or equivalent or consent of instructor.

Civil Engineering

MAJORS

Civil Engineering........................................ M.S., Ph.D.

Environmental Engineering.......................... M.S.

Gregory D. Reed, Head

Professors:

Burdette, Edwin G. (Fred N. Peebles Prof.), PE, Ph.D........................................ Illinois

Chatterjee, Arun, PE, Ph.D............................ NC State

Davis, Wayne T., Ph.D................................. Tennessee

Goodpasture, David W. (Tenneco Prof.), PE, Ph.D........................................ Illinois

Grecco, William L., PE, Ph.D........................ Michigan State

Heathington, Kenneth W........................................ Northwestern

Humphreys, J. B., PE, Ph.D........................... Texas A&M

Johnson, H. L., PE, M.S............................... Tennessee

Miller, William A., PE, Ph.D............................. Georgia Tech

Reed, Gregory D., PE, Ph.D.............................. Arkansas

Tso, Bruce A. (Crandall Prof.), PE, Sc.D............... New Mexico State

Walker, C. R. (Emeritus), PE, M.S........................ MIT

Weeter, D. W., PE, Ph.D................................. Purdue

Wegmann, F. J. (IBM Prof.), Ph.D............................... Northwestern

Associate Professors:

Alavian, V., Ph.D........................................ Wisconsin

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

Tiry, R. F. (Emeritus), PE, B.S............................. Marquette

Assistant Professors:

Bennett, R. M., PE, Ph.D................................. Illinois

Drumm, E. C., PE, Ph.D................................. Arizona

Kane, W. F., Ph.D........................................... VPI
Lecturers:
Corum, J. M., Ph.D. ................................ Illinois
Franks, C., B.S. .....................................Tennessee
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, geotechnical/materials engineering, public works engineering, structural engineering, and transportation engineering; to the Master of Science in Environmental Engineering with concentrations in water quality, water resources, air quality, and waste management.

MASTER OF SCIENCE PROGRAM

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

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

Thesis Option: A minimum of 30 semester hours, including at least 8 hours of thesis, is required.

Non-Thesis Option: A minimum of 33 semester hours, including a 3-hour special 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 with a major in Environmental Engineering, normally a Bachelor's degree in a field of engineering is required. For a student who does not have an engineering degree, the following minimum prerequisite courses will be required: Basic Engineering or Computer Science 101; Basic Engineering 121, 131; Engineering Science and Mechanics 231, 321; Civil Engineering 290, 356, 380; Mathematics 141, 142, 231, 241; Chemistry 120, 130. In general, these must be completed before courses for graduate credit can be taken.

The Department of Civil Engineering offers both thesis and non-thesis options for work toward the Master of Science degree in Environmental Engineering.

Thesis Option: The student must present a minimum of 30 semester hours of approved graduate courses. The major shall include a minimum of 6 semester hours of thesis and 12 semester hours of approved environmental engineering coursework. A minor may be selected but is not necessarily required.

Non-Thesis Option: The student must present a minimum of 33 semester hours of approved graduate courses. The major shall include a minimum of 18 semester hours of approved environmental engineering coursework. A minor may be selected but is not necessarily required.

Either option must be approved by the student's major professor. A student's program must include a minimum of 9 semester hours of advanced engineering design courses selected from a list provided by the student's committee.

Non-Thesis Option: The master's 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 thesis or dissertation credit, at least 6 hours of which must be 600-level courses.
3. Supporting courses in related scientific and engineering fields, amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 9 semester hours of mathematics will be required beyond the civil engineering undergraduate requirements.
4. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research efforts.
5. Upon completion of at least one-half of all coursework, each student must pass a comprehensive examination.
6. After completion of the dissertation, prior to graduation, each student must pass a comprehensive examination administered by a faculty committee.

ACADEMIC COMMON MARKET

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

Civil Engineering

GRADUATE COURSES

404 Computer Applications in Civil Engineering (3)

406 Legal and Ethical Aspects of Engineering (2)

410 Land Surveying (3)

421 Portland Cement and Asphallic Concrete (3)

431 Highway Engineering (3)

441 Analysis of Framed Structures II (3)

472 Steel Design (3)

494 Urban Drainage Engineering (3)

495 Water Resources Development and Management (3)

502 Registration for Use of Facilities (3-15)

503 Seminar (1-15)

510 Systems Engineering and Management (3)

521 Complex Systems (3)

531 Geographical Information Systems (3)

541 Advanced Engineering Economics (3)

551 Advanced Materials Science (3)

561 Advanced Materials Processing (3)

571 Advanced Composites (3)

581 Advanced Thermodynamics (3)

591 Advanced Heat Transfer (3)

601 Advanced Power Generation (3)

611 Advanced Fluid Power (3)

621 Advanced Machine Design (3)

631 Advanced Manufacturing Systems (3)

641 Advanced Control Systems (3)

651 Advanced Renewable Energy (3)

661 Advanced Environmental Engineering (3)

671 Advanced Geotechnical Engineering (3)

681 Advanced Structural Engineering (3)

691 Advanced Transportation Engineering (3)

701 Advanced Construction Management (3)

711 Advanced Construction Economics (3)

721 Advanced Project Management (3)

731 Advanced Building Codes and Regulations (3)

741 Advanced Building Codes and Regulations (3)

751 Advanced Building Codes and Regulations (3)

761 Advanced Building Codes and Regulations (3)

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931 Advanced Building Codes and Regulations (3)

941 Advanced Building Codes and Regulations (3)

951 Advanced Building Codes and Regulations (3)

961 Advanced Building Codes and Regulations (3)

971 Advanced Building Codes and Regulations (3)

981 Advanced Building Codes and Regulations (3)

991 Advanced Building Codes and Regulations (3)
521 Pavement Design (3) Empirical and theoretical bases of pavement design and analysis; strengthening existing pavements; pavement distress and economical design alternatives. Prereq: 321 and 339.

530 Shear Strength and Earth Slope Stability (3) Shear strength of fine-grained soils and foundation materials; stability of slopes and embankments. Prereq: 335.


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


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

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


551 Traffic Engineering-Characteristics (3) OVER-the-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/phasing; one-way reversible flow; 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 and rural and urban roads of all classes; subdivision layout; configuration of urban roads of all classes; techniques for access control; freeway interchange changes 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; analysis 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 systems—transportation, financial and paratransit; operational design of transit services: route planning and scheduling; cost analysis; mode choice models; performance evaluation; transit surveys; organization and financing. Prereq: 554 or graduate standing.

556 Traffic Accident Reconstruction (3) Data collection and analysis as basis for accident prevention on control devices, techniques of pavement design and crash testing. Prereq: 452 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 plan. Transportation systems. Propagation of non-majors.


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

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

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

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

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

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

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

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

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

574 Behavior of Reinforced Concrete Members (3) Moment-curvature and load-deflection relationships for rectangular and I-shaped sections with and without axial load; shear and torsion; relation between research results and specifications for design. Prereq: 471.

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

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

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

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

596 Special Topics (1-4) Problems and topics related to current developments in field. May be repeated. Prereq: Consent of instructor.

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

637 Numerical Models for Geologic Materials (3) Numerical models to represent the stress/strain/volume relationships of soils, rock, and concrete; nonlinear elasto-plastic models; classical plasticity models; critical state and capped plasticity models; multiple surfaces; prediction interval of parameters from laboratory tests; numerical implementation. Prereq: 530 and Engineering Science and Mechanics 539.

639 Soil Dynamics (3) Behavior of soils and soil-structure systems under linear and non-linear loading; wave propagation in elastic media; principles of seismic refraction techniques; effects of earthquakes and vibrating machines on soil and foundations; cyclic soil testing and determination of soil parameters. Prereqs: 335 and 565 or Engineering Science and Mechanics 539.

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

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: 561.


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: 566.

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

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

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

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

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


540 Remote Sensing for Transportation and Facilities Siting (3) Principles of remote sensing; sources of data, 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 facility planning, construction and operations. Prereq: Consent of instructor.

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

551 Physicochemical Unit Processes (3) Theory and design application in water and wastewater treatment. Prereq: Civil Engineering 380, and Civil Engineering 395.

552 Biological Treatment Theory (3) Theory and design applications of biological processes to treatment of wastewater and solid wastes. Prereq: Civil Engineering 390. 2 hrs and 1 lab.

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

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

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

570 Air Quality Management/Pollution Control (3) Introductory course on concepts of air pollution, analysis of relationships among sources, meteorology, effects; stack sampling; emission control systems. Prereq: Consent of instructor.

571 Design of Air Pollution Control Systems (3) Design and evaluation of systems used to control emission of airborne particulate air pollutants. Comprehensive design of specific devices and systems. Prereq: 570.

572 Air Quality Dispersion Modeling (3) Diffusion in atmosphere; application of atmospheric dispersion models and evaluation of meteorological and air quality data. Prereq: Consent of instructor.

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

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

590 Special Problems in Environmental Engineering (1-6) Enrollment limited to environmental engineering students in non-thesis program. Prereq: Graduate standing. May be repeated. Maximum 6 hrs. S/NC only.

595 Special Topics (1-4) Problems and topics related to current developments in field. May be repeated.

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


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

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


653 Pollutant Fate Modeling and Risk Assessment (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of air, water, and earthen solids in environment. Methods of assessing risk posed by presence of those chemicals. Prereq: 551.

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

Classics

(Class of Liberal Arts)

Harry C. Rutledge, Head

Professors:

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

Associate Professors:

Craig, C. P., Ph.D. .................. North Carolina
Shelton, J. E., Ph.D. .................. Vanderbilt
Tandy, D. W., Ph.D. ................. Yale

Assistant Professor:

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

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

GRADUATE COURSES

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


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

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

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

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

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

441 Special Topics in Classical Civilization (1-3) Art, literature, religion, and society of Greece and Rome. Prereq: 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 existing course, or concentrating on one aspect of existing survey. Prereq: According to topic. May be repeated. Maximum 9 hrs.

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

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

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

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

561 Special Topics in Classical Civilization (3) Advanced study of one aspect of Greek or Roman civilization or culture. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. (Same as Anthropology 562.)

Communications

(Class of Communications)

MAJOR DEGREES

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

Professors:

ACADEMIC COMMON MARKET

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

ACADEMIC STANDARDS

A student in the College of Communications whose undergraduate grade-point average, not including incomplete grades, is below 3.0 at any time after the end of 12 hours of graduate credit will be placed on probation. A student on probation will be dropped from the program unless his or her cumulative 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 in acquiring basic skills in one of the areas listed above is advised to enroll for a second baccalaureate rather than an advanced degree.

Degree Requirements

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

1. Ten hours of core courses—Communications 510, 512, 540, and 550, the first three of which must be taken during the first two semesters of the student's program, except with written approval of the Assistant Dean for Graduate Studies of the College.
2. Twelve hours within one department of the college, at least 6 hours at the 500 level or above. An internship, if needed, is included.
3. Three hours elective from a list provided by the department in area of concentration.
4. Six hours of thesis work (Communications 500), including a thesis seminar. Additional hours may be required for those who do not have academic prerequisites, and an internship may be required for those who do not have professional experience in the field they wish to study. A course in communications law is a prerequisite.

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

Students interested in subsequent entry into a doctoral program are advised to take additional courses in communications theory and research, subject to advisor's approval.

After completion of the formal program of coursework and thesis research, the student must pass an oral examination conducted by his/her graduate committee. The student also must pass a written examination after completion of the core courses and communications law.

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

THE DOCTORAL PROGRAM

The Ph.D. with a major in Communications is intended to prepare scholars for teaching, research, administration, and service in the field of mass communications.

The program is interdisciplinary, consisting of a required core curriculum and recommended courses outside the College in the related social and behavioral sciences. The program is flexible and will accommodate a wide variety of career goals in communications. New students may be admitted to the program at any time; however, core courses begin only in the fall semester.

The Master's degree is not required for entry into or completion of the doctoral program. Program planning, however, will permit the Master's degree to be earned if desired. Students lacking academic or professional experience may 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 candidate status:

1. A 3.0 (4.0 system) grade-point average in undergraduate studies, or 3.5 for graduate work if applicant holds a Master's degree;
2. above the fiftieth percentile in verbal and quantitative aptitude on the Graduate Record Examination;
3. endorsement by at least three former teachers or professional colleagues; and
4. a statement of the applicant's goals and reasons for pursuing the doctorate. Personal interviews with members of the Ph.D. Admissions Committee are recommended and may be required.

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 secondary concentration (outside the College of Communications).
5. Twenty-four hours of dissertation.

Specific courses to be taken require the approval/consent of student's advising committee.

Admission to candidacy must be attained at least two semesters prior to graduation and requires successful completion of a written comprehensive examination.

Admission requirements of The Graduate School of UTK 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.D.S., 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 sciences.

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.

THE MASTER'S PROGRAM

Thirty semester hours of graduate credit are required, 24 of which must be 500 level or above. 511 and 513 are required unless explicitly waived by the department. One course in programming in a modern recursive, high-level programming language is required as entrance to 511 and one year of college mathematics beyond algebra and trigonometry is required for 513. Graduate courses outside the department are allowed but must be approved by the Graduate Committee before enrollment.

Thesis Option
The student must reach agreement on a thesis topic with a faculty advisor and must take at least 6 hours of 500 Thesis. No more than 6 hours of 500 Thesis may count in the 24-hour requirement at the 500 level or above.

Non-Thesis Option
The student must take coursework in an area to prepare for the non-thesis Master's examination. The student's advisor must verify that an acceptable set of courses has been taken before the student may schedule the examination. Information concerning the examination is available in the departmental office.

Master's Minor in Computer Science
The graduate minor consists of 511 or its equivalent plus an additional 6 hours of computer science graduate level courses at or above the 400 level.

THE DOCTORAL PROGRAM

Admission Requirements
A student seeking admission to the Ph.D. program is expected to meet the following requirements:

1. The student should have three letters of recommendation sent directly to the department head from individuals capable of assessing the student's potential for advanced work in computer science (for example, college teachers or employer for whom the student has worked after earning a Bachelor's degree). The department reserves the right to contact these individuals or other knowledgeable people if additional information is deemed necessary or desirable.
2. The student is expected to have taken the GRE verbal and quantitative general test within the past three years and to have these scores sent to The Graduate School.
3. The student should satisfy the same background requirements as for the Master's program. See the departmental brochure for details.

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

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

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

3. The student requests a member of the Computer Science Department's faculty to become the major professor, dissertation director, and chair of the student's committee. The committee must have at least four members, with at least three from the Computer Science Department and at least one holding an appointment in another department. At least three members, including the chair, must be approved by the Graduate Council to direct doctoral research.
4. The student's dissertation committee evaluates the student's background and performance and outlines a coherent program of study, which may include additional courses and outside readings in the technical literature. This program is subject to periodic revision within reasonable limits and will be reviewed by the committee no less frequently than once a year. Completion of the entire program is not required before admission to candidacy.
5. In a public meeting, the student presents to the committee a survey of current literature in the area of proposed Ph.D. research.
6. The student completes Graduate School requirements for formal admission to candidacy.

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

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

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

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

GRADUATE COURSES

401 Applications of Computer Graphics (3) Commercial software, techniques, hardware. Prereq. 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.
402 Applications of Artificial Intelligence (3) Basic techniques of heuristic search, gaming, and theorem proving. Prereq: 320. 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, systems, techniques. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

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

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

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

424 Robotics Software (3) Software for robotic control. Prereq: 331 and 360. 3 hr lab required.

425 Functional Languages (3) Functional, applicative and object-oriented languages, LISP and SMALL-TALK, used for research applications. Prereq: 111, 112 and Mathematics 222. 3 hr lab required.

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


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

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

436 Computer Systems Hardware Design (3) Computer hardware design, instruction sets, microprocessors, programming techniques in high-level language; construction, testing and debugging of either or both of: bit-slice architecture. Prereq: 435.

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: 449.

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

443 Introduction to Information Storage and Retrieval (3) File design and organization, 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 image information enhancement, restoration. Prereq: 451. 3 hr lab required.

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


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

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


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


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

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


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


484 Special Topics in Computer Science (1-3) May be repeated. Maximum 9 hrs.

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

502 Registration for Use of Facilities (3-16) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

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

513 Boolean Algebra and Logic Design (3) Relations, functions, proofs in discrete math; Boolean algebras, Number systems, base conversions. Combinatorial and sequential logic design. Logic design lab. Prereq: One or college mathematics beyond algebra and trigonometry.

521 Artificial Intelligence (3) Heuristic search, automatic theorem proving, symbolic methods, semantic information processing, representation theory. Prereq: 513 and 515.

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-driven pattern analysis; explicit and implicit structure. Prereq: 521.

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.


536 Computer Networks (3) Design and operation of networks. Hardware and software systems; communications subsystems. Prereq: 511 and 513.

541 Database Management Systems (3) Data model theory, optimization, and normalization; intelligent database systems; comparison of implementations; analysis of distributed and networked databases. Techniques for evaluation of performance, integrity, security and reliability. Prereq: 511.

544 Information Storage and Retrieval (3) Organization, storage and retrieval of bibliographic data; analysis of commercial IR system; information analysis and automatic dictionary generation; syntax 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 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.)


593 Independent Study (1-15) Maximum 6 hrs toward degree requirements.
Asian Studies

GRADUATE COURSES

421 Readings in Islamic Literature (3) Prereq: Mastery of intermediate-level Arabic or consent of instructor. May be repeated. Maximum 9 hrs.
431 Readings in Chinese Literature (3) Prereq: Mastery of intermediate-level Chinese or consent of instructor. May be repeated. Maximum 9 hrs.
451 Readings in Japanese Literature (3) Prereq: Mastery of intermediate-level Japanese or consent of instructor. May be repeated. Maximum 9 hrs.
471 Selected Topics in Asian Studies (3) Content varies. May be repeated. Maximum 9 hrs.

Comparative Literature

GRADUATE COURSES

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

Latin American Studies

GRADUATE COURSES

401 Cultural Plurality and Institutional Changes in Latin America (3) Value systems, behavioral patterns, social structure, role of military, church, educational institutions, dictatorships, 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 neogrammarmian 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 linguistic 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.)
435 Structure of the German Language (3) (Same as German 435.)
436 History of the German Language (3) (Same as German 436.)
471 Sociolinguistics (3) (Same as English 471 and Sociology 471.)
472 American English (3) (Same as English 472.)
474 Teaching English as a Second or Foreign Language I (3) (Same as English 474.)
475 Teaching English as a Second or Foreign Language II (3) (Same as English 475.)
485 Special Topics in Language (3) (Same as English 485.)
559 Problems in Linguistics: Romance Languages I (3) (Same as French 559 and Spanish 559.)

Urban Studies

GRADUATE COURSES

401 The City in the U.S. (3) (Same as Planning 401.)
441 Urban Geography (3) (Same as Geography 441.)
464 Urban Ecology (3) (Same as Sociology 464.)

Women's Studies

GRADUATE COURSES

400 Topics in Women's Studies (3) Content varies. May be repeated.
422 Women Writers in England (3) (Same as English 422.)
425 Women's Health (3) (Same as Health 425.)
434 Psychology of Gender (3) (Same as Psychology 434.)
466 Rhetoric of the Women's Rights Movement (3) (Same as Speech 466.)
483 Afro-American Women in American Society (3) (Same as Afro-American Studies 483.)

Curriculum and Instruction

(Office of Graduate Study)

MAJOR DEGREES

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

Theodore W. Hippie, Head

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

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

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

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 helping children learn mathematics. Unit planning, daily planning, grouping, general factors related to classroom management. Not open to students with recent course in teaching of elementary school mathematics. Cannot apply toward M.S. degree. Prereq: Admission to teacher education. F, Sp

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

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

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

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

486 Introduction to Instructional Computing (3) Classroom use of computers, applications for teachers, overview of computer hardware 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 programs for secondary schools. Prereq: Admission to teacher education. F, Sp

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

502 Registration for Use of Facilities (3-18) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 6 hrs. S/NC only. E


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

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

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 only. E

517 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 letter grade. E

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

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

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

521 Teaching Social Studies in Elementary and Middle Schools (3) Planning and techniques. Trends in 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 or consent of instructor. F, Su

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


525 Strategies, Programs and Materials for Teaching Elementary Social Studies (3) Analysis of new and innovative social studies program materials and techniques. Exploration of new approaches to 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, Su

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, Su

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

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

530 Teaching Reading in Elementary and Middle Schools (3) Trends in methods, materials, basic approaches. Skill development and analysis of historical procedures for teaching reading at elementary school
level. Prereq: Course in teaching of reading or consent of instructor. F,Su

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

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

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

534 Seminar in Reading Education (1-6) May be repeated. Maximum 8 hrs. E

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

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

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

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

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

540 Topics in Improvement of Instruction (1-3) Special topics in enrichment, remedial, and enrichment programs. May be repeated. Maximum 6 hrs. S/NC only. E

541 The High School Curriculum (3) Identification of problems associated with curriculum study, Tennessee's educational standards in literacy, and programs of local, regional, and national significance. E

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

543 Foundations of Educational Policy (3) Relationships among philosophy, policy, and practice; educational policies that arise from philosophical and practical considerations relative to human nature, to education and to the content of curriculum and to methods and techniques for conducting educational enterprises. F,Su

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

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

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

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

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

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

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

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

558 Curriculum Planning and Development (3) Foundations and principles of curriculum planning and development. Historical analysis of curriculum theory, principles of planning and development, and classroom application for improved learning. E

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

562 Direction and Supervision of Student Teaching (3) Roles and responsibilities of cooperating teachers and student teacher; objectives and policies of student teaching program; elements of clinical supervision; overview of research. F,Su

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

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

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

567 Application of Theory in Early Childhood Education (K-3) (3) Principles and practices from selected theoretical orientations. Prereq: Course in early childhood education or consent of instructor. May be repeated. Maximum 8 hrs. F,Su

568 Teacher-Parent-Community Relations (3) Techniques for effective relations between parents and teachers; examination of roles and expectations; parental involvement; volunteer programs, influence of community on educational process. Prereq: Consent of instructor. Sp,Su

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

573 Utilization of Educational Television and Radio (3) Television and radio as instructional and training media. Selecting, making and evaluating instruction/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. Curricular, instructional, research, and classroom management applications from microcomputers to super computers. Prereq: Consent of instructor. F,Su

578 Teaching English as a Second Language (3) Instructional methodology and teaching techniques, procedures to diagnose English linguistic proficiency; materials for non-native speaker in K-12 classroom. Prereq: for Tennessee ESL (K-12) certification. Prereq: Consent of instructor.

579 Career Development: Workshop (1-6) E

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

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

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


584 Seminar in Early Childhood Education (3) Analysis of probability and statistics in schools, elementary through college. Probabilities and statistical experiments, demonstrations, and applications. Prereq. 581. F


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

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


588 Instructional Theory and Design (3) Relationship of educational theory to research and teaching practice in foreign language education; instructional design and related learning theories; instructional models and teaching styles. E

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

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


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, enrichment programs and professional guidelines for middle, junior, and senior high schools, and community colleges. Prereq: Consent of instructor.
to formal and non-formal educational settings. Analysis, research, and theoretical models related to how learners process

652 Advanced Studies in Educational Anthropology (3) Research and writing of plays, reading of scripts. Prereq: 2 courses in reading education or consent of instructor. S

600 Doctoral Research and Dissertation (3-15) Prereq: 2 courses in educational research for middle, junior and senior high schools, or consent of instructor. May be repeated. Maximum 6 hrs. E

601 Studies in English Education (3) Issues and trends in English education. Prereq: 2 courses in educational research or consent of instructor. S

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

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

604 Seminar in Curriculum and Instruction (1) Required 2 consecutive semesters. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. E

606 Research in Elementary Education (3) Analysis of research in elementary education with application to classroom teaching. Prereq: research course. Su

608 Seminar in Philosophy of Education (3) Selected philosophical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. E

621 Seminar in Social Studies Research and Theory (2) Status of research and theory. Needed research, related research from other fields, and application of research. Prereq: Recent course in teaching of social studies or consent of instructor. May be repeated. Maximum 4 hrs. E

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

626 Advanced Studies in Elementary School Science (3) Current research in elementary school science as applied to classroom practice. Prereq: Graduate course in science education or equivalent or consent of instructor. May be repeated. Maximum 4 hrs. E

635 Teacher Education in America (3) For students interested in teaching in public schools. Prereq: research course. Su

636 History of Education (3) Analysis of research in educational theory. Prereq: Consent of instructor. E

639 Independent Study (1-3) May be repeated. S/NC only. E

652 Seminar in Elementary School Mathematics (3) Research in elementary school mathematics. Prereq: Graduate course in mathematics education or consent of instructor. Sp

655 Educational Leadership: Theory and Practice (3) Theories of leadership applied to variety of educational settings. Prereq: Consent of instructor. F

665 Advanced Studies in Secondary Science and Environmental Education (3) Trends in science and environmental programs, materials methods and research for middle, junior and senior high schools, and community colleges. Prereq: 588 or equivalent and consent of instructor. Sp

671 Advanced Educational Statistics (3) Applications of parametric and non-parametric statistical inference to educational and instructional problems. Use of microcomputers in educational research. Prereq: 651. Sp

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

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

676 Curriculum Theory (3) Influential curriculum theories and approaches, implications for structure and design of educational programs. Nature and function of theory, theory building activities. Prereq: Consent of instructor. E

682 Advanced Studies in Elementary School Mathematics (3) Research in elementary school mathematics. Prereq: Graduate course in mathematics education or consent of instructor. Sp

683 Advanced Studies in Elementary School Mathematics (3) 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

689 Internship (1-3) Experiences in application of research, methodology and instructional improvement. Prereq: Program prerequisites and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

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

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

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

696 Advanced Studies in Secondary Science and Environmental Education (3) Trends in science and environmental programs, materials methods and research for middle, junior and senior high schools, and community colleges. Prereq: 588 or equivalent and consent of instructor. Sp

Ecology

(Ecology of College of Liberal Arts)

MAJOR

DEGREES

Ecology

M.S., Ph.D.

Dewey L. Bunting, Director

B. L. Dearden, Associate Director

Paul A. Delcourt, Associate Director

Shared Faculty:

Amundsen, C. C., Ph.D., Botany
Auerbach, S. I., Ph.D., ORNL
Bartlett, Steve, Ph.D., ORNL
Blaylock, B. G., Ph.D., ORNL
Buckner, E. R., Ph.D., Forestry
Bunting, Dewey L., Ph.D., Zoology
Burghardt, G. M., Ph.D., Psychology
Carter, Janus, Ph.D., Geography
Clebsch, E. E., Ph.D., Botany
Coutant, C. C., Ph.D., ORNL
DeAngels, D. L., Ph.D., ORNL

Deardren, B. L., Ph.D., Forestry
Delcourt, Hazel, Ph.D., Zoology
Delcourt, Paul A., Ph.D., Geology
DeSelm, H. R., Ph.D., Botany
Dimmick, Ralph W., Ph.D., Fisheries and Wildlife
Drake, James A., Ph.D., Zoology
Echtneracht, Arthur C., Ph.D., Zoology
Elwood, J. W., Ph.D., ORNL
Etner, D. A., Ph.D., Zoology
Evans, A. M., Ph.D., Botany
Farkas, Walter, Ph.D., Environmental Practice
Fribbie, Henry A., Ph.D., Plant & Soil Science
Gardner, R. H., Ph.D., ORNL
Gehris, C. W., Ph.D., ORNL
Gillilan, C. S., Ph.D., ORAU
Gillilan, John L., Ph.D., Zoology
Greenburg, Neil, Ph.D., Zoology
Gross, L. J., Ph.D., Mathematics
Hallam, Thomas G., Ph.D., Mathematics
Hammittt, W. E., Ph.D., Forestry and Wildlife
Hansen, J. H., Ph.D., UT/TSI
Hardin, Carol P., Ph.D., Geography
Hay, R. L., Ph.D., Forestry
Herbes, S. E., Ph.D., ORNL
Hildebrand, S. G., Ph.D., ORNL
Hilty, J. W., Ph.D., Entomology & Plant Pathology
Horn, Sally P., Ph.D., Geography
Houston, M., Ph.D., ORNL
Kelly, J. M., Ph.D., TVA
Kimmel, B. L., Ph.D., ORNL
Kitchen, Hyram, D.V.M., Ph.D., Veterinary Medicine
Kot, M. Ph.D., Mathematics
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
Olson, J. S., Ph.D., ORNL
O'Neil, R. V., Ph.D., ORNL
Pagni, R. M., Ph.D., Chemistry
Parmalee, Paul W., Ph.D., Anthropology
Pelton, Michael R., Ph.D., Fisheries & Wildlife
Pimm, S. L., Ph.D., Zoology
Pless, C. D., Ph.D., Entomology & Plant Pathology
Post, W., Ph.D., ORNL
Reed, R. M., Ph.D., ORNL
Rehder, J. B., Ph.D., Geography
Reiche, D. E., Ph.D., ORNL
Rennie, J. C., Ph.D., Forestry
Reynolds, John H., Ph.D., Plant & Soil Science
Riechert, Susan E., Ph.D., Zoology
Sayer, Gary S., Ph.D., Microbiology
Schlarbaum, S. E., Ph.D., Forestry & Wildlife
Schneider, Gary, Ph.D., Forestry
Shugart, H. H., Ph.D., UV
Smith, W. O., Ph.D., Botany
Stacey, G., Ph.D., Microbiology
Stewart, A., Ph.D., ORNL
Strange, R. J., Ph.D., Botany
Van Hook, R. I., Ph.D., ORNL
VanWinkle, W., Ph.D., ORNL
Vaughn, G., Ph.D., Zoology
Walton, B. G., Ph.D., ORNL
Wehry, E. L., Ph.D., Chemistry
West, D. C., Ph.D., ORNL
White, David C., Ph.D., Microbiology
White, P. S., Ph.D., UNC
Withron, J. L., Ph.D., Fisheries & Wildlife
Witherspoon, J. P., Ph.D., ORNL
Wood, F. W., Ph.D., Forestry
The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. The interdisciplinary 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; and (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 37996-1610.

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 annually by the Ecology Curriculum Committee. The remaining of a student's coursework is designed in consultation with the graduate committee. A listing of approved campus-wide ecology offerings is provided to each student during orientation.

A graduate minor in ecology is available on an individual basis.

THE DOCTORAL PROGRAM

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

ADVISORS

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

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

500 Thesis (1-15) P/VPN only, E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only, E
510 Special Problems in Ecology (1-3) Individual investigations in ecology. May be repeated with consent of instructor. Maximum 6 hrs.
520 Ecology for Planners and Engineers (3) Ecological principles and effects that human-caused changes have on living organisms. Lectures and field trips.
530 Development Planning in the Third World (3) Scientific basis for integrated resource management and environmental assessment in developing nations.
537 Natural Resource Management and Environmental Assessment in Developing Nations (3) Assessment of environmental and resource development issues.
552 Environmental Planning (3) (Same as Planning 555 and Botany 557.)
555 Environmental Planning (3) (Same as Planning 555.)
561 Environmental Toxicology (3) (Same as Biochemistry 561.)
562 Techniques in Environmental Toxicology (3) (Same as Biochemistry 562.)
573 Population Biology (3) (Same as Zoology 573 and Botany 573.)
574 Communities and Ecosystems (3) Patterns underlying principles behind short and long term community and ecosystem organization, dynamics, energetics and nutrient cycling.
600 Doctoral Research and Dissertation (3-15) P/VPN only, E
604 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 604.)
610 Special Topics in Ecology (3) Seminars on advanced topics and recent developments.
620 Seminar in Ecology (2) May be repeated. Maximum 12 hrs.
637 Applied Ecology (3) Review of contemporary and historical issues. Analysis of scientific basis of environmental assessment and natural resource management. Analysis of careers and career planning in applied ecology. Prereq: 573-74 or equivalent or consent of instructor. (Same as Botany 637.)
period. The probationary period is defined as the next semester's coursework established by the degree program for full-time students, and the next two semester's coursework as established by the degree program for part-time students.

THE MASTER'S PROGRAM

Admission to the M.A. program is based on undergraduate academic performance and on scores from the GRE or scores from the GMAT. The student may choose either the thesis or non-thesis option.

The non-thesis option requires 30 hours of coursework at the 400 level or above. Of these, at least 24 hours (at least 18 hours of which are in economics) must be at the 500 level or above. Of the minimum of 18 hours in economics at the 500 level or above, 12 hours must consist of 511, 512 and 513, 514, and the remaining 6 hours must be in one field of economics. Of the 30 hours, a maximum of 9 hours in courses approved by the department may be taken in fields other than economics. Students electing the non-thesis option are required to pass a final comprehensive examination.

The thesis option requires 30 hours of coursework at the 400 level or above, including at least 24 hours at the 500 level or above (no more than 6 hours of which may be thesis hours). Of the remaining 18 hours at the 500 level or above, at least 15 hours must be in economics and must include 511, 512, 513, and 514. A maximum of 6 hours may be in an area other than economics.

THE DOCTORAL PROGRAM

Admission to the Ph.D. program is based on promise of outstanding scholarship as demonstrated by coursework at the 500 level or above, 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.

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 political economic strategies, policies, and problems. Prereq: 201. This course includes a major writing requirement.


462 Economics of Resources and Environmental Policy (3) Economic analysis of environmental policy and allocation of resources. Benefits and costs of development of natural resources and impacts of growth on environment. Major writing requirement. Prereq: 201.

501 Managerial Economics (3) Application of economic concepts to business decision making. Analysis of market structures, behavior of the firm in perfectly competitive and monopolistic environments. For non-economics majors. Not available to students with credit for 511. Prereq: 311 or equivalent.

511-12 Microeconomic Theory (3,3) Theory of consumer behavior and firm behavior in perfect competition and cost, behavior of the firm in perfectly competitive and monopolistic environments. For non-economics majors. Not available to students with credit for 511. Prereq: 311 or equivalent.

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 economic structures and policies from colonial times. Prereq: Graduate standing in economics or consent of instructor.


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

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

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


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

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

624 Economic Development: Western Impact on Asia and Africa (3) Studies of consequences of contact between developed world and developing countries of Asia and Africa. Prereq: Undergraduate degree in economics or consent of instructor.
The program requirements, concentrations and specializations are:

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<tr>
<th>Requirements</th>
<th>Minimum Hours</th>
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<tbody>
<tr>
<td>Research Area</td>
<td>14</td>
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<td>Foreign or Computer Language</td>
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<td>(demonstrate proficiency)</td>
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<td>General Core Requirements</td>
<td>6</td>
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<tr>
<td>Courses in history of education,</td>
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<td>philosophy of education (two areas</td>
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<td>must be represented)</td>
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<tr>
<td>Courses in learning theory, curriculum</td>
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<td>theory, and administrative theory</td>
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<td>(three areas must be represented)</td>
<td>3</td>
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<tr>
<td>Alternative Core Requirements</td>
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<tr>
<td>Courses in philosophy of science</td>
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<td>Trans-college Seminar—three</td>
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<td>consecutive semesters (including</td>
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<td>summer)</td>
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<tr>
<td>Seminar in area of specialization</td>
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<td>Courses in learning theory/group or</td>
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<td>independent study</td>
<td>3</td>
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<tr>
<td>Concentrations</td>
<td>24</td>
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CONCENTRATIONS

Administrative Theory and Practice

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

Theories of Curriculum Development and Foundations of Education

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

Instructional Theory and Practice

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

Theories and Practice of Educational and Personal Adjustment

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

Foundations of Human Movement

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

Health Education

Specializations:
1. Public health
2. Safety

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The Ph.D. program in Education is available to residents of the states of Georgia 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 academe and issues/problems in education. Minimum of two consecutive semesters preceded or followed by summer term required of all Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. Maximum 3 hrs. May not be used to meet 600 requirement. S/N only.

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Educational and Counseling Psychology

College of Education)

MAJORS

Degree: M.S.

Educational Psychology

Degree: M.S., Ed.D.

Educational Psychology and Guidance

Degree: Ed.S.

Education

Degree: Ph.D.

Siegfried C. Dietz, Acting Head

Professors:

Davis, K. L., Ed.D......................................... Georgia
DeRidder, Lawrence M. (Emeritus), Ph.D........................................ Michigan
Dickinson, Donald J., Ed.D. .................................. Oklahoma State
Dietz, Siegfried C., Ed.D. .................................. Arizona State
Hector, M. A., Ph.D........................................... Michigan State
Huck, Schuyler W., Ph.D....................................... Northwestern
SPECIALIST PROGRAMS

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

THE DOCTORAL PROGRAMS

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

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

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

ACADEMIC COMMON MARKET

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

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 and Counseling (3) Theories and research concerning development of person's sexual role and its relevance in educational and counseling settings. E

431 Personality and Mental Health (2) 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 psychology, psychosocial behavior and appropriate interventions. E

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

493 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

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

502 Registration for Use of Facilities (5-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E


504 Special Topics (1-15) 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, conditioned, observational learning, and other psychological learning as they 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 evaluation as they apply to education. Prereq: 515 or consent of instructor. F

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

520 Statistics and Research Design: Conceptual (3) Conceptually oriented, conceptual treatment of statistics, research design, and qualitative basis of testing. E
521 Statistics and Research Design: Application (3) Data collection and analysis. Descriptive techniques, estimation, tests of hypothesis testing and selected parametric and nonparametric tests. For Master’s students conducting thesis and beginning doctoral students. Use of computer and 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 profession. Consideration of history and current issues in school psychology. S/NC only. Sp

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

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

545 Psychoeducational Consultation (3) Use of two and three person consultation in educational and therapeutic settings based on behavioral, ecological, social learning and cognitive-behavioral theories. Coreq: 541 or consent of instructor. F,S,Sp

546 Practicum in Consultation (2) Application of consulting skills to educational settings. Coreq: 545. Sp

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

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

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

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

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

554 Group Dynamics and Methods (3) Theory and types of groups, descriptions of group practices, methods, dynamics, and facilitative skills, supervision of leadership skills. E

555 Practicum in Counseling (3) Supervised practice and application of counseling skills with individual clients. Prereq: Admission to program, 431, 525, 551 and consent of instructor. May be repeated. Maximum 9 hrs. E

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

558 Internship in School Counseling (1-6) Supervised postpracticum employment at departmentally approved site. Prereq: 550 and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E

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

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

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

570 Cross-Cultural Counseling: Theory and Research (3) Theory and research on issues and problems in counseling of clients from different cultural backgrounds in U.S. and abroad. Sp

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

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

600 Doctoral Dissertation (1) Full-time research and study leading to completion of the doctoral dissertation in areas of specialization. Prereq: Admission to doctoral program in educational psychology. May be repeated. Maximum 6 hrs. S/NC or letter grade. E

601 Doctoral Dissertation (3) Full-time research and study leading to completion of the doctoral dissertation in areas of specialization. Prereq: Admission to doctoral program in educational psychology. May be repeated. Maximum 12 hrs. S/NC only. E

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

625 Advanced Study in Personality (3) Theory, research and conceptual analysis of studies with application to education and counseling. Prereq: 431 or equivalent. Sp

635 Ethical, Legal, and Professional Issues in Psychology (3) Human services, teaching and public policy. Prereq: Admission to doctoral program in psychology, or consent of instructor. (Same as Psychology 635.) Sp

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

650 Seminar in Counselor Education (1) Professional issues related to role and function of counselor educator. Prereq: Admission to doctoral program in counselor education. May be repeated. Maximum 2 hrs. F

655 Practicum in Counselor Education (3) Supervised practice and application of counseling skills with clients. Prereq: Supervision to counselor education program and consent of instructor. May be repeated. Maximum 6 hrs. E

659 Internship in Counselor Education (1-6) 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 Educational Implications of Neuropsychology (3) Educational implications of neuropsychological bases of students' cognition, behavior, and emotions. Prereq: 515 and 516, or consent of instructor. Sp


663 Scale Construction (3) Development, pilot testing, and revision of attitude inventories, rating scales, and other self-report instruments. Use of base scores for thinking, 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 skills, self-instruction, cognitive restructuring, symbols 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 personality and vocational measures in assessment of clients. Prereq: 525, 552, or consent of instructor. F

672 Psychological Dysfunction (3) Classification methods, dynamics and treatment of dysfunctional individuals in counseling. Prereq: 625 and course in abnormal psychology, or consent of instructor. Sp

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

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

678 Theory and Practice of Counseling Supervision (3) Theory and practice of supervision in counseling. Prereq: 655, 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

Educational Leadership

(Majors of Education)

MAJORS

DEGREES

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

Educational Administration (M.S., Ed.D.)

Educational Leadership (Ph.D.)

Professors:

Mary Jane Connelly, Head

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 offers both a thesis and non-thesis option. A minimum of 39 hours, which includes 6 hours of practicum experience, is required in either option.

Students entering any of the M.S. options are advised to first complete the introductory core consisting of Educational Administration and Supervision 513, 515, 516, and 535 or a demonstrated computer proficiency. The courses are prerequisites to other courses in the department.

THE 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 final 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 paper. 

THE DOCTORAL PROGRAM

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

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

Educational Administration and Supervision

GRADUATE COURSES

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

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

503 Problems in Lieu of Thesis (3-6) May be repeated.

513 Administrative and Organizational Theory in Education (3) Introduces students to the theoretical, administrative and organizational foundations of management and leadership of educational programs and institutions.

515 Human Relations and Communication in Administration (3) Describes, experimental, and quasi-experimental designs to help students without quantitative backgrounds to read and understand technical professional literature. Introduction to inferential statistics, needs assessments, and evaluation procedures.

518 Educational Specialist Research and Thesis (3) May be repeated. Maximum 6 hrs. P/NC only. E

529 Politics of Education and Educational Environments (3) Selection, supervision, and use of effective interpersonal communication skills and channels, intergroup relations, supportive work climates, personal motivation, conflict management skills, and role of values, attitudes, and expectations in administration.

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

518 Educational Specialist Research and Thesis (3) May be repeated. Maximum 6 hrs. P/NC only. E

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

544 School Finance and Business Management (3) For prospective building level administrators. Financial and legal management tasks and procedures in individual school setting. Prereq: M.S. Introductory core or consent of instructor.

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.

548 Introductory Supervision and Personnel (3) Basic supervisory and personnel concepts and related competencies: building (or micro-organizational) level, interviewing, personnel planning, selecting and maintaining employee information systems, and non-instructional personnel, clinical supervision, staff evaluation, and staff development. Prereq: Introductory M.S. core or consent of instructor.

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

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.

580 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.

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

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,Sp

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

597 Secondary Administrator Seminar (1-3) For in-service training of secondary school administrators. 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,Sp

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

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

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

611 Current Issues in Educational Administration (1-4) Prereq: Concurrent enrollment in educational administration course. Selected each semester and presented by specialist. Prereq: Presently school supervisor or administrator, or consent of instructor. May be repeated. S/NC or letter grade. E

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

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

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

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

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

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

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

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

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

655 State-Federal Relations in Education (3) Interrelationships of federal, state, and local responsibilities and organization for education by analysis of traditional, legal, fiscal and functional aspects of educational partnership. F,Sp

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

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

680 Administration of Complex Organizations (3) Concepts and theoretical formulations to understand, analyze, evaluate, and change complex educational programs and organizations. Prereq: 513 or consent of instructor. Sp,Su

687 Seminar in Educational Facility Planning (3) Concepts and techniques for evaluating educational facilities, conducting comprehensive school surveys, and developing educational specifications. Prereq: 547 or consent of instructor. Sp

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

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

698 Seminar in Higher Education (3) Analysis of administrative and organizational structure, teaching and organizational theory, and practice in higher education. Prereq: 543 or consent of instructor. F,Sp

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

701 Dissertation (1-15) P/NP only. E

702 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

703 Problems in Lieu of Thesis (3-6) May be repeated. S/NC only. E

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

Electrical and Computer Engineering (College of Engineering)

MAJOR DEGREES

Graduate Programs in Electrical and Computer Engineering

Electrical and Computer Engineering

Degrees

M.S., Ph.D.

Program Directors:

Joseph M. Googe, Head

Professors:

Alexeff, Igor, Ph.D. Wisconsin Bailey, J. Milton, Ph.D. Georgia Tech Birdwell, J. Douglas, Ph.D.

MIT
THE MASTER OF SCIENCE PROGRAM

Electrical and Computer Engineering aims to provide advanced education in the electrical and computer engineering disciplines. Students pursue a Master's degree program in one calendar year. Graduates may also hold a B.S. in Electrical Engineering and are considered for admission on an individual basis. The minimum expectation is a cumulative grade-point average of 3.0 and a GPA of 3.0 for the senior year.

Students who hold the B.S. or B.A. in a field other than electrical engineering are expected to have a minimum cumulative grade-point average of 3.0 and a minimum senior year average in their field. These students should also have a background equivalent to that obtained by earning credit with a minimum 3.0 grade-point average in the Electrical Engineering courses normally taken at the 200 and 300 levels in the Bachelor's program in this department, and two 400-level courses in the student's major area of concentration in the Master's program. Students from fields other than electrical engineering who have met the admission standards except for this background will be admitted only as non-degree students until they have completed coursework to provide this background.

Master's Degree Requirements

Specific degree requirements which must be met include:

1. Electrical and Computer Engineering courses approved by the Electrical and Computer Engineering Department.

2. A minimum of 24 semester hours of 400-level coursework.

3. An additional 12 semester hours of graduate coursework or immediate completion of the Master's degree.

4. A minimum of 24 hours of doctoral coursework must be completed after the student has taken the qualifying examination.

5. Participation in departmental seminars.


Many of the electrical and computer engineering courses are offered in the evening. Students working in industry are encouraged to participate in the department's graduate program. Departmental graduate programs are also available at the Space Institute of Tullahoma.

Graduate work leading to the Master of Science degree in electrical engineering may be completed 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.

Students who hold the B.S. or B.A. in a field other than electrical engineering are also expected to have a minimum cumulative grade-point average of 3.0 and a minimum senior year average in their field. These students should also have a background equivalent to that obtained by earning credit with a minimum 3.0 grade-point average in the Electrical Engineering courses normally taken at the 200 and 300 levels in the Bachelor's program in this department, and two 400-level courses in the student's major area of concentration in the Master's program. Students from fields other than electrical engineering who have met the admission standards except for this background will be admitted only as non-degree students until they have completed coursework to provide this background.

Doctoral Program

The Ph.D. with a major in Electrical Engineering may be pursued in the concentration areas of circuit theory, computers, electromagnetics, communication theory, control systems, 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. degree include the following:

1. A Master of Science or Master of Engineering degree.


   a. A minimum of 24 semester hours of work in electrical and computer engineering courses at the 500 and 600 levels.

   b. A minimum of 9 semester hours of 600-level coursework. At least 3 semester hours of this work must be in an area other than the student's major area.

   c. A minimum of 12 hours of mathematics courses approved by the Electrical and Computer Engineering Graduate Committee. All 12 hours must be 400-level or above, and at least 6 hours must be at the 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 and/or career.

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 written examination in each of four areas. Areas include mathematics and transform methods, and 2 basic electrical network analysis methods. All courses are taken as a 3-hour written examination.

Candidates who pass 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 the Master's degree. A minimum of 12 hours of graduate coursework must be completed after the student has taken the qualifying examination.

The comprehensive examination is normally taken after the qualifying examination. It 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 the qualifying examination.

5. Participation in departmental seminars.


GRADUATE COURSES

Courses required in the Electrical and Computer Engineering undergraduate curriculum cannot be used in either the M.S. or Ph.D. programs. No 400-level course may be used toward a graduate degree in Electrical and Computer Engineering except when required by the program.


412 Linear Control System Design (3) Classical and modern techniques of design of linear feedback control systems, root loci, methods, compensation, state feedback. Prereq: 411.

421 Power Systems (3) Bulk power system planning and control; reliability; system stability. Prereq: 322.

422 Machines (3) Dynamic behavior of rotating machines; transformers and for common modern operation of d.c. machines; response to different waveforms in supply; describing equations for a.c. machines and their numerical solutions. Prereq: 322. Coreq: 426.


426 Machines Lab (1) Experiments and projects demonstrating machining cores. Prereq: 422.

429 Power Electronics Lab (1) Experiments and projects demonstrating power electronic devices.

431 Digital and Analog Integrated Electronics (3) Basic processing concepts of active and passive components for monolithic integrated circuits; characteristics of bipolar, MOS and JFET transistors in integrated circuit devices and standard digital logic circuits including TTL, ECL, Schottky, NMOS, CMOS, and GaAs gates and arrays; design concepts for op-amps, comparators, references, regulators, and other linear functions. Prereq: 332. Coreq: 435.

432 Analog Signal Processing Electronics (3) Trans- ducer signal and interfacing characteristics; analog integrator circuits; general control voltage- fed invert- er and isolation amplifiers, rms and logarithmic converters, multiplexers, and function generators; integrated cir- cuit applications; active filters, level and phase detection, multiplexers, modulation and demodulation, sample and hold, and comparators. Prereq: 332. Coreq: 436.

433 Electronic Amplifiers (3) Feedback amplifier prin- ciples; wideband linear amplifier design; radio frequency and audio power amplifier design; linear regulated power supply design; oscillator principles. Prereq: 332. Coreq: 439.


449 Microwave Circuits and Electronics Laboratory (1) Experiments and projects demonstrating micro- wave circuit and electronics. Coreq: 443.

451 Microprocessors in Computer Engineering (3) Project-oriented course using microcomputer kit having monitor program and development system with cross- assembler, file management, and emulation capabilities. Interfacing and hardware/software trade-offs in interrupt driven applications. Term grade dependent on number of projects and homework solutions, and engineering notebook. Prereq: 352. Coreq: 455.


453 Data Acquisition Systems (3) Digital-to-analog conversion by DAC and D/A ladder networks; error analysis of D/A converters; sample hold circuits; analog-to-digital conversion techniques; open loop system; mixed signal converter; closed loop systems; dual slope and successive approxima- tion error of A/D converters; accuracy, linearity, drift, dynamic range, frequency response, gain, grounds and shielding; automated testing of A/D and D/A con- verters; device service routines; signature analysis. Prereq: 352. Coreq: 459.


455 Microprocessor Laboratory (1) Experiments and projects demonstrating microprocessors. Coreq: 451.


461 Plasma Magnetohydrodynamic Engineering (3) MHD approximations; MHD instability 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 multiple beams to continuum; Vlasov and Landau theory; microwave generation in plas- mas and traveling wave tubes; Microwave maser in circular geometry; gyrotrope and orbitron. Design of plasma devices. Prereq: 361; 481 or consent of instruc- tor.

463 Introduction to Fusion Energy I (3) High temperature plasma physics relevant to fusion plasmas, principles of fusion reactors, and engineering and physics con- strains on fusion reactors. Prereq: 361 or consent of instructor. (Same as Nuclear Engineering 463.)

464 Introduction to Fusion Energy II (3) Principles and phenomenology of tokamak reactor, alternate magnetic confinement, advanced fusion fueled plasma, fusion technology, plasma engineering, and fusion reactor design studies. Design project. Prereq: 463 or consent of instructor. (Same as Nuclear Engineering 464.)

465 Plasma Laboratory (1) Experiments and design projects for 461, 462, and 463, 464.


482 Electro-Optics II Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 489.

484 Special Problems in Electrical Engineering (1-3) Problems involving library and experimental research. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

495 Senior Seminar (1) Topics of interest discussed in written work and presentations. Prereq: Consent of instructor. May be repeated. Maximum 2 hrs.

499 Electro-Optics II Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 482.

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

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

503 Modern Transform Methods (3) Fourier and Laplace transform and complex variables theory. Z- transforms, difference equations and distributed param- eter systems.

504 Random Process Theory for Engineers (3) Probability and random variables as approached by set theory. Statistical averages and transformations of random variables. Random processes, second order prop- erty, correlation functions and temporal analysis, power spectrum and spectrum density as applied to response of systems to random signals.

511 Linear Systems Theory (3) State space models of linear dynamical systems, linear algebra, state trans- sition map, matrix exponential, controllability, observability, realization theory, and stability theory.

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


515 Adaptive Control and System Identification (2) Adaptive control of linear deterministic and stochas- tic systems, adaptive control of linear nonparametric system estimation for deterministic and stochastic systems. Prereq: 511-12 or 518-19.


Electrical and Computer Engineering 83

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

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

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

523 Power Electronics and Drives (3) Forced commutated inverters, advanced PWM techniques, current-fed and voltage-fed converters, current and voltage control of induction machines, parameter variations, control principles of synchronous machines.

541 High Voltage Systems (3) Phenomena, generation, measurement, practices and insulation in high voltages, insulation design and arc control, shielding, reliability. Prereq: 421.

528 Advanced Electrical Machines I (3) Fundamental processes of electromechanical energy conversion; application in conventional devices. Differential equations for rotating machinery. Prereq: 422 or equivalent.

529 Advanced Electrical Machines II (3) Park's transformation and two-axis model, transient behavior of isolated and interconnected rotating machines. Prereq: 528.

531 Advanced Analog Electronics I (3) Physical operation of modern electronic devices: semiconductor devices: diodes, bipolar transistors, JFETs, and MOSFETs. Small-signal equivalent circuits and noise models of active devices. Project laboratory. Prereq: 431, 432, 433, or consent of instructor.


542 Radiation and Propagation (3) Linear antennas, loop antennas, aperture antennas, optical transfer function. Canonical problems of modern geometrical theory of diffraction (GTD) for electromagnetic waves: geometric optics approximation, and accountings of far fields and near fields due to edge and surface diffraction. Horn, lens, and reflector antennas; computation of radar crosssection. Prereq: 541.

543 Information Systems I (3) Mathematical treatment of information transmission in communication systems; modulation and demodulation; discrete and analog systems. System performance with noise and bandwidth constraints, sampling theorem. Quantization effects, digital representation in real time and real frequency; digital signal processing. Prereq: 504.

544 Information Systems II (3) Wiener's theory of filtering and prediction; optimum filtering and prediction for sampled signals; extension to nonlinear systems. Determination of minimum mean square error. Application to radar tracking; target resolution and accuracy; low-noise receivers. Prereq: 543.

545 Introductory Microwave Networks and Components (3) Scattering and transfer representation for multiplex; 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.


552 Digital System Design II (3) State identification and structure realizations of sequential machines. Digital system architecture design: microprogramming and interrupt control. Prereq: 551.

560 Power Systems (3) Principles of active, passive, perturbing and nonperturbing diagnostic methods used in low-voltage, medium-voltage, and high voltage power system components of interest to research. Laboratory safety, data reduction and presentation, microcomputer usage and exploration and analysis, and reduction of time series data. Prereq: 481, 463, or consent of instructor. (Same as Nuclear Engineering 561.)

561 Plasma Diagnostics (3) Principles of active, passive, perturbing and nonperturbing diagnostic methods used in low-voltage, medium-voltage, and high temperature plasmas of interest in fusion research. Laboratory safety, data reduction and presentation, microcomputer usage and exploration and analysis, and reduction of time series data. Prereq: 481, 463, or consent of instructor. (Same as Nuclear Engineering 561.)

562 Plasma Diagnostics I (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. (Same as Nuclear Engineering 562.)

563 Plasma Engineering (3) (Same as Nuclear Engineering 563.)

564 Fusion Technology (3) (Same as Nuclear Engineering 564.)

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 Robot Sensing (3) Design and applications of various sensors such as vision, range, proximity, force, and torque. Multi-sensor integration for robotics applications. Prereq: 572 or consent of instructor.


588 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 588, Civil Engineering 588, Engineering Science and Mechanics 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 (1-3) Topics of interest discussed in weekly seminar. May be repeated. Maximum 9 hrs.

599 Special Topics (1-5) May be repeated. Maximum 9 hrs.

600 Doctoral Research and Dissertation (3-18) FNP only. E.


612 Advanced Systems Theory (3) Game theory, dual control problem, hierarchical systems, and information structures. Prereq: 611.


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) Systematic study and analysis of nonlinear electrical networks, network elements and equation, linear systems, nonlinear ODE's, geometric analysis and numerical techniques. Prereq: 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.


623 Advanced Power Electronics and Drives (3) Phase-controlled cycloconverters, cycloconverter-fed ac drives, resonant converters, matrix converters, synchronous machines, static Kramer drivers, static Scherbius drives, VSCF generation, modern control theory in ac drives.

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


641 Electromagnetic Diffraction and Scattering (3) Diffraction of electromagnetic waves by spheres, corners and cylinders; ground wave propagation; modern approximate methods; guided waves, leaky waves. Prereq: Consent of instructor.

642 Asymptotic Techniques in Wave Propagation (3) Electromagnetic waves with spatial and temporal dispersion and with applications to the control of dynamic systems. Scattering and power flow scattering. Single scattering radiative transport in turbulent
MAJOR

DEGREES

Engineering Science 

Engineering Science and Mechanics

(College of Engineering)

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
Frost, W. (UTSI), Ph.D. ......................... Washington
Jendrucko, R. J., PE, Ph.D. .............. Virginia
Keefer, D. R. (UTSI), Ph.D. ............ Florida
Kim, K. H., Ph.D. ........................................ NC State
Landes, J. D., PE, Ph.D. ....................... Lehigh
Lee, C. W. (Emeritus), Ph.D. .......... Illinois IT
McCay, T. D. (UTSI), PE, Ph.D. ......... Auburn
Pih, H., PE, Ph.D. ....................................... Illinois IT
Remenyik, C. J., Ph.D. ....................... Johns Hopkins
Roberts, R. M. (UTSI), Ph.D. .......... Airforce Tech
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
Wasserman, J., PE, Ph.D. ................. Cincinnati

Assistant Professor:
Brooks, G. N., Ph.D. ............................... Stanford

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program concentrations include solid mechanics, fluid mechanics, computational mechanics, biomedical engineering, and optical engineering (UTSI only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. Each applicant is advised as to any prerequisite courses before entering a program; the student's program of study must be approved by his/her advisory committee, and must comply with the requirements of The Graduate School. The student's major professor may be selected from a department other than the Department of Engineering Science and Mechanics; however, at least one member of the student's graduate advisory committee must be on the faculty of the Department of Engineering Science and Mechanics.

A departmental application is required in addition to The Graduate School application. The names and addresses of four references must be included with the departmental application. The flexibility and interdisciplinary aspect of the program concentrations are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering or can best be met by interdisciplinary study in engineering. The department's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics or in related interdisciplinary studies such as 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:

- Hours Credit
- Mathematics
- Engineering courses (Major concentration may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.) 12 18

- Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.) 6 9
- Thesis
- 6

"Engineering courses under option II may include advanced laboratory work or special problem work; for example, Engineering Science and Mechan
ics 581 or analogous courses in other departments.

A final examination is required under both options covering graduate coursework and the thesis.

THE DOCTORAL PROGRAM

Specific departmental requirements for the Ph.D. include:

1. A minimum of 72 semester hours beyond the Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

2. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 12 semester hours in mathematics or computer science in courses numbered 400 and above, exclusive of a first course in ordinary differential equations.

4. A minimum of 6 semester hours of courses numbered 500 and above, offered in departments other than mathematics, computer science, and the student's major department and not included in the areas of concentration under item 2.
examinations are:

- 435 Engineering Acoustics (3) Concepts of acoustics, measures of sound and their units; noise generation and transmission, noise control principles and applications, materials and procedures for noise abatement. Prerequisite: Introductory course in vibrations or acoustics.

- 442 Fluid Mechanics II (3) Differential forms of basic laws; compressibility, isentropic flow, shocks, duct flows with and without swirl, internal and external viscous flows, boundary layers, elementary turbulent closure. Prerequisite: 441. 3 cr.

- 454 Computational Mechanics III (3) Integration of fundamental physical laws, mathematical methods and computational techniques necessary to develop engineering analysis and design capabilities. Prerequisite: Computational Mechanics II.

- 461 Experimental Stress Analysis (3) Theory, techniques, and instrumentation of resistance strain gauges; strain rosettes, strip gauges, and buckling and large deflection. Prerequisite: 321. 2 hrs and 1 lab.

- 463 Photomechanics (3) Introduction to photoelasticity, photoelastic coating method, Moiré method, interferometry, and holography. Prerequisite: 321. Physics 232. 2 hrs and 1 lab.

- 485 Dynamic Data Acquisition (3) Use and calibration of instrumentation for measuring and recording dynamic events; Fourier analysis, transfer function analysis, digital signal processing, transduction, experimental parameter estimation with applications to modal vibration analysis. Prerequisite: 301 and 1 lab.

- 471 Clinical Engineering and Bioinstrumentation (3) Function and characteristics of health care delivery systems: hospital organization and health care economics; development and management principles for hospital-based clinical engineering program. Biomedical instrumentation system operational characteristics; performance of transducers, signal conditioning, data readout and storage devices; evaluation of commercially available systems, selection and procurement methods, custom-designed system, equipment maintenance and control programs for hospitals. Ethical issues and professionalism in clinical engineering. Prerequisite: Biomedical engineering, Introduction to Pattern Recognition.

- 473 Biomechanics (3) Mechanical properties of living tissues; biomechanics of injury; mechanics of prosthesis; national composite properties; clinical test of prosthetic devices; biomechanical problems related to impact. Prerequisite: 321.

- 475 Design of Artificial Internal Organs (3) Design, development and evaluation of artificial internal organs; analysis of transplantable and replacement systems for optimization; review of currently available devices, federal regulation, and ethical considerations. Prerequisite: 341, Mathematics 231.

- 476 Transport Phenomena in Living and Life Support Systems (3) Application of mass, momentum and heat transport theory to quantitative analysis of in vivo physiological and life support systems. Prerequisite: 476. 3 cr.

- 480 Fracture Toughness and Material Science (3) Fracture toughness data in design. Prerequisite: 321 and Materials Science and Engineering 201. Same as Materials Science and Engineering 476. 3 hrs or 2 hrs and 1 lab.

- 485 Principles of Nondestructive Testing (3) Principles and theory of nondestructive testing methods; liquid penetrant, magnetic particle, eddy current, ultrasonic, acoustic emission, optical methods; physical basis of nondestructive testing. Prerequisite: EM211. MAT 321. 3 cr.

- 491 Fundamentals of Vibrations (3) Free and forced vibrations of damped and undamped lumped parametric systems; energy methods; interaction of vibration and continuous bodies. Prerequisite: 231, Mathematics 231.

Dynamic Systems (3) Three dimensional dynamics of particles and rigid bodies; gyroscopes; variable mass systems; central force motion; Lagrange's equations; stability; transfer functions. Prerequisite: Dynamics.

- 495 Engineering Acoustics (3) Concepts of acoustics, measures of sound and their units; noise generation and transmission, noise control principles and applications, materials and procedures for noise abatement. Prerequisite: Introductory course in vibrations or acoustics.

- 496 Fluid Mechanics II (3) Differential forms of basic laws; compressibility, isentropic flow, shocks, duct flows with and without swirl, internal and external viscous flows, boundary layers, elementary turbulent closure. Prerequisite: 495. 3 cr.

- 498 Computational Mechanics III (3) Integration of fundamental physical laws, mathematical methods and computational techniques necessary to develop engineering analysis and design capabilities. Prerequisite: Computational Mechanics II.

- 501 Experimental Stress Analysis (3) Theory, techniques, and instrumentation of resistance strain gauges; strain rosettes, strip gauges, and buckling and large deflection. Prerequisite: 495. 2 hrs and 1 lab.

- 503 Photomechanics (3) Introduction to photoelasticity, photoelastic coating method, Moiré method, interferometry, and holography. Prerequisite: 495. Physics 232. 2 hrs and 1 lab.

- 505 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. Prerequisite: 501 and 1 lab.

- 511 Clinical Engineering and Bioinstrumentation (3) Function and characteristics of health care delivery systems: hospital organization and health care economics; development and management principles for hospital-based clinical engineering program. Biomedical instrumentation system operational characteristics; performance of transducers, signal conditioning, data readout and storage devices; evaluation of commercially available systems, selection and procurement methods, custom-designed system, equipment maintenance and control programs for hospitals. Ethical issues and professionalism in clinical engineering. Prerequisite: Biomedical engineering, Introduction to Pattern Recognition.

- 513 Biomechanics (3) Mechanical properties of living tissues; biomechanics of injury; mechanics of prosthesis; national composite properties; clinical test of prosthetic devices; biomechanical problems related to impact. Prerequisite: 511.

- 515 Design of Artificial Internal Organs (3) Design, development and evaluation of artificial internal organs; analysis of transplantable and replacement systems for optimization; review of currently available devices, federal regulation, and ethical considerations. Prerequisite: 513, Mathematics 231.

- 516 Transport Phenomena in Living and Life Support Systems (3) Application of mass, momentum and heat transport theory to quantitative analysis of in vivo physiological and life support systems. Prerequisite: 516. 3 cr.

- 518 Fracture Toughness and Material Science (3) Fracture toughness data in design. Prerequisite: 513 and Materials Science and Engineering 201. Same as Materials Science and Engineering 476. 3 hrs or 2 hrs and 1 lab.

- 519 Principles of Nondestructive Testing (3) Principles and theory of nondestructive testing methods; liquid penetrant, magnetic particle, eddy current, ultrasonic, acoustic emission, optical methods; physical basis of nondestructive testing. Prerequisite: 511. MAT 321. 3 cr.

- 520 Fundamentals of Vibrations (3) Free and forced vibrations of damped and undamped lumped parametric systems; energy methods; interaction of vibration and continuous bodies. Prerequisite: 513. Mathematics 231.

Dynamic Systems (3) Three dimensional dynamics of particles and rigid bodies; gyroscopes; variable mass systems; central force motion; Lagrange's equations; stability; transfer functions. Prerequisite: Dynamics.

- 521 Engineering Acoustics (3) Concepts of acoustics, measures of sound and their units; noise generation and transmission, noise control principles and applications, materials and procedures for noise abatement. Prerequisite: Introductory course in vibrations or acoustics.

- 522 Fluid Mechanics II (3) Differential forms of basic laws; compressibility, isentropic flow, shocks, duct flows with and without swirl, internal and external viscous flows, boundary layers, elementary turbulent closure. Prerequisite: 521. 3 cr.

- 523 Computational Mechanics III (3) Integration of fundamental physical laws, mathematical methods and computational techniques necessary to develop engineering analysis and design capabilities. Prerequisite: Computational Mechanics II.

- 524 Experimental Stress Analysis (3) Theory, techniques, and instrumentation of resistance strain gauges; strain rosettes, strip gauges, and buckling and large deflection. Prerequisite: 521. 2 hrs and 1 lab.

- 525 Photomechanics (3) Introduction to photoelasticity, photoelastic coating method, Moiré method, interferometry, and holography. Prerequisite: 521. Physics 232. 2 hrs and 1 lab.

- 526 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. Prerequisite: 525 and 1 lab.

- 527-28 Fracture Mechanics (3,3) Mechanics of fracture and crack growth; stress analysis; crack tip plastic zone; energy principles in fracture mechanics; fatigue crack initiation and propagation; fracture mechanics design and fatigue life prediction. Analytical, numerical, and experimental methods for determination of stress intensity factors. Current topics in fracture mechanics. Prerequisite: 500. 6 cr.


- 536 Advanced Engineering Acoustics (3) Introduction to theory and application of acoustic analysis; vibration of continuous systems, plane and spherical waves, transmission phenomenon, radiation and scattering. Resonant filters, absorption mechanisms, microphones, ultrasonics, sonar transducers. Prerequisite: 435 or 437.

- 539 Introduction to Continuum Mechanics (3) Cartesian tensors, transformation laws, basic continuum mechanics concepts, conservative fields, 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 laws; mass, momentum and energy conservation laws; relationship of conservation laws to Navier-Stokes equations; exact solutions, potential flow, transonic, boundary layer theory. Prerequisite: Thermodynamics and coupled heat/mass transfer models. Coreq. 539.
542 Fluid Dynamics II (3) Development of basic conceptions governing equations for turbulences and turbulent field motion. Formulation for conservation function, energy spectra, diffusion, introduction to turbulent transport processes, free turbulence, wall turbulence; use of engineering turbulence closures due to examination of modern numerical and experimental methods. Prereq: 541.


553 Finite Element Structural Analysis (3) Finite element analysis techniques in structural mechanics and elasticity, nonlinearities. Two and three-dimensional formulations; isoparametric elements, numerical quadrature. Equation solving: substructuring, skyline solvers, matrix iteration techniques. Applications in beams, plates and shells; use of representative computer programs and procedures in networked mini-computer/work station environment: CAD, graphics, solids modelers, 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 I (1) Introduction to networked computer/engineering work station environment for CAD/graphic/numerical computing and data base management. Coreq: 557.

561 Photoelasticity (3) Polarized light; basic principles of photoelasticity; experimental techniques and equipment; numerical methods in photoelastic stress analysis; three-dimensional problems, experimental 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, radiometry. Prereq: 556.

569 Optical Engineering Laboratory II (2) Prereq: 567. Coreq: 568.

571 Biomechanics of Hard and Soft Tissue (3) Introduction to anatomy, physiology, and analytical methods for mechanics of living tissue. Continuum mechanics analysis of hard and soft issue, biological fluid flow in vessels, rheology of blood in micro vessels; bioviscoelasticity of fluids and solids, mechanical properties of blood vessels; skeletal, heart and smooth muscle; bone and cartilage. Research paper.

572 Biomedical Fluid Mechanics (3) Application of fluid mechanics theory to fluid flows in living systems.


581 Special Topics in Engineering Mechanics (3) Mechanics problems related to recent developments. Prereq: Consent of instructor. May be repeated with consent of department.

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

589 Measurement Science II (3) (Same as Nuclear Engineering 588, Chemical Engineering 586, Civil Engineering 588, Electrical and Computer Engineering 586, Aerospace Engineering 589, and Mechanical Engineering 589.)

600 Doctoral Research and Dissertation (3-15) E 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 562.


624 Viscoelasticity (3) Viscoelastic constitutive relations; isothermal boundary value problems; wave propagation in viscoelastic materials; stability problems; determination of viscoelastic properties. Prereqs: 523 and 539 or Polymer Engineering 541.

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 Convection (3) Convective processes, heat and mass transfer, boundary layer analysis, stability, transition, turbulence, closure models; Navier-Stokes equations, closure procedures; time and ensemble averaging, large scale structures; high speed flow, reacting, nonreacting, excitation, ionization. Applications in propulsion, lasers, aerodynamics. Prereq: 542.

645 Theory of Turbulence (3) Mathematical description of turbulence: isotropic turbulence, energy spectra, Kolmogoroff's hypothesis, large and small eddy structures 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 nonsmooth solutions; shocks, artificial dissipation; two- and three-dimensional, compressible viscous and inviscid flows; potential; Euler and complete Navier-Stokes descriptions; mixed subsonic-supersonic flows. Algorithm constructions: finite difference, finite element, approximate factorization, flux vector splitting, finite volume; generalized coordinate 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: 551-552.

587 Computational Mechanics Laboratory II (2) Laboratory in support of Computational Mechanics I (552). Prereq or coreq: 552-553.

588 Computational Mechanics Seminar (1) Current developments in computational fluid/thermal/structural mechanics. For departmental thesis students only. May be repeated.

589 Advanced Photoelasticity (3) Scattered light three-dimensional photoelasticity; dynamic photoelasticity; photopolyptactic and photoviscoelasticity; holographic photoelasticity, recent developments. Prereq: 561. 2 hrs and 1 lab.

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)

MAJOR

DEGREES

English ............................................ M.A., Ph.D.

Dorothy M. Scura, Head

Professors:

Armstead, Jack M., Ph.D.............Duke

Bratton, Edward W., Ph.D.............Illinois

Carroll, D. Allen, Ph.D.................North Carolina

Cox, Don R., Ph.D.........................Missouri

Dake, Robert Y., Jr., Ph.D.............Yale

Dykeman, Wilma (Adjunct), B.A........Northwestern

Enser, Allison R., Ph.D.................Indiana

Finneran, Richard J. (Hodges Chair of Excellence), Ph.D.................North Carolina

Fitzgerald, Mary (Adjunct), Ph.D........North Carolina

Goslee, Nancy M., Ph.D.................Yale

Heffeman, 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

Penny, A. Richard, Ph.D..............Colorado

Reese, Jack E., Ph.D.................Kentucky

Sanders, Norman J. (Lindsay Young Prof.), Ph.D............North Carolina

Shakespeare Schneider, Daniel (Distinguished Prof.), Ph.D............Northwestern

Scura, Dorothy M., Ph.D.................North Carolina

Shurr, William (Distinguished Prof.), Ph.D............California

Trahern, Joseph B., Jr., Ph.D............Illinois

Wheeler, Thomas V., Ph.D.............North Carolina

White, Jon M. (Lindsay Young Prof.), M.A............Cambridge

Associate Professors:

Burghardt, Lorraine S., Ph.D............Chicago

Dumas, Bethany K., Ph.D..............Arkansas

Gill, J. E., Ph.D.................North Carolina

Goslee, David F., Ph.D.................Yale

Hutchinson, George, Ph.D............Indiana

Kallet, Marilyn, Ph.D............Rutgers

Keene, Michael, Ph.D..............Texas

Lakso, Robert, Ph.D............Illinois

Maland, Charles J., Ph.D............Michigan

Maland, Charles J., Ph.D............Michigan

Penner, A. Richard, Ph.D..............Colorado
Assistant Professors:

Bensei-Myers, Linda D., Ph.D. .......... Oregon
Dunn, Allen, Ph.D. .......... Washington
Forte, Jeanie K., Ph.D. .......... Washington
Hammontree, Patsy G., M.A. .......... Tennessee
Papke, Mary E., Ph.D. .......... McGill
Riley, Kathryn, Ph.D. .......... Maryland
Samuels, Donald, Ph.D. .......... North Carolina
Smith, Arthur, Ph.D. .......... Houston
Wallace, Ray, D.A. .......... Illinois State
Zomchick, John, Ph.D. .......... Columbia

The Department of English offers the Master of Arts and the Doctor of Philosophy degrees with a major in English. Thesis and non-thesis options are available for the M.A. as well as a special concentration in writing. Detailed information about the Master’s and doctoral programs, and about individual graduate courses, may be obtained by writing the Director of Graduate Studies in English, McClung Tower.

THE MASTER’S PROGRAM

Requirements

Coursework: A minimum of 24 semester hours in English beyond the B.A., to include 6 hours at the 400 level; 12 additional hours at the 500-600 level (Only 3 hours of 593 Independent Study may be applied toward the M.A.); and 6 hours for graduate credit at any level, including the 400 level. In this coursework, students must maintain at least a 3.0 GPA.

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

Non-Thesis Option: Six hours of 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 UTK with a grade of B or better.
3. Passing of the regular Ph.D. foreign language examination given by UTK and approved by the Director of Graduate Studies.

Language Requirement: A language requirement met in one of the following ways:

1. Two languages approved by the Director of Graduate Studies in English. The requirement for each language may be fulfilled by (a) completion of French 302 or German 332 with a grade of B or better; (b) completion at UTK of any two courses given in the foreign language at the 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.

2. One modern language approved by the Director of Graduate Studies in English. This requirement must be fulfilled by a passing grade on the language examination given by UTK and completion of two courses given in the foreign language at the 400 level or above, at least one course to be at the 500 or 600 level. A minimum grade of B must be received in each course.

3. One modern language approved by the Director of Graduate Studies in English and intensive study of the English language. This requirement must be fulfilled by completion of (a), (b), or (c) in option 1 or one for foreign language; and completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509 History of the English Language. For the other 3 hours, the student may either complete the history of the language sequence or choose one other course in language taught in the Department of English at the 500 or 600 level and approved by the Director of Graduate Studies in English. These courses will not count toward the minimum number of courses for the Ph.D., and anyone electing this language option may not take the comprehensive examination in linguistics.

Examinations: (1) A 4-hour qualifying examination taken before the end of the first year of Ph.D. coursework; this examination is given three times a year, with the M.A. written examination. (2) A comprehensive written examination, which may be divided as the department directs; see the English Department graduate brochure. The comprehensive examination is given twice a year, normally in March and September. Before a student may take the examination, 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 6 semester 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 Troylus and Criseyde in Middle English.
Entomology and Plant Pathology

(Conce of Agriculture)

MAJOR DEGREE

Entomology and Plant Pathology M.S.

Carroll J. Southards, Head

Professors:

Bernard, Ernest C., Ph.D.............. Georgia
Gwinn, Kimberly D., Ph.D.............. NC State
Johnson, Leander F., Ph.D.............. Louisiana State
Lambdin, Paris L., Ph.D.............. VPI
Piess, Charles D., Ph.D.............. Clemson
Southards, Carroll J., Ph.D.............. NC State

Assistant Professors:

Grant, Jerome F., Ph.D.............. Clemson
Gwinn, Kimberly D., Ph.D.............. NC State
Reddick, Bradford D., Ph.D.............. Clemson
Whindham, 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 fungal 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 completed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include seminars relevant to the thesis. The minor will be selected from current courses 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 the student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

510 Plant Disease Fungi (4) Morphology, taxonomy, biology, and genetics of plant pathogenic fungi. Isolation and identification of plant pathogenic fungi. Prereq: 313 or consent of instructor. 2 hrs and 2 labs. F.A

511 Plant Disease Diagnosis (3) Diagnosis of plant diseases, disease symptoms, 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-parasite-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 events involved in host-pathogen interactions. Mechanisms of disease resistance. Prereq: Introductory plant physiology and pathology, or consent of instructor.

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

521 Plant Virology (3) Symptomatology, epidemiology, and management of virus infection; structure, morphology, replication, transmission, purification, characterization, and classification of plant viruses; serology; plant pathogenic viroids, mycoplasmas and spongoplasmas. Prereq: 313 or consent of instructor. 2 hrs and 1 lab. F.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, biology and control of arthropod parasites and vectors of pathogens of humans and animals. Ecology and behavior of vectors in relation to pathogen transmission and control. Prereq: 321 or 325, or 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 Sciences 525). 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 Intro to 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 3 hrs. E

Environmental Practice

(Conse of Veterinary Medicine)

MAJOR DEGREE

Veterinary Medicine M/V.M.

T. P. McDonald, Acting Head

Professors:

Farkas, W. R., Ph.D.............. Duke
Kishen, Hyram, D.V.M., Ph.D.............. Florida
McDonald, T. P., Ph.D.............. Tennessee
Oliver, J. W., D.V.M., Ph.D.............. Purdue

Associate Professors:

New, J. C., D.V.M.............. Texas A&M

Environmental Practice

(Conce of Veterinary Medicine)

MAJOR DEGREE

Veterinary Medicine M/V.M.

T. P. McDonald, Acting Head

Professors:

Farkas, W. R., Ph.D.............. Duke
Kitchen, Hyram, D.V.M., Ph.D.............. Florida
McDonald, T. P., Ph.D.............. Tennessee
Oliver, J. W., D.V.M., Ph.D.............. Purdue

Associate Professors:

New, J. C., D.V.M.............. Texas A&M
Schroeder, E. C., D.V.M. Michigan State

Assistant Professors:
Frazier, D., D.V.M., Ph.D. NC State
Lotropo, C. D., D.V.M., Ph.D. Tennessee
Morris, P. J., D.V.M. California (Davis)

Clinical Associate:
Funk, R. S., D.V.M. Ohio State

See Veterinary Medicine for program description.

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

501 Special Topics in Environmental Medicine (1-3) Aherent metabolism, pharmacokinetics, toxicologic studies, toxicokinetics, studies, epidemiology and techniques in molecular biology: atomic absorption, gas chromatography, ultra centrifugation, extractive techniques and radiomuncassay. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

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

503 In vitro Evaluation of Toxicity (3) Principles and techniques of in vitro evaluation of toxicity, mutagenesis, carcinogenesis, and teratogenesis. Prereq: Biochemistry 501 and consent of instructor. Sp,A

504 Experimental Animal Surgery (3) Competence in performing humane surgical modifications of experimental animals. Techniques of anesthesia. Drug administration and postoperative care. Prereq: Embryology, paratoxicology, physiology and/or consent of instructor. 1 hr and 2 labs. F

561 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamics properties of drugs: mode of action, pharmacologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncrasies and clinical applications. Prereq: Consent of instructor. F

600 Doctoral Research and Dissertation (1-3) F/NP only. E

610 Advanced Topics in Environmental Medicine (1-3) Current and future research methodology, laboratory situation, recent advances in instrumentation in analytical techniques for environmental medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

Finance
(Office of Business Administration)

MAJOR DEGREES
Business Administration MBA, Ph.D.

Harold A. Black, Head

Professors:
Black, Harold A., Ph.D. Ohio State
Dorrweich, William W. (Wm. Voight Prot.), 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
Shrievs, Ronald E. (Faculty Scholar), Ph.D.

Associate Professors:
Auxier, A. L., Ph.D. Iowa
Boehm, T. P., Ph.D. Washington (St. Louis)
Wachowicz, J. M., Jr, CPA, Ph.D. Illinois
Wansley, James, W. Ph.D. South Carolina

Assistant Professors:
Daves, Phillip R., Ph.D. North Carolina
Ehrhardt, M. C., Ph.D. Georgia Tech
Ketcham, D. C., Ph.D. Penn State
Tramble, J. L., Ph.D. Texas A&M

BUSINESS ADMINISTRATION

501 Financial Management (3) Principles of financial management. Analysis of investment, financing, and asset management functions of firm. May be used toward degree requirements. May be repeated. S/NC 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 applied toward degree requirements. May be repeated. S/NC only. E

511 Contemporary Issues in Corporate Finance (3) Selected topics in financial management, recent developments and issues that may 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.


589 Special Topics in Finance (3) Topics vary. Prereq: 501.

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


642 Seminar in Finance II: Theory of the Firm (3) Financial theory of firm and financial decision making under conditions of uncertainty, equilibrium models of firm. Option pricing, agency theory, capital structure, economics of information, and dividend policy.

651 Advanced Seminar in Finance I (3) Recent theoretical and empirical developments in finance literature. Intertemporal asset pricing, signaling, arbitrage pricing theory, international finance.

652 Advanced Seminar in Finance II (3) Recent theoretical and empirical developments in finance literature. Market structure, theory of intermediation, structure of interest rates.

Food Technology and Science (College of Agriculture)

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

Hugh O. Jaynes, Head

Professors:
Collins, J. L., Ph.D. Maryland
Draughon, F. A., Ph.D. Georgia
Miles, J. T. (Emeritus), Ph.D. Wisconsin
Overcast, W. W. (Emeritus), Ph.D. Iowa
Penfield, M. P., Ph.D. Tennessee

Associate Professors:
Biswal, R. N., Ph.D. Massachusetts
Christen, G. E., Ph.D. Missouri

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

Graduate School rating forms or letters of recommendation from at least three people are expected to attend this course and participate in discussions during the Master's program. Completion of 510 or equivalent is also required.

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

THE DOCTORAL PROGRAM

1. Completion of a Master's degree in the field, or a closely related field, or passing a special qualifying examination is required for admission. Scores on the GRE aptitude test are also required.


3. A minimum of 72 hours beyond the Bachelor's degree, excluding credit for the Master's thesis, is required. Of this, 24 semester hours must be 800 Doctoral Research and Dissertation.

4. At least 24 hours of coursework numbered above 500 are required exclusive of 500 Doctoral Research and Dissertation. At least 6 of the 24 hours must be courses numbered above 600.

5. A minimum of 8 hours of coursework 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 the 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. Phystiochemical 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 survivability of foodborne microorganisms, pathogenic and spoilage microorganisms affecting quality of foods and their control. Prereq: Microbiology 210. Coreq. F

429 Food Microbiology Lab (3) Methods for examination, enumeration, cultivation and identification of foodborne microorganisms. Prereq: Microbiology 210. Coreq. 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 and spoilage of foods. Methods of preservation. Prereq: Agricultural Engineering Technology 422, 2 hrs and 1 lab. Sp

450 Dairy Products I (3) Procurement, processing and distribution of fluid milk. Manufacture of butter, frozen and condensed dairy products. Prereq: 140 or consent of instructor. 2 hrs and 1 lab. F

451 Dairy Products II (3) Manufacture of cheese and specialized dairy products. Market standards and grades, product defects, scoring of dairy products, Prereq: 140 or consent of instructor. 1 hr and 2 labs. Sp

460 Meat Products Technology (4) Processing methods for making cured, smoked, fresh, baked and formed products. Effect of processing methods on product characteristics. Prereq: 360 or consent of instructor. 3 hrs and 1 lab. F

470 Food Crop Products (3) Food products from plants; types, manufacturing systems, quality attributes and utility. Prereq: 3 hrs biological science. 2 hrs and 1 lab. Sp, A

480 Cereal Science and Bakery Products (3) Chemistry and technology of processing cereal grains, interactions of ingredients during production and storage of baked products. Prereq: 410 or 411 or equivalent. 2 hrs and 1 lab. F, A

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

501 Seminar (1) Reports and directed 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, measurement and reactions involved in color and flavor changes that occur in conversion of muscle to edible meat. 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-products. Utilization. Prereq: 440-29, 440, Biochemistry 410 or equivalent. 2 hrs and 1 lab. Sp, A

521 Advanced Food Microbiology (3) Microorganisms in foods, their identification, characterization and relationship to food processing. Isolation of microorganisms from plants and food products. Prereq: 420-29, 1 hr and 2 labs. Sp, A

540 Food Product Development (3) Art, science and technology of developing and marketing new food products. Prereq: 440. 2 hrs and 1 lab. Sp

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

580 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, A

590 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

593 Directed Studies (1-3) Research on non-thesis topics chosen by student and major professor. Supervisor 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

620 Food Toxicology (2) Basic and applied concepts in food toxicology; toxicological aspects of processed foods. Mode of action, prevention and control of food toxicants in food supply. Prereq: 410-11, 521, or consent of instructor. Sp, A

640 Advanced Food Processing (3) Role of processing treatments in modification of food properties; texture, flavor and color characteristics. Prereq: 440, 510, 511 or consent of instructor. Sp, A

Forestry, Wildlife and Fisheries

(College of Agriculture)

MAJORS

DEGREES

Forestry...........................................M.S.

Wildlife and Fisheries Science..........................M.S.

George T. Weaver, Head

Professors:

Barrett, J. W. (Emeritus), Ph.D.................Syracuse

Buckner, E. R., Ph.D.........................NC State

Core, H. A. (Emeritus), Ph.D.................Syracuse

Dimmick, R. W., Ph.D.........................Wyoming

Hammitt, W. E., Ph.D.........................Michigan

Little, R. L., Ph.D..............................NC State

McGee, C. E. (Adjunct), D.F......................Duke

Ostermeier, D. M., Ph.D.........................Syracuse

Pelton, M. R., Ph.D..............................Georgia

Ripley, T. H. (Adjunct), Ph.D......................VPI

Schneider, G. D., Ph.D.........................Michigan State

Sharp, J. B., D.P.A..............................Harvard

Smalley, G. (Adjunct), Ph.D......................Tennessee

Strange, R. J., Ph.D..............................Oregon State

Stumbo, D. A., Ph.D..............................Minnesota

Thor, E. (Emeritus), Ph.D.........................NC State

Weaver, G. T., Ph.D..............................Tennessee

Wilson, J. L., Ph.D..............................Tennessee

Woods, F. W., Ph.D..............................Tennessee

Associate Professors:

Dearden, B. L., Ph.D.........................Colorado State

Hay, R. L., Ph.D..............................Duke

Hopper, G. M., Ph.D.........................VPI

Johnson, D. W. (Adjunct), Ph.D.................Washington
than 3 faculty members will be selected. At above is required.
work of which 23 must be at the 500 level or

Non-Thesis Option (Forestry only) thesis and coursework is required.

 seminars 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.

Title Option
1. Prior to research for the thesis, the student is required to develop a detailed written research proposal. Registration for a minimum of 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 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 course-work 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 graduate seminar program during the first semester in residence. 3. Three hours of Forestry 511 are required.
4. Nine hours of coursework in the department must be at the 500 level or above, exclusive of Forestry 511.
5. Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 28 hours of approved study.

Forestry

GRADUATE COURSES

421 Forest and Wildland Resource Economies (3) Production functions, supply-demand and market analysis; non-market programs and projects; economic analysis and decision models; investment and financial analysis; managerial economics; taxes; forest products marketing. Prereq: 324 or consent of Instructor, F.

422 Forest and Wildland Resource Policy (3) Policy formulation: criteria, priorities, sustainability; 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 survey techniques: evaluation of recreation management: case studies. Weekend field trips. Prereq: 321, 323, Ornamental Horticulture and Landscape Design 280, or consent of instructor. 1 hr and 2 labs, F.

431 Solid Wood Processing (3) Production processes or solid wood products; sawmilling, secondary machining, drying and preservation. Prereq: 331 and 332, or consent of instructor. 2 hrs and 1 lab, F.

433 Wood Composites and Gluing (3) Principles of adhesion; wood adhesives; fundamentals of plywood and composite panel manufacture. Evaluation resin properties; testing bond strength and durability. Prereq: 331 and 332, or consent of instructor. 2 hrs and 1 lab, F.


500 Thesis (1-15) P/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 Problem Analysis in Forest Resources (3) Problem identification, analysis and solution in forest resource management. Identify, analyze and prepare written report. Topic and report must have approval of graduate committee. Available only to students in nonthesis option for M.S. in Forestry. E

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

520 Advanced Forest Tree Biology (3) Growth, reproduction, and physiology of trees; forest ecology; variability and taxonomy of forest trees. Prereq: Graduate standing in forestry or biological science, or consent of instructor. Sp.

520 Advanced Forest Resource Management (3) Analysis of forest management problems as exemplified in public agencies and private firms. Forest organization and computerized regulation systems; financial and operational planning tools, as applied to forest resource management. Prereq: Senior-level forest management or consent of instructor. Sp.

540 Genetics in Forestry (3) Genetic improvement of forest trees, selection for priori phenotypes; field testing for genetic variability; tree breeding, development of seed orchards; hybridization; tree cytology and tissue culture use of genetic variation; plant and conducting forest genetics research. Prereq: Silvicultural methods and Biology 220 or consent of instructor. Sp.

550 Recreation Planning for Forests and Associated Lands (3) Plans for process for recreation development on forests and associated lands; analysis and critique of specific contemporary alternatives. Overhead field trips. Approval of graduate committee or level in forest recreation or consent of instructor. F.

555 Forest Recreation Research Methods (3) Evaluation of research methodologies through readings and case studies; techniques of recreation resource monitoring and research investigation; current research trends in recreation, pr. 321 or equivalent and statistics. F.

560 Industrial Forestry I (3) Economic structure of forest products industries. Identification and analysis of industry structure and markets, domestic and foreign. Current trends in markets and industrial structure; impacts of short term and strategic planning. Prereq: Senior-level forest management or consent of instructor. F.

565 Industrial Forestry II (3) Evaluation of alternative strategies for firms in industry. Role of timber and timberland in integrated forest firm from standpoint of financial and strategic evaluations for different levels of self-sufficiency in securing raw materials. Tax and legal aspects of fee and leasehold interests. Other financial and institutional arrangements affecting forest management and marketing strategies for private, industrial firms. Prereq: Senior-level forest management or consent of instructor. Sp.

570 Management & Policy of Forest Resource Organization (3) Theory and application of management as applied to natural resource organizations: institutional, political or strategic, 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.

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

581 Ecotone (3) Chromosome structure and behavior during mitotic and meiotic divisions in relation to structural changes, genetic controls, hybridization, speciation, and polyploidy. Laboratory; normal and aberrant meiotic systems and somatic chromosomes from plants and animals. Prereq: Biology 220 and at least 6 additional hrs in biological sciences. (Same as Botany 581) Sp.

585 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory; fixed and variable plot sampling; line sampling; point sampling; regression estimators; multistage and multiphase sampling. Growth and yield predictions for even-aged and uneven-aged forests. Prereq: 325 or consent of instructor. F.

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

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; management plans; trapping and handling wildlife. Prereq: Forestry, Wildlife and Fisheries 317 or Biology 230. 2 hrs and 1 lab. F

445 Ecology and Management of Wild Birds (3) Biological and ecological characteristics of game birds, endangered birds, and bird pests. Current principles and practices of wild bird management. Prereq: Forestry, Wildlife and Fisheries 317 or Biology 230. 2 hrs and 1 lab. F

446 Ecology and Management of Wild Mammals (3) Biological and ecological characteristics of game mammals, endangered mammals, and introduced mammals. Current principles and practices of wild mammal management. Prereq: Forestry, Wildlife and Fisheries 317 or Biology 230. 2 hrs and 1 lab. Sp

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 when student uses laboratory 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) Current developments in wildlife and fisheries science. Required of all graduate students in residence in fall. May be repeated. Maximum 2 hrs. S/NC only. E

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 laboratory. 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, excretion, osmoregulation, and neural/hormonal control of these systems in fishes. Practical applications of fish physiology in water pollution assessment, fish care 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 L., 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
Minkin, C. W., Ph.D. Syracuse
Paluh, Ronald W. Northern Illinois
Ralston, B., Ph.D. Northwestern
Schmude, T. H., Ph.D. Wisconsin
Wilbanks, T. J. (Adjunct), Ph.D. Syracuse

Associate Professors:

Brinkman, L. W., Jr., Ph.D. Wisconsin
Carter, James R., Ph.D. Georgia
Foresta, R., Ph.D. Rutgers
Pulsipher, L., Ph.D. Southern Illinois
Rehder, J. B., Ph.D. Louisiana State

Assistant Professors:

Blassing, T. J. (Adjunct), Ph.D. Colorado
Harden, Carol P., Ph.D. California
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 backgrounds in mathematics and computer science. The doctoral program is for those who have demonstrated proficiency in conducting independent research. The department is particularly well-qualified to direct research in geography of the natural environment (biogeography, biological classification, spatial analysis (especially transportation and location analysis), Latin America, and the American South. Graduate concentrations include nonmetropolitan areas, land use, urban geography, transportation geography, geography of resources, geography of development, and regional and historical geography of the United States.

THE MASTER'S PROGRAM

The department offers the thesis and non-thesis options for the Master of Science. Both options require a minimum of 30 semester hours beyond the completion of a sound undergraduate major program. At least two-thirds of the hours in the degree program must be at or above the 500 level and must include 501 (at each offering during residency). 504 and 3 semester hours at the 600 level. In the thesis option, no more than 6 hours may be thesis. A final examination is required in both programs.

THE DOCTORAL PROGRAM

The doctorate is a research degree and is granted only to those who demonstrate proficiency in conducting independent research. Students must have achieved the equivalent of a comprehensive Master's program before they will be admitted to the doctoral program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program of study must include sufficient coursework within the department, but outside the areas of concentration, to give a broad foundation of the discipline. The program must include 504, 515, 599, and (at each offering during residency) 501. A minimum of 12 hours must be earned in related fields outside the department. Competence in a foreign language is required. Additional tools, including languages, will be required as appropriate to the student's area of research specialization. Examinations required for admission to candidacy include a written comprehensive; written examinations on two special fields; and an oral examination on the student's program, the special fields, and the dissertation proposal. Also required is a final oral examination on the dissertation and on other aspects of the program as determined by the student's doctoral committee.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

411 Computer Mapping and Geographic Information Systems (3) Concepts, management, and presentation of digital data for spatial analysis: cartographic data structures. Prereq: 310 and knowledge of computer language or consent of instructor. 2 hrs and 1-2 hr lab.

412 Cartography (3) Cartographic techniques applied to design, compilation, and reproduction of maps and other graphics. Prereq: 310 or consent of instructor. 2 hrs and 1 or 2 hr lab.

413 Remote Sensing: Types and Applications (3) Principles and uses of remote sensing imagery, digital data, and specific geographic interpretation and mapping techniques. Prereq: 310 or consent of instructor.

415 Quantitative Methods in Geography (3) Geographic application of statistical techniques, point pattern analysis, and analysis of areal units. Prereq: Mathematics 115 or two semesters of calculus or consent of instructor.

421 Geography of Folk Societies (3) Geographical study of folk culture, traditional material culture and rural settlement, examples from eastern North America and selected foreign areas. Prereq: 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, changes in patterns of urban-industrial development. Prereq: 361 or consent of instructor.

433 The Land-Surface System (3) Nature and regional variations in relationships among surface form, water, vegetation, and surface materials. People as evaluators and agents of change. Prereq: 131-32 or 330 or consent of instructor.

434 Climatology (3) General circulation system leading to world pattern of climates. Climatic change and modification, and interrelationships of climate and human society. Prereq: 131-32 or 330 or consent of instructor.
441 Urban Geography (3) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. Prereq: 101-02 or 141 or 340 or consent of instructor. (Same as Urban Studies 441.)

443 Rural Geography (3) Geographical appraisal of rural areas of the United States; small towns and urban fringes. Problems and potentials of rural America. Prereq: 101-02 or 141 or 340 or consent of instructor.

445 Geography of Resources (3) Study of factors related to variations in resource availability from time to time and place to place, energy and metallic resources. Prereq: 101-02 or 141 or 340 or consent of instructor.

449 Geography of Transportation (3) Examination of transportation systems, their effects on trade patterns, land use, location problems, and development. Prereq: 141 or 340 or consent of instructor.

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

500 Thesis (1-15) P/NC 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 faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

504 Research Design (3) Geographical research from selection of topic and development of research design through field work and final report.

505 Directed Research (2-6) Research on problem as related to individual student. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 6 hrs.

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 6 hrs.

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

512 Topics in Cartography (3) Trends, concepts, problems and methods in cartography. Prereq: 411 and 412 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

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

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

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

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

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

524 Topics in Political Geography (3) Geographical consequences of public decisions; understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

525 Topics in Historical Geography (3) Examination of trends, concepts, and methods in historical geography. Prereq: 433 or 434 and consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

526 Topics in Physical Geography (3) Examination of trends, problems, and methods in geography of land surface system or in modern climatology. Prereq: 433 or 434 and consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

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

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

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

550 Regional Geomorphology (3) (Same as Geology 550.)

577 Biological Conservation (3) Analytical treatment of politics, policies, and norms of biological conservation as practiced in U.S. and abroad. Prereq: Consent of instructor.

591 Foreign Study (1-16) See page 31. Prereq: Written consent of department prior to registration. Maximum 16 hrs.

592 Off-Campus Study (1-16) See page 31. Prereq: Written consent of department prior to registration.

593 Independent Study (1-16) See page 31. Prereq: Written consent of department prior to registration.

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

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

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

625 Seminar in Historical Geography (3) Prereq: 525 or consent of instructor. May be repeated. Maximum 6 hrs.

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

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

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

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

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

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

673 Seminar in Geography of Latin American (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Geological Sciences

(Students interested in these programs should contact the Director of Graduate Admissions in the department.)

593 Independent Study (1-16) See page 31. Prereq: Written consent of department prior to registration.

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

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

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

625 Seminar in Historical Geography (3) Prereq: 525 or consent of instructor. May be repeated. Maximum 6 hrs.

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

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

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

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

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

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

673 Seminar in Geography of Latin American (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

The Department of Geological Sciences offers both the M.S. and Ph.D. degrees in Geology. Persons interested in these programs should contact the Director of Graduate Admissions in the department.

For admission, an applicant must provide transcripts of previous university work, two rating forms or letters of recommendation, and GRE scores, including the subject exam in geology (or in another area if geology was not the area of previous university-level concentration). Students are not admitted under provisional or non-degree status.

Prerequisite for both degrees is a Bachelor's degree, including coursework in mineralogy, optical mineralogy, petrology, stratigraphy, paleontology, structural geology, and field geology. One year each of coursework in calculus and chemistry and one year of coursework in biology, physics, or statistics are also required. Applicants lacking any of these may be admitted, but the deficiencies must be removed within the first year without graduate credit.

THE MASTER'S PROGRAM

The department offers the thesis option in the Master's program. Graduation requires successful oral defense of a written thesis and a minimum 3.0 GPA in all graduate coursework.

Course requirements are a minimum of 30 semester hours, including:
The DOCTORAL PROGRAM

The prerequisite for the Ph.D. program, in addition to that for the M.S. program, is either a Master's degree in Geology, or a Bachelor's degree plus completion of 9 hours of coursework from the list in #3, above, including one course from each of the following groups:

Group I: 510, 530, 560, 580.
Group II: 521, 525, 545, 546, 550, 557, 561.
Group III: 570, 571, 576, 577.

4. Eight hours of additional graduate coursework.

1. Six hours of Thesis 500.
2. Registration in 595 during the first two years in residence. Two hours required in each of the first two years. The remaining ten hours may be counted toward the 30-hour minimum. This requirement may be waived in unusual circumstances.
3. Sixteen hours of geology courses, with at least 14 hours at the 500 level, including at least one course from each of the following groups:
   - Group I: 510, 530, 560, 580.
   - Group II: 521, 525, 545, 546, 550, 557, 561.
   - Group III: 570, 571, 576, 577.

4. 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. Field techniques: mapped, practiced, and applied to solution of geologic problems. Prereq: Completion of major core courses and consent of instructor.

45 Process Geomorphology (3) Integrative approach to development of earth based upon its formative geologic histories, maps, remote sensing imagery. Prereq: 101-02. (Same as Geography 450.) 2 hrs and 1 2-hr lab.
45 Basic Environmental Geology (3) Applications of geoscientific techniques to comprehension of geologic processes on humans and effects of human activities on earth's environments. Prereq: 12 hrs of geology courses, 2 hrs and 1 3-hr lab or field period.
46 Principles of Geochemistry (3) Application of chemical principles to geologic problems. Crystal chemistry and relation between basic atomic structure and distribution and behavior of elements in earth's crust. Prereq: Chemistry 120-30. Recommended prereq: 330, 2 hrs and 1 lab.
470 Applied Geophysics (3) Basic principles and applications of seismic, gravity, magnetic, and electrical prospecting methods. Recommended prereq: Mathematics 141-42 or 147-48 and Physics 131, 2 hrs and 1 lab.
48 Principles of Economic Geology (3) Ore-forming processes, classification of mineral deposits, survey of different types of mineral deposits with examples, and metallogeny. Prereq: 310 and 330 or equivalents. Recommended prereq: 460. 2 hrs and 1 2-hr lab.
50 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 who needs University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. SJCN only. E
52 Clay Mineralogy (3) Origin, chemistry, structures, and properties of clay minerals; application of mineralogical techniques in clay mineral studies. Prereq: 310 and 568 or equivalent. 2 hrs and 1 lab.
520 Advanced Paleontology (3) Detailed analysis of selected groups in invertebrate and vertebrate functional morphology, evolutionary development.
521 Data Analysis in Geology and Paleobiology (3) Application of statistical and other quantitative techniques to geological and paleontological data. 2 hrs and 1 seminar.
525 Biostatistics (3) Examination of principles of stratigraphy and biostatistics through examination of selected case histories. 1 hr and 1 2-hr seminar.
530 Petrogenesis of Crystalline Rocks (4) Origin and properties of igneous and metamorphic rocks, magmatic and subsolidus processes and physical consequences. Laboratory involves petrographic study of crystalline rocks in thin section. Prereq: 410. 3 hrs and 1 lab.
540 Seminar in Local Geology (1) Introduction of geology of Southern Appalachians. 1 hr plus field trips.
545 Sandstone Petrology/Physical Sedimentology (Field and microscopic analysis of terrigenous clastic rock types; physical processes of sedimentation, transport of sediments, formation of sedimentary structures. Prereq: 340 or equivalent. 3 hrs and 1 lab.
546 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonate sediments and diagenesis of resultant rocks; field and laboratory analysis of sample material and preparation of scientific reports. 3 hrs and 1 lab.
550 Regional Geomorphology (3) Integrative approach to study of natural geomorphological regions stressing links and similarities across boundaries, unique characteristics of major divisions, provinces, sections, and districts. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Botany 426.)
555 Seminar in Quaternary Studies (3) Interdisciplinary examination of contemporary issues in the dynamics of pattern and process in Quaternary landscapes; responses of plant, animal and human populations to environmental changes during glacial/interglacial cycles. Prereq: 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) Interpre-pretation of geomorphologic, stratigraphic, and sedimentologic evidence in order to reconstruct Quater-nary landscapes in the United States and major regions of North America; correlation of major episodes of North American history with paleo-oceanographic changes in Atlantic and Pacific Oceans. Prereq: 101 or consent of instructor.
557 Quaternary Paleoclimatology (3) Perturbation, process, and pattern within Quaternary ecosystems; climatic change and vegetational responses during the last 2.5 million years. Prereq: Consent of instructor.
561 Aqueous Geochemistry (4) Introduction to and applications of equilibrium thermodynamics to earth surface environments; geochemistry of natural water, weathering reactions, and early sediment diagenesis. Prereq: Chemistry 120-30. 3 hrs and 1 lab or seminar.
568 Geochemical Analysis (3) Collection and treat ment of geochemical data using electron microprobe, x-ray fluorescence, isotope, and optical absorption spectrophotometry techniques. Prereq: 310 or consent of instructor. 2 hrs and 1 lab.
569 Experimental Geochemistry Laboratory (1-3) Independent lab study of problems in geochemistry using experimental and analytical techniques. Prereq: Consent of instructor.
570 Advanced Structural Geology (4) Current topics in structural geology and tectonics of mountain belts; recent literature. Prereq: 370 or equivalent. Consent of instructor. 3 hrs and 1 lab or seminar.
571 Regional Tectonics and Structural Geology (3) Major subdivisions of earth's crust and processes that form them. Comparison of internal structure of mountain ranges and ocean crust. Prereq: 460 or equivalent. Consent of instructor. 3 hrs and 1 lab or seminar.
573 Plate Tectonics and Orogeny (4) Tectonic development of orogenic belts in context of newest aspects of plate tectonic theory; current literature and ongoing research for both modern and ancient examples. Prereq: 370 or consent of instructor. 3 hrs and 1 seminar.
576 Reflection Seismology (3) Interpretation of geologic structure and stratigraphy using seismic data effects of velocity anomalies, multiples and complex reflector geometry. Application to hydrocarbon exploration. Prereq: Stratigraphy and sedimentation, structural geology, and 470 or consent of instructor.


580 Ore Petrology (3) Detailed study of selected ore deposits; petrology of ore-gangue assemblages. Prereq: 480 or consent of instructor. 2 hrs and 1 1/2 hr lab.

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

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

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

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

594 Field Problems in Geology (1-2) Literature study and seminars on specific regions of geologic interest, supplemented by extended field trip. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

595 Selected Topics in Geology (1) Presentation of graduate, faculty, and visiting scientist research. Registration required each semester except summer for resident full-time graduate students. S/NC only.

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

610 Seminar in Mineralogy (2) May be repeated with consent of department. Maximum 6 hrs.

620 Seminar in Paleontology (2) May be repeated with consent of department. Maximum 6 hrs.

630 Seminar in Petrology (2) May be repeated with consent of department. Maximum 6 hrs.

640 Seminar in Sedimentary Geology (2) May be repeated with consent of department. Maximum 6 hrs.

650 Seminar in Geomorphology and Quaternary Geology (2) May be repeated with consent of department. Maximum 6 hrs.

660 Seminar in Geochemistry (2) May be repeated with consent of department. Maximum 6 hrs.

670 Seminar in Structural Geology (2) May be repeated with consent of department. Maximum 6 hrs.

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

680 Seminar in Economic Geology (2) May be repeated with consent of department. Maximum 6 hrs.

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Germanic and Slavic Languages

(College of Liberal Arts)

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

David E. Lee, Head

Professor:
Falen, James E., Ph.D.................Pennsylvania
Fienle, Donald M., Ph.D.................Indiana
Fuller, H. W. (Emeritus), Ph.D.................Wisconsin
Kratz, Henry, Ph.D.................Ohio State
Osborne, J. C., Ph.D.................Northwestern

Rice, Martin P., Ph.D.................Vanderbilt
Rittenhoff, U., Ph.D.................Connecticut

Associate Professors:
Hodges, Carolyn R., Ph.D.................Chicago
Lauckner, Nancy A., Ph.D.................Wisconsin
Lee, David E., Ph.D.................Stanford
Mellor, C. J., Ph.D.................Chicago

Assistant Professor:
Kloostrie, J. I., Ph.D.................Indiana

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

THE MASTER'S PROGRAM

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

THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

Admission Requirements

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

Degree Requirements

Candidates must complete a minimum of 63 semester hours of course work beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. The program shall consist of a first concentration, a second concentration, and a cognate field.

1. First Concentration: French, German or Spanish. It will consist of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:
   - A minimum of 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); French 512 (3), German 512 (3), or Spanish 512 (3); French 515-18 (2,2), or German 520 (3).
   - At least 12 hours at the 600 level (exclusive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It shall consist of at least 18 hours beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.

3. Cognate Field: 6 hours must be in courses numbered 400 and above in a field outside the department of the first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be administered after completion of the 6 cognate hours by the language section concerned.

4. Additional Requirements: A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening, and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized examinations that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI). If the student has not chosen a third language as his or her cognate area, basic competence (determined by a reading examination of translation into English administered by the department concerned) in a third language is required. If the student's first and second languages are Romance languages, the third language should be chosen from another language branch.

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

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct in at least two foreign languages, subject to staffing needs.

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

For additional courses, refer to Romance Languages.

ACADEMIC COMMON MARKET

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

German

GRADUATE COURSES

331-332 Elements of German for Upper-Division and Graduate Students (3,3) Elements of language, elementary and advanced readings and a final 10,000 word translation project. Open to graduate students preparing for language examinations, and upper-division students desiring reading knowledge of the language. No credit for students having completed 101-02 or 107. 332 may be repeated. Maximum 6 hrs. Undergraduate credit only.
551 German Humanism, Reformation and Baroque (3) Content varies. May be repeated. Maximum 6 hrs.
552 German Enlightenment, Rococo and Sturm und Drang (3) Content varies. May be repeated. Maximum 6 hrs.
553 German Classicism and Romanticism (3) Content varies. May be repeated. Maximum 6 hrs.
554 German Realism and Naturalism (3) Content varies. May be repeated. Maximum 6 hrs.
555 Modern German Literature 1890-1945 (3) Content varies. May be repeated. Maximum 6 hrs.
556 Modern German Literature 1945-Present (3) Content varies. May be repeated. Maximum 6 hrs.
560 German Literary Theory and Criticism (3) 561-62 Directed Readings in German Language and Literature (3,3) 571-72 Old Norse Language and Literature (3,3) 591 Foreign Study (1-15) See page 31.
592 Off-Campus Study (1-15) See page 31.
593 Independent Study (1-15) See page 31.
600 Doctoral Research and Dissertation (3-18) P/NC only. E 610 Gothic (3) Phonology, morphology, and syntax of Gothic language. 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.
621-32 Seminar in German Language (3,3) May be repeated. Maximum 18 hrs.
631-32 Seminar in German and Germanic philology (3,3)

**Russian**

**GRADUATE COURSES**

425 Introduction to Descriptive Linguistics (3) (Same as French 425, German 425, Spanish 425, and Linguistics 428.)
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 Proséminaire (3) Bibliography; methods; illustrative problems; preparation of papers.
550 Studies in Russian Literature (3) Content varies. May be repeated. Maximum 9 hrs.
591 Foreign Study (1-18) See page 31.

**Health, Leisure, and Safety**

(College of Education)

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**Health Education**

**Charles B. Hamilton, Head**

Professors:

- Gorski, J., Dr.P.H. UCLA
- Hamilton, Charles B., Dr.P.H. Oklahoma
- Hayes, Gene E., Ph.D. North Texas State
- Kirk, Robert H., H.S.D. Indiana
- Wallace, Bill C., Ed.D. Northern Colorado

Associate Professors:

- Krick, Ken L., Re.D. Indiana
- McGuire, Joseph L., Ph.D. Michigan
- Neutens, J. J., Ph.D. Illinois
- Pursley, R. Jack, Ph.D. Iowa
- Rockett, Ian R., Ph.D. Brown
- Thompson, A. F., Ph.D. Michigan State

Lecturer:

- Duffy, Mary, M.D. Pennsylvania

The Department of Health, Leisure, and Safety offers graduate programs leading to the Master of Science, the Master of Public Health, the Specialist in Education, the Doctor of Education, and the Doctor of Philosophy with a major in Education. Inquiries should be directed to the department head.

**Health**

Graduate programs are available leading to the Master of Science with a major in School Health Education (thesis or 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, West Virginia, and/or the District of Columbia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

400 Consumer Health (3) Survey of major consumer health care providers and health care services, selecting, purchasing, evaluating, and financing medical and...
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, medical, 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

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

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

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

505 Continuing Education in Public Health (1-3) Selected learning activities and experiences in specialized areas of public health utilitarian 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 509, Public Education 509, and Social Work 509.) S/NC only. F,Sp

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

511 Fundamentals of Industrial Hygiene (3) Occupational health theory, practice and regulations: recognition, evaluation and control of workplace health hazards. Pertinent workplace problems and situations. F


513 Industrial Hygiene Instrumentation and Sampling (3) Instrumental techniques for analyzing and collecting samples, industrial environment for personal exposure to chemical and physical stressors affecting worker's health. Lecture, demonstration, and lab. Prereq. 511 or consent of instructor. Sp

514 Industrial Toxicology and Occupational Exposures (3) Principles of industrial toxicology, basic toxic mechanisms, ports of entry, physiologic and biochemical responses. Occupational exposure assessment, physiologic factors and environmental conditions that influence exposure characterization, statistical aspects of sampling, and transport of contaminants into general environment. Sp

520 Public Health Policy and Administration (3) Administrative considerations of community-based health care programs and facilities. Concepts such as access to care, health care financing, model health care delivery systems. Systems of health care funding and provision; strategies for intervention and education. Sp


523 Management in Extended Care Settings (3) Managerial concepts and theoretical foundations essential to supervision and administration of domiciliary health services programs and operations, planning, organization and operation of health services programs for patients and clients in settings which provide activities of daily living and

Health, Leisure, and Safety 99
special psychosocial environmental needs. Programs for home health services, comprehensive medical rehabilita-
on, nursing homes, congregate living centers and similar type health programs. Prereq: 521 or con-
sent of instructor. Sp

525 Financial Management of Health Programs (3) Financial management concepts and practices applied to home health, nursing care, and long-term care settings. Fundamentals of bud-
getting, costing, financing, rate setting, financial reporting and control. Opportunities to apply techniques. Prereq: 520 or consent of instructor. Sp

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

540 Research Methods in Epidemiology (3) Basic measurem ent science of public health. Epidemiologic principles of study design and analytic approaches. Prereq: 520 or consent of instructor. Sp

542 Advanced Epidemiologic Methods (3) Both cohort and case-comparison study designs; conduct and inter-
pretation of study, and general attention to calculations and formulae. Professional literature, contemporary perspective of epidemiologic approaches to problem-solving and policy formulation in public health. Prereq: 540 or consent of instructor. F

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

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


560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodol-
gies; systems-oriented planning process. Major elements of planning and organization; approaches to prob-
lemation of plan, design, evaluation and implementation. Health problems of institutions, com-
munity needs assessment; identification of appropriate diagnoses, and programs for addressing needs. Sp

562 Group Processes in Health Planning (3) Application of group process techniques used in health planning. Tailoring group processes, leadership roles and tech-
niques, participant motivation and creativity in health planning groups. Su

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

569 Fitness Testing, Programming, and Leadership for Diverse Populations (1) (Same as Physical Edu-
cation 569.)

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

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Nursing 585, Educational and Counsel-
ing Psychology 585, Physical Education 585, and Social Work 585.)

587-98-98 Internship (3,3,3) Internship in either approved organizational or research setting under supervision of designated preceptor. Prereq: MPH major, one semes-
ter of 698-98 internship, notice and consent of major advisor. S/ NC only. E

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

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

550 Health Aspects of Gerontology (3) (Same as Health 550.)

565 Seminar in Nation's Health (3) (Same as Health 565.)

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

Recreation and Leisure Studies

Graduate study with a major in Recreation and Leisure Studies leads to the Master of Science. Professional preparation concen-
trations are available in therapeutic recreation, general recreation, and sport administration/management. The third concen-
tration is a multidisciplinary program with the department of Physical Education and Dance. The M.S., with thesis and non-thesis options, requires completion of 32 semester hours.

GRADUATE COURSES

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

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

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

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

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

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

510 Perspectives and Trends in Leisure Studies and Services (3) Basic role of leisure delivery systems in today's society, scope of leisure services, determi-
ant of leisure behavior, developmental features of leisure and recreation. Current trends, problems, laws, and issues affected by and/or affecting delivery of leisure services. Prereq: Consent of instructor. Sp

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

520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose,
History
(College of Liberal Arts)

MAJOR

DEGREES

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

John Muldowny, Acting Head

Professors:

Bergeron, Paul H., Ph.D........................... Vanderbilt
Chmielewski, Edward V., Ph.D............. Harvard
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
McDonell, Michael J., Ph.D.............. Pennsylvania
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
Johnston, Charles W., Ph.D.................. Michigan
Muldowny, John, Ph.D......................... Columbia
Pinkney, Paul J., Ph.D............................ Vanderbilt
Trainer, Edwin H., Ph.D...................... Emory
Utley, Jonathan G., Ph.D...................... Illinois

Assistant Professors:

Brummel, Palma R., Ph.D. ..................... Chicago
Lansing, Carol L., Ph.D...................... Michigan
Matson, Cathy D., Ph.D....................... Columbia

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 stu-
dents 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 500-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. Stu-
dents 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 mini-
mum 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 depart-
ment. 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 UTK.

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 Euro-
pean 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 exami-
nation may be obtained from The Graduate
School.

2. By coursework. Upon consultation
with the advisor, a student may elect to com-
plete an appropriate sequence in a language
department (or an intermediate sequence in
a language in which no appropriate
sequence is available). Satisfactory comple-
tration 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
three 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 Relation

Regional/Local (U.S.)

National/Regional (non-U.S.)

Dissertation and Defense

Original research forms the basis for the
dissertation. After the dissertation has been
completed, the dissertation must pass a

Record Examination (general and subject

History 101
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 to Graduate Study in History (3) Assumptions and methods of historians. Required of all candidates for advanced degrees. F

521 M.A. Readings (3) Directed readings in preparation for M.A. examinations. Open only to Master’s candidates in history. May be repeated. Maximum 8 hrs. S/NC only.


532 Topics in Modern Europe (3) Reading seminar: secondary sources on modern movements and trends that are especially relevant to the period. Focus varies. May be repeated. Maximum 15 hrs.

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

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

542 Topics in 19th- and 20th-Century United States (3) Reading seminar: secondary sources on 19th- and 20th-century United States. Focus varies. May be repeated. Maximum 15 hrs.

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

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

554 Topics in Comparative Social and Economic History (3) Reading seminar: secondary sources on multinational topics, comparatively structured. Focus varies. May be repeated. Maximum 15 hrs.

555 Topics in United States Social and Economic History (3) Reading seminar: secondary sources on U.S. social and economic history. Focus varies. May be repeated. Maximum 15 hrs.

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

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

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

560 Topics in U.S. Religious History (3) (Same as Religious Studies 566.)

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


565 Topics in Premodern European History (3) Reading seminar: secondary sources in premodern European history. Focus varies. May be repeated. Maximum 15 hrs.

566 Topics in Comparative Social and Economic History (3) Reading seminar: secondary sources on social impact of war and naval strategy in foreign relations. Focus varies. May be repeated. Maximum 15 hrs.

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

591 Foreign Study (1-15) See 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 Directed Readings (3) Directed readings to prepare candidate for doctoral comprehensive examination. May be repeated. Maximum 1 per doctoral field. S/NC only.


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

641 Seminar in Early American History (3) Research seminar in primary sources culminating in scholarly paper in American history. Focus varies. May be repeated. Maximum 15 hrs.


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


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


680 Seminar in History (3) Research seminar in primary sources culminating in scholarly paper in aspect of history not covered in another 600-level research seminar. Focus varies. May be repeated. Maximum 15 hrs.

Home Economics

(College of Human Ecology)

MAJOR

Home Economics............................................. M.S.

DEGREE

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 (HEED prefix) may be selected to meet requirements of that program. Graduate coursework in Home Economics Education may also be selected for development of a concentration or minor within other areas of specialization.

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 undergraduate 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. Home economics teachers may choose courses within this area to update their knowledge. 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 home economics subject matter. At least one course is to be from each department in the college. The non-thesis option requires a practicum. An oral/written 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 at UKT on an in-state tuition basis. The 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.

GRADUATE COURSES

510 Curriculum in Home Economics (3) Development of home economics educational materials and instruction. Prereq: 420 or equivalent or consent of instructor. F

515 Evaluation in Home Economics Education (3) Assessment of programs and pupil progress; techniques, methods and purposes. Prereq: 420 or equivalent. F

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. Su, A

525 Home Economics Adult Education (3) Development and administration of community-based home economics programs for adults. Prereq: Consent of instructor. Sp, A

530 College Teaching in Home Economics (3) Instructitional effectiveness, techniques, organization, and evaluation. Prereq: Consent of instructor. F

563 Family Life Education Programs (3) (Same as Child & Family Studies 563)
580 Special Topics in Home Economics Education (1-3) Prereq: Consent of instructor. May be repeated. E

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

**Human Ecology**

(College of Human Ecology)

**MAJOR**

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**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 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 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).
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.

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**

The ACM is an interstate agreement among southern states for sharing academic programs. Residents of one of the participating states who qualify for admission may enroll in certain programs on an in-state tuition basis. Potential doctoral students in Human Ecology who are residents of Alabama, Arkansas, Kentucky, Louisiana, Mississippi, South Carolina, Virginia, or West Virginia are eligible.

**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. 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 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 experience. 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, Public Health 585, Physical Education 585, and Social Work 585). S/NC only. E

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. E

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**Industrial and Organizational Psychology**

(College of Business Administration and College of Liberal Arts)

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**MAJOR**

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**DEGREES**

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

Michael Rush, Director

Committee:

Dewhirt, H. Dudley, Management
Dobbins, Gregory H., Management
Fowler, Oscar S., Management
Fowler, Raymond, Psychology
James, Lawrence R., Management
Jenkins, Roger L., Business Administration
Ladd, R. T., Management
Larsen, John M., Jr. (Emeritus), Management
Lounsbery, John W., Psychology
O'Brien, Ralph G., Management
Russell, J. E. A., Management
Schumann, David W., Marketing
Sundstrom, Eric, 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 professional, managerial, and organizational research; for university teaching; and for consulting relationships with industry. The programs emphasize a scientist/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 recommendations from the two department heads.

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.

**ADMISION REQUIREMENTS**

Applicants for admission should request information and application forms from both 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 specific weakness in mathematics and physical sciences.

Test scores on each section of the general portion (verbal and quantitative) of
THE GRADUATE PROGRAM

The Graduate Record Examination (GRE) and the Subject GRE (Psychology-81) are recommended. 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

A thesis is required with a minimum of 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; 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 525, 526, 527, 620, 629, 630.

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

A Master’s candidate must pass a final oral examination.

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

THE DOCTORAL PROGRAM

(NOTE: 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 work on the qualifications for pursuing a Ph.D. are required.)

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

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

Management 567-68 or Psychology 517-18, Psychology 557, Statistics 537-38.

A minimum of five doctoral seminars (15 hours) selected from: Management 610; Management/ Psychology 625, 626, 627, 638; Psychology 623, 624. (Five doctoral seminars are viewed as the absolute minimum; more are recommended. Statistics 671 and Psychology 605 are also recommended.)

Electives, as approved for an individual’s plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their dissertation may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 690. 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 850 (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 area 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 as 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 Alabama, South Carolina, or Virginia. The Ph.D. program is available to residents of Arkansas or Kentucky. Additional information may be obtained from the Office of Graduate Admissions and Records.

The doctoral 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 graduate program requires 24 hours of coursework and 6 hours of Thesis. A non-thesis option with 30 hours of coursework plus a 3-hour design project is 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 Industrial 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

400 Manufacturing Materials/Processes (3) Characteristics of materials and processes used in modern manufacturing.

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.

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

403 Production Facilities Design and Material Handling (3) Design of production facilities: plant layout, materials 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 302, 401.

405 Engineering Economy (2) Methods and problems in selection or replacement of equipment. Decisions among engineering alternatives involving capital recov-
406 Simulation (3) Simulation of complex industrial processes. Introduction of simulation languages. Com-


411 Planning and Scheduling (3) Forecasting tech-
niques and case studies in forecasting and planning. Performance measures for job shop and flow shop scheduling. Techniques for generating production sched-

412 Quantitative Methods in Project Management (2) Project planning, scheduling, and control based on networking and precedence diagramming meth-
ods. Resource allocation and time-cost trade off algorithms, multi-project control, computer applica-
tions, and PERT methods of handling uncertainty in activity time estimates.

413 Research Methods in Industrial Engineering (3) Methods to collect and analyze data. Process con-
trol design, process optimization, behavior analysis, sampling, single subject experimental designs, clas-
sical experimental design methods, and time series models. Reliability techniques and statistical con-
tcepts as related to measurement and collection of data. Strategies to control rival hypotheses: randomiza-
tion, blocking, factorial designs, fractional replication and building extraneous variables into experiments. Selection of appropriate experimental designs for given research situations and interpretation of data. Prereq: 300 and senior standing. Statistics 251.

414 Laboratory and Methodology in Human Factors Engineering (3) Project and laboratory-oriented investiga-
tions of human-machine systems. Implementation and measurement of human capabilities and limita-

421 Informational Systems (1) (3) Systems engineer-
ing approach to design, development, implementation, and evaluation of systems of information. Informa-
tion systems of IE systems. Data structures and database management systems. Prereq: 200 and senior standing.

422 Senior Industrial Engineering Problems Analy-
sis (3) Application of senior concepts in senior design projects in local organizations, problem definition, analyses, and presentation. Prereq: 402, 403, and 405.

423 Industrial Safety (3) Accident causation, losses, and investigative techniques. Role of human, task/machine, and environment in accident prevention. Safety standards, codes, and laws. Product liability, design, evaluation, and management of safety organizations and programs. Hazard recognition, analysis, control and risk assessment, systems safety and related techni-
cues. Prereq: Senior standing.

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

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


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

514 Information Systems II (3) Systems analysis and control concepts applied to systems of inform-
ation. Role of IE in office and factory of future. Management support systems, decision support sys-
tems, and integrated support systems.

515 Production and Inventory Systems (3) Application of OR techniques to production and inventory sys-
tems. Deterministic and stochastic inventory models. Use of mathematical programming for product mix, process selection, blending and aggregate produc-
tion planning. Basic concepts: Application of activity oriented and complex queuing models in manufacturing environ-
ment.


517 Reliability Engineering (3) Continuous time random processes with applications to availability of equip-
ment and manufacturing systems. Failure density and failure rate. Dependability considerations and application to product design. Maintenance. Reliability-
based criteria for product acceptance. Prereq: 516.

518 Advanced Engineering Economy (3) Financing and investment functions of firm; deterministic analy-
sis of single and multi-period cash flow projections; separation of relevant and non-relevant time periods and basic horizon models; stochastic analysis of cap-
ital budgeting problems; Monte Carlo simulation techniques; multiple attribute decision analysis. Prereq: Statistics.

519 Human Factors Engineering I (3) Consideration of interrelationships between human, task/machine interface, and environment. Conceptual and limi-

520 Human Factors Engineering II (3) Design of man-
machine interfaces and environment. Specific appli-
cation of human factors engineering and special problem areas. Prereq: 519.

521 Human Factors Engineering Methodology (3) Background in methodology used by human factors engineering designer and systems analyst. Observa-
tional methods, instrumentation, design aiding techniques, computerized methods, human reliability and human error prediction, training analysis, evalua-
tion of man-machine systems, and objectives of evaluation. Use of efficient experimental designs, on-line modeling techniques, questionnaires and survey design, critical incident technique, concensus tech-
niques (Delphi), accident investigation behavioral instrumentation, performance measurement, statisti-
cal techniques in experimental design, and expert systems. Prereq: 520.

522 Optimization Methods in Industrial Engineering (3) Classical optimization theory, unidimensional and N-dimensional search techniques, Lagrangean relax-
ation, separable programming, linearization techniques, quadratic programming, and dynamic programming. Prereq: 301 or 537.

523 Linear Programming and Extensions (3) Simp-
ex is and revised simplex methods, duality, parametric and post-optimality analysis. Use of LP software inte-


526 Dynamic System Simulation (3) Systems engi-

531 Motivational Theories, Systems and Practices in Various Organisations (2) Complex optimization theo-
tories and concepts in use in technology based organizations. Impact of concepts evaluated accord-
ing to results in various types of organization structures.

532 Productivity and Quality Engineering (3) Pro-
duction planning and control. Techniques for use to analyze current competitive position of important sec-
tors of American industry with respect of both internal and international competition. Management of systems which promote or inhibit productivity or quality improve-
ments.

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 social-scientific engineering organizations. Cases used to illustrate contemporary problems and environments. Techni-
cal management function, marketing of technical services and products.

534 Engineering Management Control Systems (3) Underlying framework of accounting principles and practice reviewed as basis for evaluating productivity costs, requirements for new ventures, changes in strat-
gy, financial condition. Computer data bases examined for control system alternatives.

535 Organizational Behavior and Managerial Deci-
sion (3) Theories of behavior and applicability of techniques to individual and their applications to managerial decision making processes. Roles of various people categories and managerial decision making formal and informal. Case studies used to identify causes of organizational dis-
order, policies, and organizational behavior and to suggest corrective action.

536 Project Management (3) Management and con-
trol of multifaceted engineering and technological projects. Coordination and interactions between client and various service organizations. Selection of project manager and progress, by projects associated with various phases of life cycle of project. Case studies illustrate theories and con-
cepts.

537 Industrial Engineering Analysis and Control Techniques (3) Survey of management analysis and control systems through IE techniques. Qualitative and quantitative systems: methods analysis, work mea-
surement, incentive systems, wage and salary development, production and inventory control, linear programming, and applied operations research tech-
niques. 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 establish-
ment of manufacturing or service enterprises. Organization, philosophy, and evaluation. Cost and location studies and market anal-
ysis 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 Econ-
omy (3) Mathematical programming techniques applied to capital budgeting; advanced topics in multiple attri-
bute decision analysis; Bayesian analysis of sequential decision making; artificial intelligence in complex deci-
sion analyses. Prereq: 518, 523.

602 Nonlinear Programming (3) Optimization techniques for static and dynamic nonlinear systems subject to various constraints. Applying optimization theory to solve nonlinear optimization problems. Variate metric methods, search methods, constrained nonlinear pro-
gramming, and penalty function methods. Prereq: 522, 523.

603 Dynamic Programming (3) Solving multi-stage optimization problems as sequence of single-stage optimization problems. Computational and theoreti-
cal aspects of dynamic programming. Applications of dynamic pro-
duction under certainty and risk. Prereq: 522.

604 Advanced Topics in Optimization (3) Multi-stage optimization theory. State and incremental dynamic program-
ning 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.

**Journalism**

(College of Communications)

**MAJOR**

**DEGREE**

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

James A. Crook, Director

Professors:


Associate Professors:


Assistant Professors:


Adjunct Professor:

Haley, Alex

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

**GRADUATE COURSES**

403 International Communications (3) Development and operations of world mass communications channels and agencies. Comparative analysis of media, media practices, and flow of news throughout world. Print and broadcast systems in terms of relevant social, political, economic, and cultural factors. Relation of communication practices to international affairs and understanding.

412 Opinion Writing (3) Analysis of editorial positions, practices, and pages. Writing of editorials and columns for newspapers, magazines, and company publications, rhetorical devices and use of logic. Prereq: Communications 200, or consent of instructor.

414 Magazine Article Writing (3) Techniques of writing in-depth articles of mass circulation and specialized magazines. Preparation of presenting material, problems in specialized areas: business, science, agriculture, humanities. Prereq: Communications 200, or consent of instructor.

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

420 Print Media Management (3) Current business practice among print news media, especially newspapers. Problems in management and production and outlook for new technologies. Prereq: 6 hrs mathematics and/or accounting and senior standing. Sp

430 Public Affairs Reporting (3) Reporting and writing about courts, government, and public agencies. Event

and issue-oriented journalism of politics and public affairs. Prereq: 560. Sp

433 Advanced Editing (3) Sensitivity to language and editing skills. Headline writing, layout, and production. Prereq: 203.

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

470 Public Relations Campaigns (3) Preparation of communications materials to implement planned public relations programs. Preparation of news releases—written and video—and broadcasting copy. Research, planning, communication, and evaluation of major public relations projects and campaigns. Prereq: 203, 270, and senior standing. F,Sp

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

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

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


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, program, 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: 560 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. Sp

580 Seminar in Visual Communication (3) Behavioral aspects of communication with images. Theories of psychological effect in color, shape, texture, and other design elements. Prereq: 203 or Advertising 350 or Broadcasting 430 or equivalent.

590 Communications and International Development (3) Relationship between mass communications and development of nations. Role of communications media in developing 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.

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**Law**

(College of Law)

**MAJOR**

**DEGREES**

Law .................................................. J.D., J.D.-MBA

Marilyn Yarbrough, Dean

Professors:


Associate Professors:


Instructor:

Hoover, Mary Jo, J.D. .......... Brooklyn

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

Current information regarding admission, financial aid, course requirements, academic policies, extracurricular activities, and student services is available in the College of Law Bulletin from the Admissions Office, The University of Tennessee, College of Law, 1505 West Cumberland Avenue, Knoxville, Tennessee 37996. Completed application should be received before February 1 of the year of requested admission.
DEGREE OF DOCTOR OF JURISPRUDENCE

The degree of Doctor of Jurisprudence will be conferred upon candidates who complete, with the required average, six semesters of resident law study and who have earned such credit, including all required courses. The required average is 2.0 and that average must be maintained on the work of all six semesters and also for the combined work of the grading periods in which the last 28 hours of credit were earned. Averages are computed on weighted grades. Grades are on a numerical basis from 0.0 to 4.0. A grade of 0.9 or below is a failure.

Eligible law students may receive credit towards the J.D. for acceptable performance in up to three (3) upper-level courses taken in other departments at The University of Tennessee. Course selection and registration are subject to guidelines approved by the law faculty which include the requirement that any such course be acceptable for credit toward a graduate degree in the department offering the course.

Refer to the Law Bulletin for current degree requirements.

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.-MBA program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. degree and The Graduate School and College of Business Administration for the MBA degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program students must register for law courses prior to or to enter 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 both colleges. 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 credit toward the J.D. degree for acceptable performance in a maximum of 8 semester hours of approved graduate-level courses offered by the College of Business Administration. A student shall receive 2 semester hours of credit for each such course successfully completed unless the law faculty specifies otherwise. Two of the 8 semester hours must be earned in Accounting 501, 503, 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 9 semester hours of approved courses offered by the College of Law.

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

Awarding of Grades

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

Non-Law Elective Course Credit

Students enrolled in the J.D.-MBA 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.

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/NC grade 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.-MBA Program. Grades must be earned according to the grading system of the respective college, e.g. numerical grades for law courses, letter grades for graduate courses. Refer to page 18 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

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


003 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.

004 Contracts II (3) Continuation of Contracts I, issues arising after contract formation: interpretation, duty of good faith; conditions, impracticability and frustration of purpose; remedies for breach of contract; assignment and delegation. Considerable coverage of Article 2 of the Uniform Commercial Code with reference removed to anticipatory repudiation, impracticability and good faith.

005 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.

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

007 Torts I (3) Intentional torts, including battery, assault, false imprisonment, infliction of emotional distress, conversion and trespass; privileges and defenses to intentional torts; negligence, including standard of care and proof of negligence; immunities and limitations on duties; cause in fact; and proximate cause.

008 Torts II (3) Defenses, including contributory negligence, assumption of risk, comparative negligence, and statutes of limitations; vicarious liability; strict liability; products liability; settlement; problems of multiple defendants, non-tort alternatives for recovery for personal injury; law reform; defamation, invasion of privacy, and wrongful legal proceedings; misrepresentation, injurious falsehood, misappropriation of commercial values, and interference with contract; constitutional torts.

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

010 Property (4) Introductory course treating issues of ownership, possession, and title in the areas of landlord-tenant relations; estates in land and future interests; co-ownership and marital property; real estate sales agreements and conveyances; title assurance and recording statutes; servitudes; and selected aspects of nuisance law, eminent domain and zoning.

12 Constitutional Law I (3) Judicial review, limits on judicial power; national legislative power; regulation of commerce; power to tax and spend; other sources of national power; separation of powers; state taxation and regulation of commerce; intergovernmental immunities.

13 Evidence (4) Rules regulating introduction and exclusion of oral, written and demonstrative evidence at trials and other proceedings, including relevance, competence, impeachment, hearsay, privilege, expert testimony, authentication, and judicial notice.
814 Legal Profession (3) Legal, professional and ethical standards applicable to lawyers.

816 Computer-Assisted Legal Research (8) Introduction to and applications of electronic research techniques, LEXIS and WESTLAW. Offered periodically throughout year. May be taken beginning spring of first year. Students render first draft of appellate brief in Legal Process II. Must be completed satisfactorily prior to end of second year of study. Prereq: Completion of first draft of appellate brief in 806. NC only.

818 Income Tax (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 (corporate, estate, and trust).

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 and timing of judicial review of agency actions.

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 limitations.

824 Local Government (3) Distribution of power between state and local governmental units; sources of authority for local government operations; creation of local governmental units; problems creating and fragmenting 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 raising of capital by new and growing enterprises; securities transactions by promoters, officers, directors and others; regulation of publicly-held corporations; litigation under Rule 10b-5 and other anti-fraud provisions; and provision of legal and other professional services in connection with securities transactions.

828 Business Planning Seminar (2) Selected topics from law of business associations. Prereq: 827. May be repeated.

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

831 Business Planning 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 relevant 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 debtor; emphasis on Federal Bankruptcy Code.

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

848 Civil Rights Actions (3) Litigation to vindicate constitutional rights in jury trials; due process against the government and its officials, as well as rights protected by other civil rights legislation: elements of cause of action under 42 U.S.C. sec. 1983, actions against federal government officials under the Bivens doctrine; institutional and individual immunities; relationship between state and federal courts in civil rights actions; and remedies for violations of constitutional and other civil rights.

849 Discrimination and the Law (3) Comparison of race, sex and other invidious discriminatory practices as they affect political participation, education, employment, housing and other social and economic activities; legislative enforcement of post-Civil War Amendments to Constitution.

851 Constitutional Law Seminar (2) Current constitutional law problems.

854 Criminal Procedure I (3) Police practices and constitutional rights of persons charged with crimes: arrest; search and seizure; identification; interrogation and confessions; electronic eavesdropping; and right to counsel.

855 Criminal Procedure II (3) Pre- and post-trial procedures in a criminal case: bail; preliminary hearing; grand jury; prosecutorial discretion; discovery; speedy trial; plea bargaining; post-conviction relief. Federal Rules of Criminal Procedure.

857 Criminal Law Theory (3) Theoretical foundations of criminal law. Prereq: 809.

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

862 Family Law (3) Survey of laws affecting formal and informal family relationships: premarital disputes; ante-nuptial contracts; creation of common law and formal marriage; legal effects of marriage; support obligations; divorce and separation; annulment; divorce, alimony, and property settlements; child custody and child support; adoption; illegitimacy.

863 Children and the Law (2) Legal relationship between children and their parents and the state: parental prerogatives and children's rights; rights of illegitimates: adoption; temporary and permanent removal of children from their parents by the state: juvenile court procedures.

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

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

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

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

875 Empirical Studies of Legal Institutions (3) Social, economic and organizational factors that affect behavior of clients, lawyers, judges and other actors in legal institutions. Empirical studies of subjects: social structure and organization of bar; factors that affect filing, processing and disposition of claims in civil justice system; and factors that affect process of case dispositions in criminal prosecutions: plea bargaining process. Factors that affect the "legal decision" to operate differently than "law on the books."

787 Jurisprudence (3) Critical or comparative examination of legal theories, concepts, and problems: legal positivism; natural law theory; legal realism; idealism; historical school. Current theoretical developments: sociological jurisprudence; policy science; and critical legal studies.

789 Law and Economics (3) Relationship between legal and economic thought. Use of economics in legal decision making and legal criticism.

881 Law and Literature (3) Systematic study of literature and its application to legal theory and accurate, fluent, and creative legal composition.

883 Law, Language, and Reality (3) Intermediate level jurisprudence course. Law as the mind's attempt to defend, direct, and administer human activity: exploration, through methods of epistemology, of ethical values underlying formal legal reasoning and legal concepts.

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

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

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

891 Comparative Law (3) Introduction to civil law systems of France and Germany, focusing on legal institutions, methodology, and aspects of law of obligations and commercial law.

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

896 Employment Law (3) Legal regulation of employment relationship: legal, social and economic influences in employee-employer relationship; employment discrimination; legally prescribed minimum standards of compensation and other conditions of employment; regulation of retirement systems.

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

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

904 Civil Advocacy (6) Supervised fieldwork, requiring students to assume primary responsibility for representing clients with various civil legal problems. Exploration of theory, practice and ethics of interviewing, counseling, planning, investigation, discovery, drafting, negotiation, litigation, and other professional tasks necessary to provide competent representation for clients. Hearings in state and federal courts, or before state and federal administrative officers or judges. Prereq: $20 and third-year standing.

906 Criminal Advocacy (6) Supervised fieldwork, requiring students to assume primary responsibility for defending clients accused of crime in Knox County. Exploration of theory, practice and ethics of interviewing, counseling, planning, investigation, discovery, drafting, negotiation, litigation, and other professional tasks necessary to provide competent representation for clients. Hearings in state and federal courts, or before state and federal administrative officers or judges. Prereq: $20 and third-year standing. Recommended prerequisite coreq: 859.

915 Conflict of Laws (3) Jurisdiction, foreign judgments, and conflict of laws.
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 are related to library and information services.
7. A knowledge of research methods sufficient to enable them to engage in effective problem solving.
B. To provide services to the state, region, and nation in association, consulting, and continuing education activities which will promote the development and improvement of information systems and services such that the school’s contributions reach beyond its immediate academic programs. The school will provide:
1. Continuing education for information professionals and, on a selective basis, to persons outside the information field.
2. Advisory services to 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. A test should be taken at least once in 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 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 allowed for thesis credit. At least 30 hours must be taken in the Graduate School of Library and Information Science, allowing up to 9 hours outside the school with a maximum of 6 from outside the University. Upon completion of the program, all students are subject to a final examination. For students who elect the thesis option, the examination will be oral. 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 the degree. Such students usually work at least 20 hours each week and thus may extend the period required for the degree. Similar opportunities exist with 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.
The program is listed in the Academic Common Market of the Southern Regional Education Board. Students residing in Arkansas, Georgia, West Virginia, or Virginia can normally qualify for in-state fee status by applying to the Academic Common Market coordinators in their state capitals.
For information about financial aid and other information about the MLS in Library and Information Science, write to:
Gary P. Purcell, Director
Graduate School of Library and Information Science
University of Tennessee
804 Volunteer Blvd.
Knoxville, TN 37996-4330

FINANCIAL ASSISTANCE OPPORTUNITIES
Employment with The University of Tennessee Libraries may provide a work-study opportunity for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students usually work at least 20 hours each week and thus may extend the period required for the degree. Similar opportunities exist with other libraries and information agencies in the Knoxville area.
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Gary P. Purcell, Director
Graduate School of Library and Information Science
University of Tennessee
804 Volunteer Blvd.
Knoxville, TN 37996-4330

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 he/she is in graduate 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 Information Professionalism and Their Organizations (3) Variety and prospects of information professionals; professional organizations: achievements, responsibilities, goals, and issues. E, Su, A
520 Technical Services I (3) Technical services principles and techniques: acquisitions, cataloging, cataloging of serials and more difficult materials. Prerequisite: 571 or 572 or consent of instructor. Su
521 Technical Services II (3) Library of Congress subject organization and description, automated cataloging and cataloging, cataloging of serials and more difficult materials. Prerequisite: 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, social services in business, education, and law. Prerequisite: 530. Sp
532 Sources and Services in Science and Technology (3) Information sources in engineering, physical and life sciences. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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. Prerequisite: Admission to program or consent of instructor. E, Su, A
551 School Libraries and Media Centers (3) Planning, implementing and evaluating school library programs, Curricular involvement, 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. Prerequisite: 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 collections: selection, acquisition, bibliographic control, storage, maintenance, and public service. Prerequisite: 530 or consent of instructor. Sp
563 Nonbook Materials (3) Selection, acquisition, media- graphic representation, storage, utilization, and programming; microformats, films, video, sound recordings, and as information media. F
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
569 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. F
573 Services for Children and Young Adults (3) Philosophy and objectives of public and school library services for children and young adults. Reading, listing, and viewing guidance for individuals and groups. Program planning, implementation, and evaluation. Prerequisite: 571 or 572 or consent of instructor. Su
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 attributes of information; information theory, relevance, use and user studies, bibliometrics, and major components of information retrieval system design. Related research paper on 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 studies 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: 582 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. E

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. E

511, 512, 531, 532; Biochemistry 511; Microbiology 410; Botany 451; Chemical Engineering 475; and Zoology 507.

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 physiology 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 courses and individual programs 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 (529, Biotechnology Practicum Cooperative 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. Additional requirements 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 and their components for the production of useful materials. This will be achieved at the M.S. level by a prescribed course of 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, bioprocess engineering, bioproducts and biotransformations, liposomes, monoclonal antibodies 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 411; Microbiology 410; Botany 451; Chemical Engineering 475; and Zoology 507.

Cellular, Molecular and Developmental Biology

The interdepartmental 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 sociobiology. 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 interdepartmental program in physiology includes research in the areas of cellular, comparative, developmental, exercise, muscle, neurophysiology, regulatory, or reproductive. Required courses are Zoology 520, 521, 240, 350, 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

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

509 Biotechnology Seminar (1-3) 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 organization for students undertaking non-thesis option of biotechnology concentration. Evaluation by supervisor and written report by student. May be repeated. Maximum 4 hrs.

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.

**Logistics**

See Marketing, Logistics and Transportation

**Management**

(College of Business Administration)

**MAJOR DEGREES**

MBA, Ph.D.

Oscar Fowler, Chair

Professors:

Boiling, Ronald W. (Emeritus), Ph.D.; Stanford

Dewhirst, H. Dudley, Ph.D., Texas

Ho, J. C., Ph.D., Stanford

James, Lawrence R., Ph.D.; Utah

Lithber, John M., Jr. (Emeritus), Ph.D., Purdue

Neel, C. Warren, Ph.D., Alabama

Reed, S. Kyle (Emeritus), Ph.D.; Edinburgh

Reese, Don (Emeritus), Ph.D., Iowa

VanCamp, S. C. (Emeritus), Pennsylvania

Wagoner, George A. (Emeritus), M.S.; Indiana

Whitlock, G. H. (Emeritus) (Distinguished Prof.), Ph.D., Tennessee

Associate Professors:

Dobbins, Gregory H., Ph.D., VPI

Fowler, Oscar S., Ph.D., Georgia

Gilbert, Kenneth C., Ph.D.; Tennessee

Ladd, Robert T., Ph.D., Georgia

Maddox, Robert C., Ph.D., Texas

Rush, Michael C., Ph.D.; Akron

Russell, J. E. A., Ph.D.; Akron

**Assistant Professors:**

Bowers, Melissa R., Ph.D.; Clemson

Campbell, P. G., M.S.; Austin Peay

Fox, Dale R., Ph.D.; Purdue

Fryxell, Gerald E., Ph.D.; Indiana

Hudson, Robert L., Ph.D.; Minnesota

Kaplan, Lori A., Ph.D.; Michigan

Miller, Alex, Ph.D.; Michigan

Noon, Charles E., Ph.D.; Michigan

Pate, Minnie H., Ph.D.; Georgia

**BUSINESS ADMINISTRATION CONCENTRATIONS**

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

**MBA Concentrations: Management, Forest Industries Management.**

Minimum course requirements for management—Three courses from the following: 511, 513, 521, 522, 531, 541, 542, 551, 571, 593. Selection must be approved by the Management Department MBA advisor. For forest industries management — 511, 513; Forestry 560, 565.

**Ph.D. Concentration: Management.**

Minimum course requirements are for operations management — 541 and 542; two semesters of 640 (may be repeated for credit); one additional semester of approved doctoral seminar work. For strategic management — 513, 610, 611, 612.

**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

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

505 Operations and Logistics Management (3) Concepts and techniques for managing operations and distribution systems. (Same as Transportation 506.)

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

513 Strategic Planning (3) Theoretical and applied literature, successful strategic positioning of business in variety of environments. Analysis of industry notes and case histories. Coreq: Business Administration 509.

521 Personnel Administration (3) Personnel functions and human resources management. Community relations, recruiting, selection, training, performance evaluation, wage and salary administration, legal frame work as it affects personnel.

522 Labor Relations and Collective Bargaining (3) American labor history, structure and philosophy of bargaining, dispute settlement, and contract administration. (Same as Economics 562.)

525-26 Industrial and Organizational Psychology (1-3) Readings in industrial and organizational psychology. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

531 Management of Technology-Based Organizations (3) Role of technology and innovation in formulation and implementation of strategic, business and product development, and research and development function and coordination with other functions. Management of scientists and engineers.

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

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

551 Management of New Ventures (3) Integration of various functional disciplines and their application to general management of ventures formed both within larger corporations and independently. Preparation of a venture plan, case analysis.

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

571 International Management (3) Analysis of environment of international business firms and impact of internal and external factors on managerial decisions.

593 Directed Independent Study (1-3) Topic of mutual interest. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

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

601 Research Methods (3) Seminar covering broad range of issues; research process as applied to study of strategic management. Literature and examples of research, 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 structure, entry, 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.
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
Fox, Dale R., Ph.D. .................. Purdue
Kaplan, Lori A., Ph.D. .................. Michigan
Noon, Charles E., Ph.D. ................. Michigan
Patel, Minnie H., Ph.D. ................. Georgia Tech

Additional Committee Members:

Boiling, Ronald, W., Management
Fowler, Oscar S., Management
Hilliard, Jimmy E., Finance
Leitnaker, Mary G., Statistics
Ralston, 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 as preparation for doctoral study in Management Science.

Management Science coursework will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area. Supporting areas are available in other departments of the College of Business Administration (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

<table>
<thead>
<tr>
<th>Course Requirements</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Core Requirements</td>
<td>14</td>
</tr>
<tr>
<td>Management Science 531, 532, 533, 534</td>
<td></td>
</tr>
<tr>
<td>Statistics 563</td>
<td></td>
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<tr>
<td>Applied specialization area (approved by advisor)</td>
<td>9</td>
</tr>
<tr>
<td>Statistics elective—500 level or above (approved by advisor)</td>
<td>6</td>
</tr>
<tr>
<td>Mathematics—400 level or above (approved by advisor)</td>
<td></td>
</tr>
<tr>
<td>Electives selected from mathematics, statistics, computer science, and/or management science area</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
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</tbody>
</table>

A thesis option is available to qualified students who substitute 6 hours of thesis credit for the following 8 hours of coursework: 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 student 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 the business functional areas (accounting, finance, marketing, management, and transportation and logistics) or other disciplines, (e.g., computer science, forestry, ecology, and public administration);
3. to develop in the student, through coursework in mathematics, statistics and computer science, a high degree of mathematical maturity to enhance a potential career in management, research, or teaching.

Admission Requirements

The doctoral program requires three Graduate School Rating Forms and the GRE or GMAT, in addition to The Graduate School's requirements.

Coursework

A minimum of 48 semester hours of coursework taken for graduate credit (exclusive of thesis or dissertation) is required. Some of this may be the coursework from a Master's program although a Master's is not a prerequisite for the doctorate. The candidate must complete a minimum of 24 semester hours at The University of Tennessee, Knoxville, at least 6 of which must be at the 600 level. Both of these requirements are also exclusive of thesis or dissertation credits. Entering students who have completed graduate studies in applicable fields will be granted course credits for work which is equivalent to required courses in the program.

The program includes approximately 16 to 20 semester hours of coursework in the applied area.

Qualifying Examinations

The student must demonstrate mastery of probability theory and statistical inference, Statistics 563, 564, by passing a written qualifying examination. Mastery of 12 to 14 semester hours in mathematics coursework must be demonstrated by passing a written qualifying examination. Topics normally include numerical analysis, either Mathematics 471, 472, 453, and 571, or 571-572, and real analysis, Mathematics 445-446. Other options may be approved. In exceptional circumstances, the faculty will consider waiving the mathematics and/or statistics qualifying examinations. These requirements generally are completed by the end of the first year of the program.

There is no foreign language requirement.

Comprehensive Examination

Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in the examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation

The student must complete 24 semester hours of Management Science 600: Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the science. A final oral examination is conducted over the dissertation and such other segments of the program that the faculty committee deems appropriate. This effort, which is beyond the minimum 48 hours of coursework, normally is completed in the third year of the program.
A graduate student in the College of Business Administration whose grade-point average falls below 3.0 will be placed on probation. A student on probation will be dropped from the program unless his/her cumulative graduate grade-point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next semester’s coursework as established by the degree program for full-time students and the next two semester’s coursework as established by the degree program for part-time students.

PREREQUISITES FOR MANAGEMENT SCIENCE COURSES

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

BUSINESS ADMINISTRATION CONCENTRATION

For complete listing of MBA program requirements, see Business Administration. MBA Concentration: Management Science

Minimum course requirements are 532 and 534. The MBA Core is revised as follows: substitute Management Science 531 for 501, Statistics 563 for 501, and with approval of student’s advisor, substitute Statistics 564 for 501.

GRADUATE COURSES

500 Thesis (1-18) 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. S1/NC only. E
533 Computational Mathematical Programming (3) Advanced modeling, computational and reporting techniques in mathematical programming. Prereq: Statistics 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 (1-9) 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 tree methods. Prereq: 531 or equivalent.
631 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branch and bound, cutting plane, and group 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.
691-92 Management Science Seminar (1,1) Subjects selected from current literature.

Marketing, Logistics, and Transportation

(College of Business Administration)

MAJOR DEGREES
Business Administration.............MBA, Ph.D.
David J. Barnaby Chair

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, Transportation 507, Business Administration 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. S1/NC only. E
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.
593 Independent Study (3) Directed research and study. Prereq: MBA Core and consent of instructor. May be repeated. Maximum 6 hrs.
599 Special Topics Seminar (3) Topics vary: 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. E
601 Marketing Theory (3) Nature and scope of marketing, role of theory development and theory testing important to marketing research.
602 Research Methods (3) Research process: problem formulation, research design, 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.
Logistics and Transportation

Professors:
Davis, F. W., Jr., Ph.D., Michigan State
Dicker, Gary N., DBA, Indiana
Frye, J. L. (Emeritus), Ph.D., Florida
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:
Foggin, 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: 503, 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. E

503 Logistics and Transportation Economics and Policy (3) Economics and legal principles which shape formation and administration of logistics and transportation policy in U.S.

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 503.

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. E

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

602 Seminar in 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

(College of Engineering)

MAJORS

Metallurgical Engineering.................M.S., Ph.D.
Polymer Engineering......................M.S., Ph.D.

Joseph E. Spruill, Head

Professors:
Ashbee, K. H. G., Ph.D.................Birmingham
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
Canonicco, D. A., Ph.D.................Lehigh
Fellers, J. F., Ph.D.................Akron
Lih, J. S., Ph.D.................Kansas
Lowndes, Douglas H., Ph.D............Colorado
Lundin, Carl D., Ph.D.................Rensselaer
McHargue, C. J., Ph.D.................Kentucky
Oliver, Ben F., Ph.D.................Penn State
Phillips, Paul J., Ph.D.................Liverpool
Spruill, Joseph E., Ph.D.................Tennessee
Stansbury, E. E. (Emeritus), Ph.D........Cincinnati

Associate Professors:
Becker, William T., Ph.D.................Illinois
Liu, C. T., Ph.D.................Brown
Meek, Thomas T., Ph.D.................Ohio State
Pedraza, A. J., Ph.D.................National

Assistant Professor:
Benson, R. S., Ph.D.................Florida State

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering. Both the metallurgical and polymer programs are flexible and inter-disciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs. Prospective students should consult materials science and engineering faculty concerning development of individual concentrations or special programs compatible with their backgrounds and goals.

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

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

THE MASTER'S PROGRAM

Thesis Option

Departmental requirements include the satisfactory completion of:
1. A major consisting of 12 to 18 semester hours of graduate courses in metallurgical engineering or polymer engineering. The Polymer Engineering major must include 540, 541, 543, 546 and 572. (Substitutions may be acceptable for students with significant experience in polymer chemistry, physics or engineering.)
2. One or two minors or cognate work, 6 to 12 hours total in engineering, chemistry, mathematics, physics, or other related fields.
4. Active participation in graduate seminars in the department. Resident students must register for the appropriate 500 or 504 every semester offered.

Non-Thesis Option

Under certain conditions, a candidate may apply for a non-thesis option. To be eligible, the candidate must show evidence of significant professional experience after the baccalaureate degree; at least five years of industrial experience or research publications would be examples of such evidence. A departmental faculty meeting will consider each application individually. Upon acceptance, a supervisee committee of three will be appointed, at least two being from the Department of Materials Science and Engineering. The requirements for completion of the non-thesis option are as follows:
1. A total of at least 33 hours in graduate courses in metallurgical engineering, polymer engineering and related areas. The minimum requirements are 21 hours in the Department of Materials Science and Engineering and up to 12 hours in other engineering or science courses. The candidate's degree program must be approved by the faculty committee.
2. Satisfactory completion of a critical review of the literature in an area related to metallurgical, polymer or materials engineering (580).
3. Satisfactory performance in an oral examination to be conducted by the faculty committee and covering the review paper and other areas of metallurgical or polymer engineering.

THE DOCTORAL PROGRAM

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

1. Graduation 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 42 semester hours with 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 UTK 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

400 Micronanalytical Techniques (3) X-ray diffraction principles and concept of reciprocal lattice. Kinematic theory of electron scattering; diffraction contrast imaging, geometrically induced contrast, crystal defect contrast, convergent beam microscopy. Preparation techniques for electron microscopy. Operating principles of electron microscopic techniques: TEM, SEM, STEM, and EELS. Interaction of electrons and x-rays with matter; secondary electrons, backscattered electrons, Auger electrons, scattered electrons, and x-ray emission. Applications to chemical analysis. Advanced imaging techniques. Prereq: 304. 3 hrs or 2 hrs and 1 lab. F

421 Chemical Metallurgy (3) Brittle fracture due to metallurgical and environmental factors; stress-life and strain-life fatigue analysis; residual stresses; creep and stress-rupture; finite plastic strain, ductile fracture mechanisms of rolling, deep-drawing, stretch forming; formability testing. Prereq: 302 or 201 and Mechanical Engineering 489 or equivalent. Sp

422 Chemical Process Metallurgy (3) Application of chemical thermodynamics to metalurgical processing. Ferrous and nonferrous pyrometallurgical refining, slag-metal equilibria, solidification, gas-metal processing. Prereq: 303. Sp

423 Metallurgical Fabrication (3) Principles and processes of ferrous and powder metallurgy; solidification, segregation, heat flow, microstructure, residual stresses; thermal treatments, sintering; non-destructive testing. Prereq: 301, 320. 3 hrs or 2 hrs and 1 lab. F

424 Metallurgical Process Design (3) Property control through composition, thermal and mechanical processes; material and property selection; steels and non-ferrous alloys. Prereq: Materials Science and Engineering 201 or equivalent. F

425 Metallurgical Applications in Manufacturing and Processing (3) Fabrication methods, standards and specifications, principles of theromechanical processing for finished and semi-finished products; casting, forming, joining, heat treatment, powder metallurgy, corrosion control. Prereq: 201. F

442 Mechanical Properties of Polymers (3) Deformation in amorphous and crystalline states; isotropic and anisotropic properties; phenomenological and molecular interpretations. Rubber elasticity; thermodynamics and kinetics of statistical networks.掸键和 crasing. Fiber drawing; structural models, technology. Viscoelasticity; Boltzmann's superposition principle; time-temperature superposition. Internal friction. Prereq: 441. F

443 Polymer Processing (3) Rheological measurements; flow through tubes and slits, and effects and extrudate swell; selected application; screw extrusion, injection molding; syndiospecific processing methods, structure development, properties.

444 Plastics Fabrication and Design (3) Lectures, laboratories and field trips; unit operations of plastics fabrication; classifications; 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; property 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 ceramics. Prereq: 302 or equivalent.

474 Biomaterials (3) Metals, polymers and ceramics used in cardiovascular, and dental surgical implant devices; corrosion and degradation problems; material properties of primary importance; tissue response to synthetic materials. Prereq: 201. Recommended for engineering science and mechanics majors.

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

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

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

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

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, dislocation hardening, effect of temperature, loading rate effects; effect of ordering and solid solution alloying; polycrystalline behavior in terms of single crystal deformation mechanisms. Prereq: 301, 320 or consent of instructor.

524 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems: refining, oxidation, surface treatments, alloy systems. Prereq: 570 or equivalent.

525-26 Welding Metallurgy (3) 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 Metallic Materials (3) Thermodynamics of phase equilibrium, theory of nucleation in solids; kinetics and morphology of diffusion controlled growth; kinetics of interface controlled phase transformations; crystallography and kinetics of martensitic transformations.

531 Advanced Corrosion (3) Analyses of corrosion processes in terms of polarization measurements and Pourbaix diagram. Influence of environmental and mechanical factors contributing to pitting, crevice, fretting, wear, 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 solid state. Prereq: Semester of organic chemistry and thermodynamics or equivalent.

541 Fluid Mechanics and Polymer Processing (3) Navier-Stokes equations and illustrative problems; applications in chemical engineering and polymer engineering, packed and fluidized beds, multiphase systems. Basic concepts in rheology; applications in polymer processing: screw extrusion, fiber spinning, injection molding. (Same as Chemical Engineering 541.)

542 Further Topics in Polymer Processing (3) Description and analysis of selected 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 theory; small angle x-ray and light scattering; spherical and fibrous structures; introduction to electron microscopy.

546 Mechanical Properties of Solids (3) Types of mechanical behavior; Hookean and rubber elasticity; plastic deformation; fracture; linear viscoelasticity; dynamic mechanical behavior and testing; loss tangent; experimental methods. Introduction to mechanical properties of polymeric composites.
641 Advanced Rheology and Viscoelastic Theory (3) Continuum mechanics, formulation of viscoelastic theories for describing deformation and flow of polymeric materials. Application to polymer processing problems. Recommended for MS candidates working in rheological areas. Prereq: 541.

642 Advanced Topics in Polymer Processing (3) Application of theories of rheological behavior and of structure development to analysis of polymer processing operations. Prereq: 541.

643 Phase Transformations in Polymers (3) Glass transition and glassy state; annealing of polymeric glasses; crystallization of polymers; nucleation, growth and morphology; secondary nucleation theory; solidification 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.


678-77 Advanced Topics in Materials Science and Engineering (3,3) Latest developments and/or advanced special topics. Prereq: Consent of instructor. May be repeated.

678-79 Seminar in Recent Advances in Materials Science and Engineering (3,3) Directed and independent study and analysis of current research. Prereq: Consent of instructor. May be repeated.


681-22 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.

682-24 Solidification and Crystal Growth (3,3) Theories of solidification, fluid flow effects, magnetohydrodynamics of incompressible fluids, growth stability theory, thermodynamic applications, rapid solidification theory, metastability. Prereq: Consent of instructor.

Mathematics

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

John S. Bradley, Head

Professors:

Associate Professors:


Assistant Professors:
Bales, L., Ph.D. ....................... Cornell Haeffer, J., Ph.D. ...................... Wisconsin Kot, M., Ph.D. ....................... Arizona Richter, Stefan, Ph.D. ............... Michigan Sivrisky, R., Ph.D. ................. Johns Hopkins

The Mathematics Department has three graduate degree programs: (1) the Master of Mathematics degree, intended primarily for teachers of high school mathematics; (2) the Master of Science degree, designed to prepare students for industrial employment and for teaching at the high school and junior college level; 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 admission and degree information.

The Math Department has 12 graduate assistants in its Master of Mathematics Program, 6 in its Master of Science Program, and 1 in its Doctor of Philosophy Program.
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. 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 are not jeopardized. 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.

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 the student pass a second language examination.

3. Pass an examination in the field of specialization. This examination will be given by a committee appointed by the department head at some time after the requirements in 1. have been met. A student may take this specialty examination only twice.

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 in advance by the student’s doctoral committee (such approval may occur after completion of the course).

Standard Program

Pass written examinations covering four subjects, at least three of which must be from the following list:

a. Modern Algebra 551-52
b. Complex Analysis 543-44
c. Topology 561-62
d. Real Analysis 541-42
e. Applied Linear Algebra 547-48
f. Partial Differential Equations 535-36
g. Ordinary Differential Equations 531-32
h. Numerical Mathematics 571-72
i. Statistics 525-26
j. Probability 523-24

Students may not count examinations in both d. and e., in f. and g., nor in i. and j. toward the required four passes. Those who choose four from this list must choose two from a. through e., and the students who choose only three from this list must choose one from a. through e.

Students selecting only three from the above list will also be required to pass a written exam on an area of applied mathematics (e.g., fluids, elasticity, mathematical ecology) approved as an examination topic for that student by the Graduate Committee and the Applied Mathematics Committee. The Graduate Committee will appoint a section of faculty who will submit a list of topics and references to the Graduate Committee and the Applied Mathematics Committee for approval.

Students may take as many of the written examinations as desired at any time these exams are given, subject to the following conditions:

1. The exams to be taken must be approved in advance by the student’s advisory committee.

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. Students may not count passes on examinations in both d. and e., in f. and g., nor in i. and j. toward the required three passes. At least one exam must be chosen from a. through e.

Students may take as many written examinations as desired at any time these exams are given subject to the following conditions:

a. The exams to be taken must be approved in advance by the student’s advisory committee.

b. At most 3 minus n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.

Students may take a collection of 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 courses numbered above. The exams are given subject to the following conditions:

a. The course submitted for examination must be approved by the student’s doctoral committee and the departmental Graduate Committee. The exam is to be prepared, administered, and graded by instructors of the course involved, along with at least one member of the mathematical ecology section. The student must obtain written agreement to participate in the examination from instructors of these courses and from at least one member of the mathematical ecology section, before submitting materials to the committees for approval.

b. Students may take the written examination at most twice.

GRADUATE COURSES

400 History of Mathematics (3) Survey of development of mathematics from ancient to modern times. Does not satisfy major requirements for B.S. or M.S. in mathematics. Term paper required. Prereq: 1 yr calculus, 141-42, or equivalent.

401 Mathematics and Microcomputers (3) Primarily for students seeking certification as teachers at secondary level. Use of microcomputers to study concepts and problems in mathematics. Does not satisfy major requirements for B.S. or M.S. in mathematics. Prereq: 141 plus 1 semester of discrete mathematics, 221 or 584.

404 Applied Vector Calculus (3) Topics from multivariable and vector calculus; line and surface integrals, divergence, curl, 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.


421 Combinatorics (3) Introduction to problems of construction and enumeration for discrete structures: sequences, partitions, graphs, finite fields and geometries, or experimental designs. Prereq. 323 or consent of instructor.

423 Probability II (3) Law of large numbers and central limit theorems for discrete and continuous random variables; Poisson processes; discrete and continuous parameter Markov chains and their applications, Kolmogorov differential equations; Brownian motion process as limit of random walks. Prereq. 323.

425 Statistics (3) Derivation of standard statistical distributions: t, F, and chi-square; independence of sample mean and variance; basic limit theorems, point and interval estimation, Bayesian estimates; statistical hypothesis testing, Neyman-Pearson theorems; likelihood ratio and other parametric and non-parametric tests; sufficient statistics. Prereq. 323.


444 Complex Variables II (3) Applications of complex variables to steady-state temperatures, electrostatics, and fluid flow. Prereq. 241, 443.

445-46 Advanced Calculus I, II (3, 3) Theory of sequences, series, differentiation, and Riemann integration of functions of one and more variables. Prereq. 341 or consent of instructor.

447-48 Honors: Advanced Calculus I, II (3, 3) Honors version of 445-46. Prereq. 341 or consent of instructor.

451 Topics in Algebra (5) Number theory and theory of polynomial equations such as quadratic reciprocity law and Sturm separation. Prereq. 351.

453 Matrix Algebra II (3) Matrix theory including Jordan canonical form. Prereq. 251.

455-56 Abstract Algebra I, II (3, 3) Algebraic structures: groups, rings, fields, vector spaces and linear transformations. Prereq. 351 or consent of instructor.

457-58 Honors: Abstract Algebra I, II (3, 3) Honors version of 455-56. Prereq. 341 or consent of instructor.

460 Geometry (3) Axiomatic and historical development of neutral, Euclidean, and hyperbolic geometry stressing proof technique and critical reasoning. Models of Non-Euclidean geometries. Term paper. Prereq. 141-42 and 221, or consent of instructor.

461 Topology (3) Topology of line and plane, separation properties, compactness, connectedness, continuous functions, homeomorphisms, and topological invariants. Prereq. 341 or consent of instructor.
471 Numerical Analysis (3) Computation, instabilities, and round-off. Approximation by polynomials and piecewise polynomials. Quadrature and numerical solution of initial and boundary value problems. Prereq: 371 (Same as Computer Science 471.)


490 Readings in Mathematics (1-3) Open to superior students with consent of department head. Independent study with faculty guidance. Prereq: Consent of faculty mentor to supervise independent work. May be repeated. Maximum 9 hrs.

489 Seminar in Mathematics (1-3) Students must register for number of credits desired for particular seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

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 for students who are not currently enrolled. May be used toward degree requirements. May be repeated. S/NC only. E

503 MBA Calculus (3) Review of derivatives and antiderivatives. Integration, power series, functions of two variables, introductory matrix algebra. Credit available only to satisfy MBA core requirements. Prereq: 1 yr calculus, 141-42, or equivalent.

504 Discrete Mathematics for Teachers (3) Mathematical logic and methods of argument, sets, functions and relations, combinatorics. Normally first graduate course for students seeking M.M. degree. For students majoring in 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, 141-42, or equivalent.

506 Algebra for Teachers (3) Algebraic structures: integral domains and fields and their applications to algebra of integers and polynomials. For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus, 141-42, or equivalent.


509 Seminar for Teachers (3) For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: Consent of instructor. Maximum 12 hrs.

513-14 Mathematical Principles of Fluid Mechanics (3,3) Equations of motion, incompressible and compressible potential flow, shock waves, viscous flows, Navier-Stokes equations. Prereq: 431, 435, and 445-46 or 404, or consent of instructor. (Same as Physics 571-72.)

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

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

521-22 Applied Combinatorics (3,3) Application of finite differences, generating functions, and permutation groups to enumeration problems. Coding theory, experimental design, graph theory, or decision theory. Prereq: Consent of instructor. (Same as Computer Science 521.)


525-26 Statistics (3,3) Pertinent facts from probability theory; formulation of statistical models; sufficiency, Fisher-Neyman factorization theorem, exponential families, Bayesian models; methods of estimation and optimality theory; uniform minimum variance unbiased estimates, asymptotic efficiency and optimality; the confidence procedures and hypothesis testing; optimal tests and confidence intervals, the Neyman-Pearson lemma, uniformly most powerful tests; general linear models, estimation and tests in linear models; non-parametric models, rank methods for comparison, linear regression and independence, robust tests; topics from decision theory. Prereq: 445-46. Recommended prereq: 425.

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


534 Calculus of Variations (3) Necessary conditions for extrema, Euler's equation, broken extremals, Weierstrass-Erdmann conditions. Sufficient conditions for extrema, Legendre's and Jacob's conditions, conjugate points. Multiple integrals. Prereq: 431.

535-36 Partial Differential Equations (3,3) First order equations, classification of equations and properties of elliptic, hyperbolic, and parabolic equations in several variables. Prereq: 445-46 and 231 or consent of instructor.

539 Seminar in Differential Equations (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


549 Seminar in Analysis (1-3) May be repeated. Maximum 12 hrs.

550 Matrix Algebra (3) Advanced topics in matrix theory: decomposition theorems and applications to matrices with special structure. Prereq: 453 or consent of instructor.

551-52 Modern Algebra (3,3) Groups, rings, modules and linear algebra, fields and Galois theory. Must be taken in sequence. Prereq: 455-46 or consent of instructor.

553 Linear Programming (3) Theory and applications. Prereq: Consent of instructor or 453 and programming ability.


555-58 Number Theory (3,3) Introduction to algebraic number theory. Prereq: 455-46 or consent of instructor.

559 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

561-82 Topology (3,3) Topological spaces; metrization; homeomorphic invariants of point sets. Mappings and homeomorphisms. Covering spaces and fundamental group.

569 Seminar in Topology (1-3) May be repeated. Maximum 12 hrs.


574 Matrix Theory and Techniques in Numerical Analysis (3) Advanced topics in study of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relationship to modern computer architectures. Prereq: 453, 471-72, or consent of instructor. May be repeated. Maximum 9 hrs. (Same as Computer Science 575.)

575 Seminar in Numerical Mathematics (1-3) May be repeated. Maximum 12 hrs.

581-82 Mathematical Ecology (3,3) Deterministic and stochastic models of populations, communities, and ecosystems. Prereq: 431, 453 or consent of instructor.

583 Mathematical Evolutionary Theory (3) Population genetics and evolutionary ecology. Prereq: 431, 453 or consent of instructor.

584 Mathematical Systems Theory (3) Analytic approach to discrete and continuous dynamical control systems optimal control and applications to ecology. Prereq: 431, 453, 445-46 or consent of instructor.

585 Optimal Control Theory (3) Deterministic optimal control, Examples involving calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control. Prereq: 431, 445-46 or consent of instructor.

589 Seminar in Mathematical Ecology (1-3) May be repeated. Maximum 12 hrs.

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

599 Graduate Reading in Mathematics (1-3) Independent study with faculty guidance. Prereq: Graduate standing and consent of instructor. May be repeated. Maximum 6 hrs.

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

Mechanical and Aerospace Engineering

(Majors of Engineering)

MAJORS

Aerospace Engineering..........M.S., Ph.D.
Mechanical Engineering..........M.S., Ph.D.

Donald R. Pitts, Head
A. J. Edmonson, Associate Head

Professors:

Arinilli, R. V., Ph.D...........VPI
Bailey, Joel F. (Emeritus), PE, Ph.D. ....Leigh
Braun, G. W. (Emeritus) (UTSI), PE.
Ph.D.-----------------Gottingen
Collins, Frank G. (UTSI), PE, Ph.D. .....California
Edmondson, A. J., PE, Ph.D. ......Texas A&M
Euler, J. A., PE, Ph.D. ..........Purdue
Garrison, G. W. (UTSI), Ph.D. .........Cal Tech
Harwell, Kenneth E. (UTSI), Ph.D. .......Georgia Tech
Holland, R. W. (Emeritus), PE, Meson, W. S., Ph.D. .........Tennessee
Johnson, W. E., PE, Ph.D. .........Clemson
Keshock, Edward G., PE, Ph.D. .........Ohio State
Kraner, R. J., Ph.D. .............Alabama
Liston, Hardy, Jr., M.E.....George Washington
Lo, C. F. (UTSI), Ph.D. ............Cornell
Maxwell, R. L. (Emeritus), PE, Meson, W. S., Ph.D. .........Tennessee
Poe, M. S. .................Case Western
Milligan, Manol W., PE, Ph.D. .........Tennessee
Newman, M. K. (Emeritus) (UTSI), PE, Ph.D. ..........Columbia
Parang, M., PE, Ph.D. ..........Ohio State
Parsons, J. R., PE, Ph.D. ..........NC State
Peters, C. D. (UTSI), D.A. ........Brussels
Pitts, Donald R. Ph.D. ..........Georgia Tech
Shahroki, F. (UTSI), Ph.D. ........Ohio State
Shapiro, E. .............Penn State
Speckhart, Frank H. (IBM Prof.), PE, Ph.D. ......Georgia Tech
Stair, W. Kenneth (Emeritus), M.S. .........Tennessee
Tucker, J. M. (Emeritus), M.S. .........Illinois
Wilkinson W. J., M.S. ..........Tennessee
Wilson, C. C., Ph.D. ..........Purdue
Wu, J. M. (B. H. Goerthert Prof.) (UTSI), Ph.D. ................Cal Tech
Young, R. L. (UTSI), PE, Ph.D. .........Northwestern

Associate Professors:

Becker, S. E., PE, Ph.D. ..........NC State
Crawford, A. R. (UTSI), Ph.D. ..........Tennessee
Moulder, T. H. (UTSI), Ph.D. ..........Tennessee
Schulz, R. J. (UTSI), Ph.D. ..........Tennessee
Vakil, A. D. (UTSI), Ph.D. ..........Tennessee

Assistant Professors:

Dubey, R. V., Ph.D. ..........Clemson
Jeng, S. M. (UTSI), Ph.D. ..........Penn State
Keyhani, M., Ph.D. ..........Ohio State
Nguyen, K., Ph.D. ..........Colorado

Graduate programs in Mechanical Engineering or Aerospace Engineering are available that lead to the Master of Science and Doctor of Philosophy with concentrations in energy conversion and utilization, propulsion, heat transfer and fluid mechanics, and thermodynamics. In addition, Mechanical Engineering offers concentrations in gasdynamics, machine design and dynamics, power generation, and stress analysis; Aerospace Engineering offers structures and stress analysis, aerodynamics and gasdynamics, flight mechanics, and aeroacoustics. Each student must satisfactorily complete a program of study that has been approved by the student's committee. Specific program requirements are given below.

THE MASTER'S PROGRAM

Entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. Three program options are available.

Thesis 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 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 30 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 prepared 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 a minimum of 72 semester hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including:

1. A minimum of 24 semester hours in doctoral dissertation.

2. A minimum of 12 semester hours in mathematics in courses numbered 400 or above.

3. 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.

4. Participation in the departmental seminar 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 UTK 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

416 Energy Conversion Systems (3) Fossil fuel energy conversion systems; coal technology. Coreq. 475.

416 Turbo-Machinery (3) Basic principles of turbo-machinery; systematic methods of analysis, design, performance evaluation. Prereq: Aerospace Engineering 351.

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.


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: 383 and 455.

455 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, 344. F


462 Tool Design (3) Principles underlying tool and die design; design for tool production; work holding fixtures; comparison of material removal methods; selection of tool material; plastics production. Prereq: 366 or Graduate standing 404, Engineering Science and Mechanics 321.


467 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, turbulence, heat exchangers, combustion and system analysis and design; review 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, 476. Sp


494-95 Selected Topics in Mechanical Engineering (1-4, 1-4) 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 those who desire to conduct freedom-in-depth graduate work during the summer when student uses University facilities and/or faculty time before degree is completed. May not be used to satisfy degree requirements. May be repeat- ed. S/NC only. E

511 Conduction Heat Transfer (3) Analysis of steady-state and time dependent heat conduction by analytical and numerical methods. Modeling of thermal systems. Prereq: 344.

512 Convection Heat Transfer (3) Analysis of laminar and turbulent convection heat transfer to internal and external flows, effects of variable surface temperature or heat flux and variable fluid properties. Prereq: 531.


514 Phase Change Heat Transfer (3) Mechanisms and modeling of nucleate, transition and film boiling processes; critical heat flux; forced convection boiling and post dry-out heat transfer; condensation processes; heterogeneous nucleation; dropwise and filmwise condensation; flow condensation; liquid-solid phase change processes; moving phase fronts; mathematical modeling. Prereq: 344, 511.

521-22 Thermodynamics I and II (3, 3) Macroscopic thermodynamics, energy flow, First and Second Law analysis, availability, phase and chemical equilibrium criteria, combustion, gas mixtures, and property relations, determination of thermodynamic properties from molecular structure, spectroscopic data, kinetic theory, chemical mechanics, quantum physics, Schrodinger equation. Prereq: 332.

523 Special Topics in Thermodynamics (3) Application of thermodynamics to topics of current interest in mechanical engineering. Prereq: Consent of instruc- tor.

531 Fluid Mechanics (3) Derivation of equations governing fluid of viscous fluid (conservation of mass, Newton's second law) and interelement forces at a material point. Analysis of state vector and Cartesian tensor notation. Equations of state and constitutive relations. Specialization of governing equations to those for Newtonian fluid. Approximate initial and boundary conditions. Exact solutions. Introduction to boundary layer flows, potential flows, and low Reynolds's number flows. Prereq: 341, Aerospace Engineering 351.

Aerospace Engineering

GRADUATE COURSES

422 Aerodynamics (3) Theory and design of aerodynamic bodies for desired characteristics. Potential flow theory, viscous effects, compressibility effects. Subsonic, transonic, and supersonic airfoils. Prereq: 370. F

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, guidance, control, and atmospheric reentry of space vehicle systems. Prereq: 362. Mechanical Engineering 332. Sp

425 Propulsion (3) Principles of propulsion devices; turbojet, ramjet and rocket engines. Prereq: 351. F


429 Aerospace System Design (4) Synthesis and design of complete aerospace system, economic and technical aspects. Participation in team design effort, formal presentations and design report. Prereq: 425, 426. Sp

449 Aerospace Engineering Laboratory (3) Designing, conducting, and reporting results of experimental test methods and engines. Prereq: 351. 3 labs. F

494-95 Selected Topics in Aerospace Science (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 (1-15) Recommended for the student not otherwise registered. May be repeated. S/NC only. E

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; subsonic to hypersonic speeds. Relations among thrust, drag, lift, and time, altitude, Mach number, propulsive systems, and trajectory optimization. Prereq: 422, 515 for 516.

521-22 Aerodynamics of Compressible Fluids (3,3) One-dimensional internal and external flow; waves; small perturbation theory; slender body theory; similarity rules; method of characteristics. Prereq: 422 for 521, 521 for 522.

525 Hypersonic Flow (3) Slender body flow; similarity solutions; direct numerical solution; numerical solution; boundary layer theories and turbulence models; free molecule and rarefied gas flow. Prereq: 512.

527-28 Aerospace Ground Test Facilities (3,3) Atmospheric models and similarity considerations; ground test facilities; ground tests; wind tunnel tests; water table experiments; super sonic flow experiments; boundary layer measurements, laser optical measurements. Prereq: 423 or Mechanical Engineering 531.

531 Magnetohydrodynamics (3) Electromagnetic field theory; chemical kinetics; thermodynamic and physical properties of gas plasmas; governing equations and applications. Prereq: 422 and Mathematics 471.

532 Introduction to Turbulence (3) Macroscopic effects, analogies, statistical treatment, correlation functions, Reynolds stresses, diffusion, interaction 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 shock reflection phenomena. Prereq: 522.


561 Fundamentals of Aerodynamics (3) Generation, propagation, and absorption of sound in static and moving media. Prereq: Consent of instructor.

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 588, Civil Engineering 588, Electrical and Computer Engineering 588, Engineering Science and Mechanics 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, Engineering Science and Mechanics 589, and Mechanical Engineering 589.)

590 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. 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) Pr/NP only. E

631 Magnetohydrodynamics I (3) Electromagnetic field phenomena, motion of a charged particle, statistical description of plasma, Boltzmann equation, conduction and diffusion in ionized gases, continuum magnetohydrodynamics. Prereq or coreq: 512. Prereq: Mathematics 561 or equivalent.

632 Magnetohydrodynamics II (3) Alfvén and shock waves, exact solution for magnetohydrodynamic channel flow, one-dimensional model of channel flow, engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 631 and Mathematics 562.

641-42 Physical Gas Dynamics (3,3) High speed, high temperature gas flow from molecular point of view. Kinetic theory, statistical mechanics, equilibrium flow, vibrational and chemical rate processes, non-equilibrium vibrational and chemical flow, non-equilibrium kinetic theory, flow with translational non-equilibrium. Prereq: 522, Mechanical Engineering 522.

645 Theory of Turbulence (3) (Same as Engineering Science and Mechanics 645.)


680 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. Lozio, Acting Chair

Professors:
Chen, J. P., Ph.D. ........ Penn State
Farkas, W., Ph.D. .......... Duke
Fuhr, J. E., Ph.D. .......... St. John's
Congdon, C. C. (Emeritus), M.D. ...... Michigan
Jones, J. B., D.V.M. ......... Illinois
Lange, R. D. (Emeritus), M.D. ....... Indiana

Associate Professors:
Carroll, R., Ph.D. .......... Cornell
Hanna, W. T., M.D. ......... Ain-Shams
Ichiki, A. T., Ph.D. .......... UCLA
Schroeder, E. C., D.V.M. .... Michigan State

Wust, Carl J., Ph.D. ......... Indiana

Assistant Professors:
Matteson, K., Ph.D. ......... Wisconsin
Switzer, R. C. III, Ph.D. ......... Michigan State
Tyler, J., Ph.D. ................ SUNY Buffalo
Worthington, R. E., Ph.D. ........ Washington (St. Louis)

The Department of Medical Biology of the University of Tennessee College of Medicine-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, cyto-genetics, 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 with the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. in Comparative and Experimental Medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

600 Oral Research and Dissertation (3-15) Pr/NP only. E

610 Medical Biology Seminar (1) Invited speakers. Topics posted in advance. May be repeated. S/NC only. F,Sp

611 Advanced Topics in Medical Biology (1-3) New developments in biological research applicable to clinical medicine. Prereq: 541 and consent of instructor. May be repeated. Maximum 9 hrs.

652 Special Topics in Pathology (1-3) Pathologic anatomy, biochemical pathology, and related areas. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

650 Special Topics in Medical Disease (1-3) Biochemical and physical basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

653 Metabolism of Drugs (1) Drug mechanisms of action: membrane transport, enzyme reactions, ionization, stereochemistry and metabolic pathways. Prereq: Biochemistry 410-19 or equivalent. Sp, A

542 Special Topics in Medical Disease (1-3) Biochemical and physiological basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

541 Molecular Basis for Metabolic Disease (4) Metabolic disease of humans and animals. Molecular mechanisms in inborn errors of metabolism, toxic reactions and deficiency states. Clinical and pathologic correlations. Prereq: Biochemistry 410-19 or equivalent. Sp, A

540 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.

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.

532 Special Topics in Hematology (1-3) Prereq: 531 and consent of instructor. May be repeated. Maximum 9 hrs.


541 Molecular Basis for Metabolic Disease (4) Metabolic disease of humans and animals. Molecular mechanisms in inborn errors of metabolism, toxic reactions and deficiency states. Clinical andpathologic correlations. Prereq: Biochemistry 410-19 or equivalent. Sp, A

542 Special Topics in Medical Disease (1-3) Biochemical and physiological basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

543 Metabolism of Drugs (1) Drug mechanisms of action: membrane transport, enzyme reactions, ionization, stereochemistry and metabolic pathways. Prereq: Biochemistry 410-19 or equivalent. Sp, A

545 Clinical Genetics (3) Human genetic disorders: new developments in cytogenetics, molecular genetics, clinical diagnoses and prevention. Prereq: Biology and genetics background or consent of instructor.

600 Oral Research and Dissertation (3-15) Pr/NP only. E

610 Medical Biology Seminar (1) Invited speakers. Topics posted in advance. May be repeated. S/NC only. F,Sp

611 Advanced Topics in Medical Biology (1-3) New developments in biological research applicable to clinical medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

652 Special Topics in Pathology (1-3) Pathologic anatomy, biochemical pathology, and related areas. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Metallurgical Engineering

See Materials Science and Engineering

Microbiology

(College of Liberal Arts and College of Veterinary Medicine)

MAJOR

DEGREES

Microbiology .................. M.S., Ph.D.
Veterinary Medicine .............. D.V.M.
THE MASTER'S PROGRAM

The program leading to the M.S. is designed to provide the student with broad basic knowledge, to permit the acquisition of technical competence in the fundamentals of research, and to train effective teachers. Students may enter the program after receiving either a Bachelor's or Master's degree. Those who enter with a Bachelor's degree usually receive the Ph.D. after four or five years; those with the Master's degree usually take three or four years to complete the degree. Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one semester as a teaching assistant; (4) one course in statistics; (5) five courses in at least five of the sub-disciplines recognized by the department: microbial physiology, pathogenic bacteriology, virology, mycology, immunology, microbiological genetics, microbial ecology, molecular biology, and applied microbiology; and (6) presentation of a research proposal and its oral defense.

THE DOCTORAL PROGRAM

The program leading to the Ph.D. is designed to develop the student's ability to pursue independent and original research in microbiology and allied fields, to teach both oral and written communication of the results of research to the scientific community, and to train effective teachers. Students may enter the program after receiving either a Bachelor's or Master's degree. Students who enter with a Bachelor's degree usually receive the Ph.D. after four or five years; those with the Master's degree usually take three or four years to complete the degree. Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one semester as a teaching assistant; (4) one course in statistics; (5) five courses in at least five of the sub-disciplines listed in the Master's program; (6) satisfactory performance in a comprehensive examination that must be passed before admission to candidacy; and (7) the presentation of a written research proposal and its oral defense.

GRADUATE COURSES

410 Physiology and Genetics of Bacteria (3) Modern concepts of structure and function of bacterial cell: metabolism, energy flow, and transmission of genetic information. Prereq: 310.

419 Bacterial Physiology and Genetics Laboratory (1) Laboratory exercises designed to accompany 410. Coreq: 410.

420 Pathogenic Bacteriology (2) Disease-producing microorganisms: bacteria, rickettsia, and chlamydia. Prereq: 310.

429 Pathogenic Bacteriology Laboratory (1) Exercises designed to accompany 420. Coreq: 420.

430 Immunology (2) Principles of inflammation and immunity; immunoglobulin structure and theories of formation and diversity; complement, hypersensitivities, cell cooperation and recognition in immune mechanisms; soluble factors. Prereq: Biology 220. (Same as Zoology 430.)

439 Immunology Laboratory (1) Laboratory exercises designed to accompany 430. Coreq: 430. (Same as Zoology 439.)


489 Mycology Laboratory (1) Laboratory exercises designed to accompany 480. Coreq: 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 who enters the Microbiology Department. May be repeated. S/NC only. E

510 Microbial Physiology (3) Topics in microbial physiology and metabolism. Prereq: 410, Biochemistry 410, or consent of instructor. May be repeated. Maximum 12 hrs.

520 Pathogenesis of Infectious Disease (3) Topics in pathogenesis: microbial factors and host responses. Prereq: 420, 430, or consent of instructor. May be repeated. Maximum 12 hrs.

530 Immunology and Immunochemistry (3) Topics in molecular and genetic aspects of immune response, immunology, and immunopathology. Prereq: 420, 430, or consent of instructor. May be repeated. Maximum 12 hrs.

540 Molecular Virology (3) Topics in replication, assembly, and expression of viruses. Prereq: 440 or consent of instructor. May be repeated. Maximum 12 hrs.

550 Microbial and Molecular Genetics (3) Topics in transmission and expression of genetic information at the molecular level. Prereq: 410, Biochemistry 410, or consent of instructor. May be repeated. Maximum 12 hrs.

560 Recombinant DNA (3) Principles and bacterial and phage molecular biology applied to development of recombinant DNA techniques. Prereq: 410 or consent of instructor.

569 Recombinant DNA Laboratory (3) Practical details and procedures applicable to recombinant DNA methodology and techniques. Prereq or coreq: 560 or consent of instructor.

570 Applied and Environmental Microbiology (3) Topics in applied and environmental microbiology that treat physiology, metabolism, and genetics of microorganisms: fermentations and natural and simulated ecosystems. Prereq: 470 or consent of instructor.

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

590 Laboratory Problems (2-6) Laboratory methods for development and interpretation of microbiological investigations. Prereq: Graduate standing. May be repeated. Maximum 6 hrs. S/NC only.

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 Selected Topics in Microbiological Research (2-4) Literature surveys and discussions of selected topics. Prereq: Graduate standing. May be repeated. Maximum 8 hrs. S/NC only.
Music

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 area of 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

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.

THE MASTER OF ARTS PROGRAM

A minimum of 33 semester hours, including 18 hours of coursework above the 500 level and 6 hours of thesis, is required for the Master of Arts. Specific curricula are available from the Department of Music. A reading knowledge of French or German must be demonstrated by applicants before being admitted to candidacy.

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

503 Special Topics in Performance (1-3) Prereq: Consent of department head.

504 Registration for Use of Facilities (3-15) Required or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

511 Lecture Recital (2)

521 Special Topics in Performance (1-3) Prereq: Consent of department head.

551 Church Music Performance Project (1-3) 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 viewpoint 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 mediaeval chant, secular monophony, and rise of polyphony.

540 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chansons, madrigal, and other vocal and instrumental forms and genres.

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 Beethoven.

570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romanticism.

580 Music in the Twentieth Century (3) From 1890, Debussy, to present, Stockhausen and others.

590 World Music (3) Attitudes and techniques of ethnomusicology. Survey of world music cultures. Interview and transcription projects.

593 Independent Study (1-15) See page 31. Prereq: Consent of department head.

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 Shinichi 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/NC only.

584 Practicum for Instrumental Conductors (1) Intern experience in field other than area of major interest. S/NC only.

585 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 rehearsal techniques for jazz ensembles. Prereq: Studio music and jazz major or consent of instructor.

520 Seminar in Jazz (3) Topic varies.

Music Keyboard
GRADUATE COURSES
410 Early Keyboard Literature (2) Keyboard music through baroque period, music for harpsichord. Prereq: Music History 210-220.

420-50 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.

520 Piano Literature Seminar (2) Topics vary. May be repeated. Maximum 6 hrs.

531-41 Recital Project (2,2) Preparation and accompaniment 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 neotonal 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 Styles in Opera Acting (2) Study and practice of styles in opera acting based on historical and national characteristics. Prereq: 230.

440 Projects in Opera Theatre (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

510 Vocal Literature Seminar (2) Topics vary. May be repeated. Maximum 6 hrs.

530 Opera Performance (2) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

540 Opera Production (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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 middle 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 project. Prereq: Consent of instructor. May be repeated.

595 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Music Performance
GRADUATE COURSES
All performance courses require an audition and consent of instructor. May be repeated. Maximum 8 hours 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)
496 Composition for Media (2)
499 Improvisation (1-2) May not be used toward applied music requirement.

503 Flute (1-4)
505 Oboe (1-4)
510 Bassoon (1-4)
515 Clarinet (1-4)
### Music Ensemble

#### GRADUATE COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
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<tbody>
<tr>
<td>520</td>
<td>Saxophone (1-4)</td>
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<td>525</td>
<td>Horn (1-4)</td>
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<td>530</td>
<td>Trumpet (1-4)</td>
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<td>535</td>
<td>Trombone (1-4)</td>
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<td>540</td>
<td>Baritone (1-4)</td>
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<td>Accompanying and Coaching (1-4)</td>
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<td>Composition (1-3)</td>
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<td>599</td>
<td>Improvisation (1-4)</td>
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### Nuclear Engineering

#### (College of Engineering)

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<th>MAJOR</th>
<th>DEGREES</th>
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<tbody>
<tr>
<td>Nuclear Engineering</td>
<td>M.S., Ph.D.</td>
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</table>

Thomas W. Kerlin, Head

#### Professors:

- Dodds, H. L., Ph.D., Tennessee
- Fussell, J. B., Ph.D., Georgia Tech
- Kerlin, T. W., Ph.D., Tennessee
- Mihalczko, J. T., Ph.D., Tennessee
- Pasqua, F. (Emeritus), PE, Ph.D., Northwestern
- Perez, R. B., Ph.D., Madrid
- Roland, H. C., Ph.D., Tennessee
- Stevens, P. N., Ph.D., Northwestern
- Uckan, N., Ph.D., Michigan
- Uhrig, R. E. (Distinguished Prof.), PE, Ph.D., Iowa

#### Associate Professors:

- Katz, E. M., Ph.D., Tennessee
- Miller, L., PE, Ph.D., Texas A&M
- Scott, T. H., PE, Ph.D., Florida
- Upadhyaya, B. R., Ph.D., California

#### THE DOCTORAL 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.
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.
4. 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 must then pass an oral examination on the thesis and all graduate coursework. The student must enroll for a minimum of six semester hours of NE 598 (Thesis).

#### Practice School

- The student addresses two to four separate research problems approved by his/her graduate committee. Each is similar to a thesis problem, but smaller in scope. The student must make an oral report and submit written reports on each project. He/she must pass an oral examination on practice school research and all graduate coursework. The student must enroll for sixteen semester hours of NE 598 (Nuclear Engineering Practice).
department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.

6. A reading knowledge of one foreign language may be specified by the student's doctoral committee.

The comprehensive examination is prepared by the nuclear engineering faculty and consists of 12 hours of written examinations. All past examinations are filed in the library, and students are encouraged to review them. Students are invited to take the comprehensive examination by completing approximately 30 semester hours of coursework. A student who fails the written part of the examination must take and pass the examination the next time it is offered to remain in the Ph.D. program. Registration for NE 800 is not permitted until the written examination is passed. The comprehensive examination is completed with a successful oral defense of the dissertation proposal.

A candidate must successfully defend, in an oral examination, all work presented for the degree—all coursework and 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 UTK on an in-state tuition basis. The Ph.D. program in Nuclear Engineering is available to residents of the states of Alabama, Kentucky, Mississippi, South Carolina, or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE 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.

402 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: 401, 405 or equivalent.


406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma ray and neutron attenuation, biological effects, approximate methods of shield design, discrete ordinates, and Monte Carlo. Prereq: Physics 232.

421 Introduction to Nuclear Criticality Safety (3) Fundamentals of nuclear criticality safety; criticality accidents; safety standards; overview of experiments, computational methods, and applications. Prereq: Introduction to nuclear engineering and nuclear reactor theory.

483 Introduction to Fusion Energy (3) (Same as Electrical and Computer Engineering 483.)

484 Introduction to Fusion Energy II (3) (Same as Electrical and Computer Engineering 484.)

494 Special Topics in Nuclear Engineering (3) Problems related to recent developments and practice. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 6 hrs.

500 Thesis (1-15) P/FP 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

511-12 Transport Processes in Nuclear Engineering (3,3) Rheology of Newtonian and non-Newtonian fluids; integral and system conservation equations for single and multi-component fluids; in-depth development of differential conservation equations for mass, energy, and momentum; exact and approximate solutions of equations of motion; boundary layer analysis; numerical analysis of fluid flow and heat transfer.

521 Nuclear Systems Dynamics and Control (3) Introduction to the theory of deterministic models and control analysis and application of these methods to nuclear plant dynamics, simulation and control problems.


541 Reactor Fuel Management (3) Topics relative to in-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 nuclear criticality safety analysis; nuclear data processing and transport applications; regulatory requirements; review of cooperative status of critical material facilities in East Tennessee. Prereq: 421.

550 Nuclear Instrumentation (3) Physics and electronics associated with radiation detection, methods of data analysis, applicability of particular instrument measurement, 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 work-area and environmental monitoring; dose assessment; pathways analysis; risk projections and regulations. Prereq: 551.

561 Plasma Diagnostics I (3) (Same as Electrical and Computer Engineering 561.)

562 Plasma Diagnostics II (3) (Same as Electrical and Computer Engineering 562.)

563 Plasma Engineering (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 power plants. Fusion reactor design and fusion systems; materials and irradiation; plasma heating, fueling and impurity control; review of major design studies. Prereq: 563 or same as Electrical and Computer Engineering 564.


585 Process System Reliability and Safety (3) Qualitative and quantitative techniques for assessing and improving process systems reliability and safety. Fault tree analysis and associated dependent failure analysis. (Same as Chemical Engineering 585.)

588 Measurement Science I (3) Principles of measurement, introduction to measuring devices. Prereq: Consent of instructor. (Same as Chemical 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) Modern industrial measurement systems, advanced topics in measurement. Prereq: 588. (Same as Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, Mechanical Engineering 589, and Aerospace Engineering 589.)

597 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with consent of Department. Prereq: Approval of department. May be repeated. Limitation to alternative plan students. S/NC only.

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

611-12 Selected Topics in Reactor Theory (3,3) Transport theory, control rod theory, stochastic methods. Selected topics from literature. Prereq: 572.

615 Plasma Engineering II (3) Detailed modeling of plasma breakdown, start up, burn dynamics. Prereq: 564.

616 Plasma Engineering III (3) Detailed modeling of plasma breakdown, start up, burn dynamics. Prereq: 564.

625 Special Topics in Fusion Engineering (3) Selected advanced topics in plasma engineering and fusion reactor engineering and technology. Prereq: 651.

Nursing

(College of Nursing)

MAJOR

DEGREE

Nursing................................. M.S.N., Ph.D.

Sylvia E. Hart, Dean
Mildred M. Fanske, Associate Dean
and Director of M.S.N. Program
Maureen E. Groar, Director of Ph.D. Program

Professors:
Brown, Barbara E., Ed.D.......... Temple
Goodfellow, Dale H., Ph.D........ Peabody
Groar, Maureen E., Ph.D......... Illinois
Hart, Sylvia E., Ph.D............. New York
Mozingo, Johnis N., Ph.D....... Walden
Reid, Barbara M., Ph.D......... Texas

Associate Professors:
Davis, Mitzi M., Ph.D.......... Tennessee
Droppepleman, Patricia G., Ph.D.. Tennessee
Fanske, Mildred M., Ph.D....... Vanderbilt
Foster, Miriam, Ph.D.............. Texas
Jolly, Mary Lue, Ed.D............ Kentucky
Jowers, Laurie, Ph.D.............. Texas
Jozwiak, John, Ph.D.............. Texas
Sharp, Theresa G., Ed.D......... Tennessee
Shoffner, Dava, M.S.N........... Tennessee

Instructor:
Bowen, Sheila, Ph.D.............. Tennessee

THE MASTER'S 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, and primary care nursing.

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 nurses 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 40 semester hours distributed as follows:

Core (12 credits)
503-4 Holistic Nursing I,II 8
510 Theoretical Foundations of Nursing 2
520 Nursing Resource Management 2

Research (9-12 credits)
Graduate level statistics course 3
501 Nursing Research: Methods, Design, and Analysis 3
500 Thesis 6
or 580 Nursing Project 3

Clinical Concentration (11 credits)— choose one
530-31 Adult Health Nursing I,II 11
540-41 Family Nurse Practitioner I,II 11
550-51 Parent-Child Nursing I,II 11
560-61 Mental Health Nursing I,II 11

Role Preparation (5 credits)— choose one
— Specialty Field Work and Seminar 5
563 Teaching Strategies and Practicum (Not an option for non-nurse students) 5
or, 564 Nursing Management: Strategies and Practicum (Not an option for non-nurse students) 5

Elective (3 credits)— waved for those who choose thesis option
Students who are not nurses must complete the following undergraduate nursing courses in addition to meeting the requirements listed above:
301 Pharmacology 3
302 Introduction to Professional Nursing 9
304 Nursing Assessment and Health Promotion 4
311 Acute Care Nursing 10
313 Nursing Research 3
406 Nursing Leadership 3
414 Community Mental Health Nursing 6
415 Family/Community Health Nursing 6

Registered nurses whose undergraduate degrees are not in nursing must complete 304, 305, 313, 315 Clinical Nursing Prac-
ticum, and 403. They must also complete or successfully challenge the following:
301 Pharmacology 3
312 Acute Care Nursing Theory 6
402 Family Health Nursing Theory 3
412 Psychosocial Long Term Nursing Theory 3

Students whose science backgrounds are deficient may also need to take 214 Integrated Biomedical and Health Sciences and/or 450 Physiological Principles.

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. Students must maintain a 3.0 GPA throughout the program. If the GPA for all graduate level courses is less than 3.0 after 20 credit hours are completed, the student will be required to withdraw from the program.
2. If the clinical performance of any student for any course is found to be unsatisfactory, the student will receive a grade of 'R' for the course.
3. 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.
4. 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
1. Those who already hold a Master's or doctoral degree may apply up to 9 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:
   - Core Clinical Concentration 12
   - Role Preparation Research 3

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:

- 601-2 Theory Construction and Analysis I, II 6
- 603-4 Advanced Nursing Research I, II 6
- 605-6 Nursing Research Seminar I, II 4
- 611 Advanced Nursing Seminar 2
- 614 Nursing Preceptorship 3
- Statistics 6
- Computer Science 2
- Electives 12
- 600 Dissertation 24
- TOTAL 66

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, education, occupational therapy, physical therapy, nutrition, 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. The student and major professor together choose the chair, who 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 data analysis issues and their interrelationships in planning, implementation, and evaluation of nursing and health-related research. Investigation of computer applications to data analysis. Prereq: Undergraduate research course. Prereq or coreq: Graduate level statistics course. F, Sp
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester. Students admitted to the University at either University facility and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
503 Holistic Nursing I (3) Examination of philosophy of holistic nursing and new paradigms for nursing assessment, diagnosis, and intervention. Exploration and application of principles of health promotion, education, and innovative strategies for achievement of wellness. Prereq: Courses in nursing assessment and health promotion and acute care nursing or acute care nursing and physiological principles or consent of instructor. F, Sp
504 Holistic Nursing II (5) Continuation of 503. Holistic nursing modalities utilized to provide nursing care to clients, families, and community groups. Clinical practice experience with clients experiencing deviations from wellness. Prereq: 503. 4 hrs and 1 lab. 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: 301 or equivalent or consent of instructor. F
509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Social Work 509, Physical Education 509, Nutrition and Food Sciences 509.) Prereq: Open to students who have completed introductory courses in public health and have at least a 3.0 cumulative GPA. F, Sp
510 Theoretical Foundations of Nursing (2) 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 dilemmas. Prereq: MSN student or consent of instructor. F, Sp
520 Nursing Resource Management (2) Selected organizational, conflict management, decision-making, leadership, professional, technological, and other theories, principles, and concepts applicable to clinical and administrative nursing practice. Prereq or coreq: 503. 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 providing and coordinating care and clients and families achieve optimal wellness. Prereq: 501, 504, 510. 2 hrs and 4 labs. F, Sp
531 Adult Health Nursing II (5) Continuation of 530. Role of clinical specialist in providing and managing nursing care to acutely and chronically ill adults across the life span; analysis and application of theories of health-related research in practice settings. Prereq: 530. 2 hrs and 3 labs. Sp
532 Adult Health Nursing Field Work and Seminar (5) Seminar and intensive clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced clinical practice in adult health nursing. Prereq or coreq: 531. 3 hrs and 4 labs. F, Sp
533 Directed Study in Technical Nursing Education (3) Philosophy, history, and contemporary issues in technical nursing and nursing education; teaching strategies for adult learner in community college; investigation of selected topics. Prereq: Graduate student or consent of instructor. Sp
541 Family Nurse Practitioner II (5) Continuation of 540. Management of chronic health problems; clinical experiences in variety of settings. Prereq: 540. 2 hrs and 3 labs. Sp
542 Family Nurse Practitioner Field Work and Seminar (5) Seminar and intensive clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced clinical practice as family nurse practitioner. Prereq or coreq: 541. 1 hr and 4 labs. Sp
550 Parent Child Nursing I (6) Exploration and application of selected advanced nursing, physiological, psychological, developmental, environmental, cultural, and other theories, principles, and concepts to the care of young child-bearing and child-rearing families in acute or chronic care or community settings; family wellness promotion and interventions designed to recognize and respond to the needs of all family members and children. Prereq: 501, 504, 510. 2 hrs and 4 labs. F, Sp
551 Parent Child Nursing II (8) Continuation of 550. Role of clinical nurse specialist in provision and/or management of nursing care for women and for children during child-rearing; role of urgent care in acute care or community hospital or other health care settings. Prereq: 550. 2 hrs and 3 labs. Sp
552 Parent Child Nursing Field Work and Seminar (5) Seminar and intensive clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced parent-child nursing practice. Prereq or coreq: 551. 1 hr and 4 labs. Sp
560 Mental Health Nursing I (6) Exploration and application of advanced theories of therapeutic nursing intervention to clients experiencing mental health problems. Options for clinical practice with clients of various ages in: acute care or community facilities. Prereq: 501, 504, 510. 2 hrs and 4 labs. F, Sp
561 Mental Health Nursing II (5) Continuation of 560. Families and groups with mental health problems. Prereq: 560. 2 hrs and 3 labs. Sp
562 Mental Health Nursing Field Work and Seminar (5) Seminar and intensive clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced mental health nursing practice. Prereq or coreq: 561. Sp
563 Teaching Strategies and Practicum (5) Exploration, analysis, and application of selected educational, curricular, teaching-learning, measurement, and evaluation principles and theories to instruction of undergraduate nursing students; teaching practicum in collegiate nursing program. Prereq or coreq: 531, 541, 545, 561. 3 hrs and 2 labs. Sp
564 Nursing Management: Strategies and Practicum (5) Exploration, analysis, and application of selected advanced management, supervisory, organizational, leadership, and other theories and concepts to administration of nursing services; management of clinical nursing and a nursing facility. Prereq or coreq: 531, 541, 545, 561. 3 hrs and 2 labs. Sp
577 Special Topics (3) Topic is determined by faculty and student interest. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F, Sp
580 Nursing Project (3) Research-oriented, student-initiated endeavor that culminates in scholarly paper.
suitable for publication and/or presentation; project may take form of development of innovative nursing intervention program, comprehensive literature review that reflects synthesis or comprehensive analysis, or other formats approved by nursing faculty member. Required for all MSN candidates who select non-thesis option. Prereq: 521, 510. May be repeated. Maximum 6 hrs. F.Sp

585 Seminar in Gerontology (1) (Same as Human Ecology 585.)

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

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

601-02 Theory Construction and Analysis I, II (3,3) Nursing theory development; analysis of existing health and nursing theories; theory building from existing knowledge. Prereq: 503, 510, or consent of instructor. F.Sp

603 Advanced Nursing Research I (3) Advanced concepts in research methodology and data analysis and interpretation. Qualitative nursing research. Prereq: 601, 6 hrs of graduate-level statistics. F

604 Advanced Nursing Research II (3) Continuation of 603. Qualitative research nursing. Prereq: 603. Sp

605-06 Nursing Research Seminar (2,2) Selected research topics. Required of all doctoral students. Prereq: 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, consumer groups, 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. 613. Sp

Nutrition and Food Sciences (College of Human Ecology)

MAJORS DEGREES

Food Science...........................M.S.
Nutrition..............................M.S.
Food Systems Administration............M.S.
Human Ecology........................Ph.D.

William C. Morris, Acting Head
Professors:

Beauchene, Roy E., Ph.D. ..........Kansas State
Carruth, Betty Ruth, Ph.D. .........Missouri
Sachan, Dileep S., Ph.D. ...........Illinois
Smith, John T., Ph.D. ..............Missouri
Smith, M. A. (Memphis), Ph.D. ......Tennessee

Associate Professors:

Andrews, Frances E., Ph.D. ..........Ohio State
Morris, William C., Ph.D. ..........Iowa

Skinner, Jean D., Ph.D. ..........Oregon State
Assistant Professors:

Bailey, James W., Ph.D. ..........Iowa State
Bittle, J. B. (Memphis), Ph.D. ......Tennessee
Brooks, M. D. (Memphis), M.S. ......Alabama
Costello, Carol, Ph.D. ..........Tennessee
Haughton, B., Ed.D. ...........Columbia
Hentges, Dawn L., Ph.D. ..........Purdue
Sneed, 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 to 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 may be 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 the necessary background for success in the 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, economics, science of food, and nutrition are essential. For the Master's program in food systems administration, an undergraduate course in food service systems administration, quantity food production, cost control, and personnel development is essential. In addition, students with work experience will be given preference.

THE MASTER'S PROGRAM

Nutrition

In Nutrition, students may choose a thesis or non-thesis option. Students emphasizing public health nutrition may 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 18 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.

An oral comprehensive examination is required upon completion of the thesis.

Non-Thesis Option: The program consists of a minimum of 36 hours with at least 20 hours of coursework in the department. NFS 503 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 Science

In Food Science, students may choose a thesis or non-thesis option. Food Science students who choose the non-thesis option must take 541 and 544 or 545, 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, 504, 511, 512, 540, 541, and 544 or 545 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 and 600 level is required.

An oral comprehensive examination is required upon completion of the thesis.

Non-Thesis Option: The program consists of a minimum of 36 hours with at least 20 hours of coursework in the department. NFS 537, 541, and 546 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 and 600 level is required.

A written comprehensive examination is given at the end of the program.

Food Systems Administration

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 503, 504, 511, 512, 540, 541, and 544 or 545 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 and 600 level is required.

A written comprehensive examination is given at the end of the program.

Food Science Administration

In Food Science Administration, students may choose a thesis or non-thesis option. Food Science 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 36 hours with at least 20 hours of coursework in the department. NFS 537, 541, 546, and 3 hours from 548 (non-thesis research project) are required. 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.

**ACADEMIC COMMON MARKET**

The ACM is an interstate agreement among southern states for sharing academic programs. Residents of one of the participating states who qualify for admission may enroll in certain programs on an in-state tuition basis. Students planning to enter the Master's program in Food Systems Administration who are residents of Arkansas, Kentucky, South Carolina, or West Virginia; students planning to enter Food Science who are residents of Kentucky or South Carolina; and students planning to enter Nutrition who are residents of Alabama, Arkansas, Georgia, Kentucky, South Carolina, or Virginia are eligible.

**THE Ph.D. CONCENTRATION**

Students enrolled in the food science concentration specialize in either the physical-chemical or socio-cultural aspects of food in relation to people and their environment. Students are expected to develop strengths in nutrition and other fields 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 incorporating the study of food habits and factors that influence dietary change. Cognate 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 metabolites.

**Requirements for both concentrations:**

1. Sixteen hours with a concentration in food science or nutrition including 9 hours at the 800 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. Minor in a cognate area;
6. Students without college teaching experience are required to take the fall semester seminar for GTAs and NFS 548 course requirement for a faculty-supervised problem in college teaching.

**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 efficacy 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 system analysis; equipment selection and purchase analysis. Prereq: Quantity Food Procurement, Production and Service with lab or consent of instructor. A

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

502 Registration for Use of Facilities (3-19) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/J/N only.

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 proteins: physical and chemical characteristics; behavior in foods. Prereq: 201 or equivalent. 413. F,A

505 Food Texture (3) Classification of foods according to textual parameters; instrumental and sensory methods in evaluation of textur. 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 analysis and evaluation of foods. 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 the United States. Sociocultural, economic, and technological influences on nutrition. 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 Seminar 509, Physical Education 509 and Social Work 509.)

511 Advanced Physiological Chemistry (4) Bioenergetics, flux control and hormonal interrelationships. Prereq: 313 or equivalent. F

512 Human Nutrition (3) Advances in carbohydrates, proteins, fats, etc. Nutritional requirements of humans. Prereq. 313 and 511. Sp

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. Su

516 Maternal and Child Nutrition (3) Nutrition principles related to growth and development during pregnancy, infancy, and childhood to age 5, high risk conditions. Prereq: 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 planning. Prereq: 313 or consent of instructor. Sp

518 Nutrition and Aging (3) Nutritional problems of adults; nutritional requirements, dietary intakes; effects of nutrition on health and aging. Prereq: 313 or consent of instructor. Sp

519 International Nutrition (3) World food supply, demographic, sociocultural, economic, and technological factors related to food and nutrition; international intervention and assistance programs. Prereq. Consent of instructor. F,A

520 Nutritional Ecology (3) Examination of issues in natural, political, physical, and social environments that impact availability of food and nutrients in U.S. food supply. F,A

521 Physiological Basis for Diet and Disease (2) Altered nutrient needs as result of metabolic changes that occur in selected disease states. Prereq. 411 or consent of instructor. Sp

522 Nutrition Counseling (2) Individual eating habits and disorders, evaluation strategies for effectiveness of helping process. Prereq. 313 or consent of instructor. F,A

523 Nutrition and Behavior (2) Influence of nutrients on intracerebral metabolic processes, electro-physiological indicators of brain function and behavior of individuals. Psychological, biological, and personality aspects. Prereq. Consent of instructor. Su

524 Nutrition Education: Principles, Implementation, and Evaluation (3) Conceptual models, principles, application, and evaluation models in nutrition education research. Prereq. 508 or consent of instructor. Su,A

526 Mental Retardation or Other Developmental Disorders of Childhood (3) Multidisciplinary core course required of all full-time students in training at Child Development Center, UT, Memphis. Supervised project in related area. Prereq. Consent of department head. E

527 Nutrition in Mental Retardation and Developmental Disorders (1-9) Interdisciplinary diagnosis and treatment of developmentally-handicapped children; influence of nutritionist; clinical experiences and lectures at Child Development Center, UT, Memphis. Prereq. Consent of department head. E

529 Management in Nutritional Care (2) Administrative roles and management functions of dietitians in clinical settings: program development, planning, and evaluation. Prereq. 220, 422, or consent of instructor. Su

530 Computer-Assisted Foodservice Systems Management (3) Application of computer technology to foodservice industry; inventory, food cost accounting, production, and nutrient analysis. Prereq. 320 or consent of instructor. Su,A

531 Financial and Marketing Administration in Foodservice (3) Marketing and financial techniques used in foodservice administration: developing foodservice marketing plan, budgeting, foodservice accounting and information services. Prereq. 326 or consent of instructor. Sp

532 Human Resource Management in Foodservice (3) Identifying labor needs; development and maintenance of work force. Prereq. 422 or consent of instructor. F

533 Advanced Food Production and Delivery System Management (3) Analysis of food production and delivery systems; applications of quantitative methods and models to optimize decisions. Prereq. 320 or consent of instructor. F

534 Special Topics in Foodservice Systems Administration (1-6) Contemporary developments and trends in industry. Prereq. Consent of instructor. May be repeated. E

535 Directed Study in Foodservice Systems Administration (1-3) Problems selected for study by student with guidance of faculty member. Prereq. Consent of instructor. May be repeated. Maximum 6 hrs. E

537 Seminar in Foodservice Systems Administration (1) May be repeated. S/J/N only. Sp

540 Seminar in Nutrition and Food Sciences (1) May be repeated. S/J/N only. Sp

541 Research Methods (1) Basic principles of planning, conducting, and interpreting nutrition, food sciences, and foodservice systems administration research. Prereq. Graduate hrs in nutrition and food sciences and statistics. Sp

542 Advanced Experimental Nutrition (2) Application of research principles to individual project using experimental animals. Prereq or cons or 541. Sp

543 Human Metabolic Research Methods (2) Application of research techniques to conducting and interpreting metabolic study. Prereq or cons. 541. Sp
Ornamental Horticulture and Landscape Design

(College of Agriculture)

**MAJOR**

Ornamental Horticulture and Landscape Design

**DEGREE**

M.S.

G. Douglas Crater, Head

Professors:

Callahan, L. M., Ph.D. ............................................ Rutgers
Crater, G. Douglas, Ph.D. ........................................ Ohio State
Graham, E. T., Ph.D. ............................................ Penn State
Greeshoff, Peter M. (Rachefi Chair of Excellence), Ph.D. .......... Australian National
McDaniel, G. L., Ph.D. ............................................ Iowa State
Williams, Don B., Ph.D. ........................................ Penn State

Associate Professors:

Day, J. W., Ph.D. ............................................ Mississippi State
Witte, Willard T., Ph.D. ........................................ Maryland

Assistant Professors:

Auge, Robert M., Ph.D. ..... Washington State
Rogers, S. M., M.L.A. .......................................... Georgia
Trigiano, R., Ph.D. ............................................. NC State

The Department of Ornamental Horticulture and Landscape Design offers the

Master of Science with concentrations in biocultural science and technology, nursery science and technology, or turfgrass science and technology. Various interests may be emphasized in any of these commodity areas, including micropropagation, innovative production and maintenance systems, computer-aided management systems, and the molecular biology, genetics, histology and stress physiology of ornamentals.

For admission, the student must have a B.S. in ornamental horticulture, horticulture, plant science, or a related agricultural or basic science discipline. Undergraduate transcripts must be evaluated by the department for prerequisite requirements, if any. Graduate research assistantships are available on a competitive basis. For further information, contact the department head.

**THE MASTER’S PROGRAM**

**Thesis Option**

1. A thesis is required. A Master’s committee of no fewer than 3 faculty members will be selected. Prior to research for the thesis, a proposal must be approved by the Master’s committee. Registration for a minimum of 6 hours of Thesis 500 is required. 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.

2. The academic program must be approved by the Master’s committee which may require additional course work if the student’s progress or background indicates such need.

3. All students are required to include 510 Research Methods and 2 hours of 590 Seminar in their program and are expected to attend this course and participate in discussions each semester enrolled.

4. Twelve hours of coursework in the department must be at the 500 level or above exclusive of Thesis 500.

5. An oral examination covering the thesis and coursework is required.

**Non-Thesis Option**

1. A Master’s committee of no fewer than 3 faculty members will be selected.

2. Thirty-four hours of graduate course work are required 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 upon completion of no fewer than 32 hours of approved graduate work.

**GRADUATE COURSES**

410 Nursery Management and Production (3) Modern management methods as 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. Sp, F

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 watering; and 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. Sp

460 Professional Practices in Landscape Construction and Management (2) Professionalism, salesmanship, proposals, bidding, estimating, specification, and contract management in landscape services industry. Interaction with industry representatives through special presentations. Prereq: 350 or consent of instructor. F

480 Advanced Landscape Design (4) Comprehensive application of landscape design skills. Design applications involving site layout, landscape grading, applied landscape construction, planting design. Analysis, programming, design, detailing, estimating, and specifying applicable to variety of landscape projects. Prereq: 280, 350, and 380, or consent of instructor. 1 hr and 2-3 hrs labs. Sp

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. 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


550 Microtechnique (3) Methods of investigating histostructure, histochemistry, ploidy, and physiological structures in ornamental and crop plants, light microscopy. Prereq: 8 hrs biological science, 8 hrs chemistry, and consent of instructor. 1 hr and 2 labs. Su, A

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 stage, flowering, photoperiodism, thermoperiodism, vernalization, cold acclimation, hardness, dormancy, growth regulators, environmental stress, and pest control. Prereq: Botany 341 and consent of instructor. Sp, A

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, foliar fertilization and analysis, nutrient uptake and water relations of ornamental plants grown in containers and in the field. Prereq: Botany 341, Plant and Soil Science 311 and consent of instructor. Sp, A

590 Seminar (1) Current literature and developments. May be repeated. Maximum 3 hrs. E

593 Problems in Ornamental Horticulture and Landscape Design (1-3) Independent study. Current topic related to technology and science. May be repeated. Maximum 6 hrs. E
Pathobiology

(College of Veterinary Medicine)

**MAJOR**

Veterinary Medicine ........................................... D.V.M.

**DEGREE**

R. L. Michel, Head

Professors:

McGavin, M. D., Ph.D. ............... Michigan State
Michel, R. L., V.M.D., Ph.D. ....... Michigan State
Patton, S., D.V.M. ......................... Ohio State
Potgieter, L. N. D., Ph.D. .......... Iowa State
Schuller, H. M., D.V.M., Ph.D. ...... Hannover

Associate Professors:

Edwards, D. F., D.V.M. .............. Georgia
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

Assistant Professors:

Breider, M. A., D.V.M., Ph.D. .... Texas A&M
Potgieter, L. N. D., Ph.D. ......... Iowa State
Silva-Krott, I., B.V.Sc. ................. Austria

Instructor:

Petersen, M. G., D.V.M. ............... Colorado State

Residents:

Boley, D., D.V.M. ....................... Tennessee
Duncan, R. B., 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 Pathobiology (1-2) May be repeated. Maximum 8 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/JC only. E

503 Comparative Pathology (3) 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 Ultrastuctural 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**

Philosophy ................................................. M.A., Ph.D.

George G. Brankert, Head

Professors:

Aquila, Richard E., Ph.D. .......... Northwestern
Brankert, George G., Ph.D. .......... Nebraska
Davis, John W., Ph.D. ................. Emory
Edwards, Rem B., Ph.D. ............... Emory
Graber, 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
Emmet, Kathleen A., Ph.D. .......... Ohio State
Noll, John E., Ph.D. ................... Ohio State
Osborne, Martha Lee, Ph.D. .......... Tennessee

Assistant Professors:

Hamlin, H. Phillips, Ph.D. .......... Georgia
Jones, E. Roger, Ph.D. ............... Chicago
Lavin, Michael, Ph.D. ............... Stanford
Mazoue, James G. (Visiting), Ph.D. .... Tulane

The Department of Philosophy offers graduate study leading to the Master of Arts and Doctor of Philosophy. The M.A. program includes thesis and non-thesis options and offers concentrations in medical ethics and in religious studies. The Ph.D. program also has a concentration in medical ethics. Detailed information may be obtained from the Director of Graduate Studies in Philosophy.

**THE MASTER'S PROGRAM**

The department offers both a thesis and a non-thesis option. The course requirements for an M.A. with thesis are 30 hours, including 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 30 hours of coursework of which at least two-thirds must be in courses at or above the 500 level. Students seeking the non-thesis option must also pass a final written examination on all work offered for the degree. An additional oral examination may be required.

**THE DOCTORAL PROGRAM**

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 nature 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 302 with a B or better. B- or multilingual (normally, foreign) students, whose native language (other than English) is one in which there is a significant body of philosophical literature, are exempted from the foreign language requirement.

**SPECIAL 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 can 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 Director of Religious Studies.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal resi-
GRADUATE COURSES

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

411 Modern Religious Philosophies (3) (Same as Religious Studies 411.)

412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) (Same as Religious Studies 412.)

420 Topics in History of Philosophy (3) Figures or movements from antiquity through mid-twentieth century. Prereq: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 9 hrs.

425 American Philosophy (3) Colonial to early 20th Century. Prereq: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 9 hrs.

430 Topics in Logic (3) Prereq: 6 hrs of logic or consent of instructor. May be repeated when topic varies. Maximum 6 hrs.

440 Contemporary Ethical Theory (3) Topics in metaethics or ethics. Prereq: 6 hrs of philosophy or consent of instructor.

446 Theoretical Issues in Medical Ethics (3) Prereq: 240 or 345 or consent of instructor. (Same as Religious Studies 446.)

460 Philosophy of Science (3) Methodological and conceptual issues in natural and social sciences: patterns of theory modification and replacement, nature of explanation and causation, status of theoretical entities. Prereq: 360 and 1 yr of natural or social science, or consent of instructor.

465 Philosophy of History (3) Speculative and critical aspects of philosophy of history. Prereq: 6 hrs of philosophy or consent of instructor.

473 Philosophy of Mind (3) Problems of mind and body in relation to consciousness and personal identity. Prereq: 6 hrs of philosophy or consent of instructor.

475 Analytic Metaphysics and Epistemology (3) Topics in metaphysics and epistemology in recent Anglo-American tradition. Prereq: 8 hrs of philosophy or consent of instructor.

476 Philosophy of Language (3) Survey of issues such as meaning, reference, and truth. Prereq: 6 hrs of philosophy or consent of instructor.

479 Studies in Recent Continental Philosophy (3) Selected thinkers or topics: existentialism, phenomenology, hermeneutics, structuralism, poststructuralism. Prereq: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 6 hrs.

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

520 Topics in the History of Ancient and Medieval Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

522 Topics in the History of Modern Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

524 Topics in the History of Twentieth-Century European Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

527 Topics in the History of American Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

530 Topics in Logic and Philosophy of Mathematics (3) May be repeated. Maximum 9 hrs.

540 Topics in Value Theory (3) May be repeated. Maximum 9 hrs.

542 Ethics (3) Dominant movements in history of ethics. May be repeated. Maximum 9 hrs.

544 Applied Ethical Theory (3) Single author, tradition, or topic in ethical theory, application to issues in health, business, technology, ecology, and other practical fields. May be repeated. Maximum 9 hrs. (Same as Religious Studies 544.)

546 Orientation to Medical Ethics (3) Survey of ethical theories in application to issues in medical ethics. Prereq: Consent of Medical Ethics Committee.

547 Clinical Medical Ethics (2) Clinical terminology, history of medical ethics, case study discussion, clinical observation. Open only to students concentrating in medical ethics. May be repeated. Maximum 4 hrs. S/NC or letter grade.

548 Clinical Residency in Medical Ethics (3-12) Open only to students concentrating in medical ethics. Prereq: Consent of Medical Ethics Committee. May be repeated. Maximum 20 hrs. S/NC only.

553 Philosophical Topics in Literature and the Arts (3) Aesthetics, criticism, art and society. May be repeated. Maximum 9 hrs.

560 Philosophy of Natural Sciences (3) Nature of subject matter and method of science. May be repeated. Maximum 9 hrs.


570 Philosophy of Religion (3) Examination of central problems. (Same as Religious Studies 570.)

575 Topics in Metaphysics and Epistemology (3) May be repeated. Maximum 9 hrs.

577 Philosophy of Mind (3) Relation of mental to physical and of role of words in discourse for mental activities, thinking and feeling. May be repeated. Maximum 9 hrs.

590 Social and Political Philosophy (3) Philosophical problems concerning social and political life: family, state, freedom, justice; major theoretical responses: anarchism, social contract, Marxism. May be repeated. 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.

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

620 Topics in the History of Ancient and Medieval European Philosophy (3) May be repeated. Maximum 9 hrs.

622 Topics in the History of Modern Philosophy (3) May be repeated. Maximum 9 hrs.

624 Topics in the History of 20th-Century Philosophy (3) May be repeated. Maximum 9 hrs.

640 Topics in Value Theory (3) May be repeated. Maximum 9 hrs.

646 Topics in Medical Ethics (3) Prereq: Consent of Medical Ethics Committee. May be repeated. Maximum 9 hrs.

675 Topics in Metaphysics and Epistemology (3) May be repeated. Maximum 9 hrs.

Physical Education and Dance

(Degree Program)

MAJORS

Physical Education: M.S., Ed.D.

DEGREES

Education: M.S., Ed.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
Winston, Helen B. (Emeritus), Ph.D. ........ Michigan
Wrisberg, C. A., Ph.D. ................. Michigan

Associate Professors:

Beitel, Patricia A., Ed.D. ............. North Carolina
Croskey, R. J., M.F.A. ....... Southern Methodist
DeSensi, J. T., Ed.D. ............. North Carolina
Jones, Ralph E., Ph.D. ............. Purdue
Morgan, W. J., Ph.D. ............. Minnesota

Assistant Professors:

Bassett, David R., Jr., Ph.D. ........... Wisconsin
Boroviak, Patricia C., M.S. ...... Tennessee
Donovan, T. J., Ed.D. ............. Houston
Kelley, D. R., Ed.D. ............. Georgia State
Lewis, J. L., Ed.D. ............. Tennessee
McCutchten, M. G., Ed.D. ........ North Carolina

Adjunct Faculty:

Acker, J. E., M.D. ................. Tennessee
Buckles, Tina M., Ph.D. ............. Tennessee
Holt-Hale, C. A., Ph.D. ....... Toledo
Werner, R. A., Ed.D. ............. Tennessee

THE MASTER'S PROGRAM

The Department of Physical Education and Dance 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

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:

1. Adapted Physical Education
2. Exercise Physiology
3. Motor Behavior
4. Philosophical and Sociological Foundations of Sport

The Doctor of Philosophy with a major in Physical 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 graduate students seeking a degree in the Department of Physical Education and Dance. The following retention policy applies to all graduate students seeking a degree in the Department of Physical Education and Dance:

1. Graduate students are required to maintain an overall 3.0 GPA. 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.

2. Students must have completed at least one semester of coursework at the graduate level before degree is completed. May not be repeated. E

3. 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 Physical Education and Dance
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 UTK 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.)
414 Physical Activity and Fitness (2) Relationship of exercise to cardio-respiratory function, body composition, healthy low back, and stress. Prereq: 200, 292. (Same as Health 414.)
423 Readings in Physical Education (2) Review of current and classic literature in physical education.
500 Thesis (1-15) P/np only. E
502 Registration for Use of Facilities (3-15) Required for students who are 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
509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nursing 509, Nutrition and Food Science 509 and Social Work 509.)
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. Various 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 behavior. 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 human behavior in sport context; discussion of contemporary theory, research, and methodology. 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 of current research and methodology.
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) Cultural and social 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 and 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 methodology in programming for child with special education needs. Prereq: 411 or consent of instructor. Coreq: 553.
554 Advanced Adapted Physical Education Practicum (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 program for children with special physical education/motor development needs. Testing protocols which purport to get at basic dysfunction; those which just measure symptoms of dysfunction; efficacy 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/parent implementation.
560 Physiology of Fitness (3) Adaptations that take place with training and detraining, and influence of environmental and heredity factors. Prereq: Undergraduate courses in human physiology of exercise. Coreq: 561.
561 Physical Fitness Testing and Evaluation (1) Laboratory; testing and evaluation of physical fitness factors in apparently normal population. Coreq: 560.
562 Advanced Physiology of Exercise (3) Laboratory; quantitative approach to scientific inquiry. Prereq: Undergraduate physiology of exercise.
569 Fitness Testing, Programming, and Leadership for Diverse Populations (1) 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 stressing cardiorespiratory fitness. Prereq: 550. Coreq: 568. (Same as Public Health 569.)
585 Seminar in Gerontology (1) (Same as Human Ecology 585, Nursing 585, Educational and Counseling Psychology 585, Public Health 585, and Social Work 585.)
593 Directed Independent Studies (1-3) May be repeated. Prereq: 532 or consent of instructor.
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, sport, and human movement. May be repeated. S/NC only.
622 Directed Independent Research (3-6) Prereq: Doctoral student or consent of instructor. May be repeated.
633 Advanced Motor Behavior (1-3) in-depth analysis, synthesis, and discussion of contemporary theory and topics; research development and production; motor control learning, sport psychology, motor development.
661 Seminar in Exercise and Applied Physiology (1) Prereq: 561. May be repeated with consent of instructor. S/NC only.
664 Research Participation in Applied Physiology (1-6) Participation in research with faculty member whose interests coincide with those of student. S/NC 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 The Teaching of Creative Dance (2) Theory, methods, materials, and practical experience in presentation and integration of creative dance in grades K-6.
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: 350.

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.

480 History of Dance I (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.

490 Philosophy of Dance and Related Arts (3) Aesthetic principles and current trends in dance; relationship with other art forms.


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.

Physics and Astronomy
(College of Liberal Arts)

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

William M. Bugg, Head

Professors:
Bingham, C. R., Ph.D.................... Tennessee
Blais, W. E., Ph.D.......................... Michigan State
Brau, J. (On Leave), Ph.D................. MIT
Breazeale, M. A. (On Leave), Ph.D........... Michigan State
Bugg, W. M., Ph.D......................... Tennessee
Burgdorfer, J. H., Ph.D.................... Freie Universität Berlin
Callicott, T. A., Ph.D...................... Purdue
Childers, R. W., Ph.D...................... Vanderbilt
Christophorou, L. G., Ph.D................. Manchester
Close, F. E. (Distinguished Scientist), Ph.D............. Oxford
Colglazier, E. W., Ph.D..................... Cal Tech
Collins, T. C., Ph.D....................... Florida
Condo, G. T., Ph.D......................... Illinois
Crater, H. W. (UTSI), Ph.D.................. Yale
Deeds, W. E. (Emeritus), Ph.D.............. North Carolina
Dicks, J. B. (Distinguished Prof.), Ph.D........... Vanderbilt
Fox, K., Ph.D............................ Michigan
Gallar, N. M. (Emeritus), Ph.D.............. Ohio State
Georgiou, S., Ph.D........................ Manchester
Guld, M. W., Ph.D......................... Tennessee
Harris, E. G. (Distinguished Prof.), Ph.D............. Tennessee
Hart, E. L., Ph.D.......................... Cornell
Huray, P. G. (On Leave), Ph.D.............. Tennessee
Jacobson, H. C., Ph.D..................... Yale
King, D. T. (Emeritus), Ph.D............... Bristol
Lewis, J. W. L. (UTSI), Ph.D................. Mississippi
Lovell, R. J., Ph.D.......................... Vanderbilt

Macek, J. (Distinguished Scientist), Ph.D.......................... Rensselaer
Mahan, G. D. (Distinguished Scientist), Ph.D.......................... California
Mason, A. A. (UTSI), Ph.D.................... Tennessee
McGregor, W. K. (UTSI), Ph.D.............. Tennessee
Nielsen, A. H. (Emeritus), Ph.D............... Michigan
Obenshain, F. E., Jr., Ph.D................... Pittsburgh
Painter, L. R., Ph.D......................... Tennessee
Parks, J. E., Ph.D.......................... Tennessee
Pegg, D. J., Ph.D.......................... New Hampshire
Riedinger, L. L., Ph.D...................... Vanderbilt
Ritchie, R. H., Ph.D......................... Tennessee
Rusk, W. R. (Emeritus), M.S............... Tennessee
Schwehrle, H. C. (Emeritus), Ph.D.............. MIT
Selini, L. A. (On Leave) (Chancellor's Res. Li. (Scholar)), Ph.D......................... Chicago
Shill, C. C., Ph.D.......................... Cornell
Stelson, P. H., Ph.D......................... MIT
Thompson, J. R., Ph.D...................... Duke
Thomson, J. O., Ph.D......................... Illinois
Wheeler, G. W., Ph.D...................... Yale
White, J. W. (Emeritus), Ph.D.............. North Carolina

Associate Professors:
Breinig, M., Ph.D......................... Oregon
Duckett, K. E., Ph.D....................... Tennessee
Elston, S. B., Ph.D......................... MIT
Ferrell, T., Ph.D......................... Clemson
Hendler, T. H., Ph.D....................... Michigan
Lide, R. W., Ph.D......................... Michigan
Muehlhausen, J. W., Ph.D............... Tennessee
Shieh, S. Y., Ph.D......................... Maryland
Ward, B. F. L., Ph.D......................... Princeton

Assistant Professors:
Antar, V. (UTSI), Ph.D...................... Helsinki
Daunt, S. J., Ph.D......................... Queens
Davis, R. E., Ph.D......................... Illinois
DeSerio, R., Ph.D......................... Chicago
Harmatz, Ph.D.................... Ohio State
Menzel, R. (UTSI), Ph.D.................... Tennessee
Sorensen, P. S., Ph.D..................... Copenhagen

Research Professors:
Bottcher, C., Ph.D......................... Belfast
Strayer, M. R., Ph.D....................... MIT

Research Associate Professors:
Du, Yuan-Cai, Ph.D......................... Beijing
McCorckle, D. L., Ph.D...................... Tennessee
Nave, S. R., Ph.D......................... Tennessee

Research Assistant Professors:
O. C-S (On Leave), Ph.D..................... New York
Warmack, R. J., Ph.D....................... Tennessee

Lecturers:
Fairman, R. C.
Riedinger, T., M.S......................... Vanderbilt

Graduate programs leading to the Master of Science and the Doctor of Philosophy are offered in a number of concentration areas: atomic and low temperature physics, biophysics, chemical physics, elementary particle physics, health physics, heavy ion atomic physics, molecular spectroscopy, nuclear physics, plasma physics, condensed matter physics, theoretical physics, and ultrasonics.

The University of Tennessee Space Institute, Tullahoma, where opportunities for study and research are available in quantum optics and laser physics, atomic and molecular spectroscopy, fluid physics, and theoretical physics. For additional information, contact the department head.

ADMISSION REQUIREMENTS

A student who enrolls in The Graduate School with the intention of attaining an advanced degree in Physics will have completed an undergraduate major in Physics or its equivalent. Physics 311-12, 321, 431-32, and 461-62-63 or 411-12 constitute the minimum courses prerequisite to graduate study. A student who intends to present Physics as a graduate minor will have completed an undergraduate minor in Physics or its equivalent. Physics 311 and 431-32 constitute the minimum coursework prerequisite to a minor in Physics.

First-year graduate students are required, for advising purposes only, to take a qualifying examination in undergraduate physics during the fall semester registration period.

THE MASTER'S PROGRAM

Thesis Option

This program is designed primarily for students intending to do research in industrial or governmental laboratories as physicists. 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 an 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 36 hours of 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 of a 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 the committee.

THE DOCTORAL PROGRAM

All students are expected to take Physics 521-22, 531, 541-42, 551, 561, 571-72, and 611. Physics 601-02 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 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
Physics

GRADUATE COURSES


461-62 Modern Physics Laboratory (3,3) Experimental techniques: spectroscopy, electronic measurements, computer interfacing, resonance, detectors and statistical applications to experiments in nuclear, atomic, molecular, and solid state systems. Classic experiments in quantum physics for advanced undergraduates, and more modern experiments useful for entering graduate students. Prereqs: 232 and basic knowledge of circuits.

471-72 Health Physics (3,3) Radioactivity, interaction of electromagnetic radiation with matter, radiation quantities and units, point kernel and extended sources, x-rays and gamma rays, neutron activation, interaction of charged particles with matter, stopping power, range-energy relations, counting statistics, shielding, dosimetry, waste disposal, criticality prevention, radiation biology and ecology. Prereqs: 540 or 541.

490 Senior Seminar (1-3) Topic of current interest. May be repeated with consent of department. Maximum 6 hrs.

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

501 Graduate Research Participation (3) Advanced research techniques under supervision of staff research director whose research area coincides with interests of student, to give all graduate students opportunity to participate. Prereq: Consent of department and research director. May be repeated with consent of department. Maximum 18 hrs. S/NC only. E

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 toward degree requirements. May be repeated. S/NC only. E

505 Physics of Fluids (3) Fluid physics, overview of fluid mechanics and associated computational techniques; general description of laminar and turbulent flows; acoustic, supersonic and hypersonic flows; continuum, transitional and free-molecular flows; pipe flow, nozzle flow and sonic orifice expansion flows; reacting and nonreacting flows; shock-tube physics; and an introduction to the method of characteristics and Monte Carlo computational techniques.

506 Experimental Methods (3) Principles, real operational behavior, and applications of laser types, radiation detectors, photomultiplier tubes, image intensifiers, image converters, image dissectors, streak cameras, and fast-frame-vacuum systems including cryogenic-based devices, data acquisition techniques including synchronous detection, digital electronics 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 systems.

508 Laser Physics (3) Mode analysis, stable and unstable resonators; rate equations and population inversion, 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 dye lasers.

511-12 Theoretical Physics (3,3) Classical theoretical physics, with limited use of mathematics. Prereqs: 312, 432, advanced calculus, differential equations, and vector analysis.


531 Classical Mechanics (3) Classical particle dynamics, Lagrange’s and Hamilton’s equations, moving coordinate systems, normal coordinates, rigid body motions. Prereq: 511.

532 Advanced Classical Mechanics (3) Variational principles, canonical transformations, Hamilton-Jacobi theory, nonlinear mechanics, elasticity, fluid mechanics. Prereq: 531.


557 The Theory of Relativity (3) Geometry of spacetime, relativistic electrodynamics, particle mechanics and continuum mechanics, Einstein’s field equations, Schwarzschild solutions, the classical test of general relativity. Prereq or coreq: 531 and 542.


574-75 Group Theory for Physicists (3,3) Introduction to abstract group theory, discrete and continuous groups, representation theory, the classical test of general relativity. Prereq or coreq: 531 and 542.


578-79 Atomic and Molecular Physics (3,3) Quantum dynamics of atoms, molecules and nuclei. Prereqs: 541-42 or coreqs for 578: 541-42.

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 Special Problems (3) Especially assigned theoretical or experimental work on problems not covered in other courses. May be repeated. Maximum 9 hrs. E

595 Seminar in Quantum Mechanics (3) Prereqs: 531, 571.

596 Seminar in Nuclear Physics (3) Prereqs: 531, 571.

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


602 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 and Zeeman and Stark effects, spontaneous emission of light, and the selection rules of dipole and quadrupole transitions, radiative transfer and formation of spectral lines. Study of saturated absorption spectroscopy, resonance fluorescence and strong field effects, Hanle effect, optical double resonance, optical pumping and hyperfine spectroscopy. Prereq: 521, 541, 508.

606-07 Nonlinear Optics (3,3) Nonlinear optical susceptibilities, wave propagation in nonlinear media, sum-frequency and difference frequency generation, harmonic generation, parametric amplification and oscillation, 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 plasmas. Prereq: 520.

608-09 Quantum Electronics and Electro-Optics (3,3) Electromagnetic propagation in anisotropic and periodic media, linear and quadratic electro-optic effects and devices, acousto-optical effects and devices, guided waves, phase conjugate optics, pico- and femtosecond optical switching and electronics, and optical computers and processors. Prereq: 606.

610 Quantum Optics (3) Quantum theory of emission and absorption of radiation; frequency-dependent susceptibility; coherence theory; field quantization and coherent photon states; interaction of radiation with atoms; photon optics, counting and higher-order coherent effects in quantum optics. Prereq: 521.

611 Advanced Quantum Mechanics & Field Theory (3) Second quantization, quantization of electromagnetic field, emission, absorption, and scattering of light, creation and annihilation, quantum field theory methods in condensed matter physics, and quantum optics. Topics vary according to instructor. Prereq: 520 or coreq: 561 or consent of instructor.

612 Advanced Topics in Quantum Field Theory (3) Renormalization, Lamb shift, anomalous magnetic moments, gauge theories, electroweak theory, quantum chromodynamics, grand unified theories, and advanced topics in laser physics and quantum optics. Topics vary according to interest of students, instructor, and present state of physics. Prereq: 561 or 611 or consent of instructor.

617-18 Lie Algebras in Mechanics and Physics (3,3) (Same as Mathematics 617-18.)

621-22 Nuclear Structure (3,3) General properties of nucleus; two-body scattering problems; saturation and symmetry properties of nuclear forces; theory of light nuclei; nuclear spectroscopy; special nuclei; nuclear reactions; theory of nuclear reactions; theory of beta-decay. Prereq: 517-12.

626-27 Elementary Particle Physics (3,3) Survey in elementary particle physics covering experimental and theoretical methods and collection rules in gases and condensed phases, normal coordinates and potential functions, vibration-rotation interaction theory, intensities, frequencies and line shapes of molecular transitions. Prereq: 532 and 542 or consent of instructor.

631 Advanced Topics in Relativity and Cosmology (3) Topics vary according to interests of students, instructor and present state of physics. Cosmological solutions of Einstein's field equations, black holes, inflationary universe, unified field theories or interaction between cosmology and nuclear and elementary particle physics. Prereq: 531 and 551.

641 Advanced Topics in Classical Theory (3) To meet special needs of students. Advanced dynamics and hydrodynamics, electromagnetic theory, statistical mechanics, quantum field theory, and quantum electrodynamics. Prereq: 532, 542, 551. May be repeated with consent of department. Maximum 9 hrs.

642 Advanced Topics in Quantum Theory (3) To meet special needs of students. Angular-momentum theory, basic quantum mechanics, theory of atomic spectra, molecular structure and valence theory, theory of radiation, electric and magnetic susceptibilities, high energy processes, scattering and collision processes, and theory of radiation. Prereq: 522. May be repeated with consent of department. 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 electromagnetism, atomic and nuclear structure, and surface and solid state physics, transport problems in statistical mechanics. Monte Carlo simulation of liquids, fitting and interpolation of data, correlation analysis, or optimization strategy. Prereq: 522, 531, 542, and 572.

651-62 Collision Interactions (3,3) Interaction of electromagnetic radiation and charged particles with atoms and molecules or free particles, scattering, ionization, transport and capture, collective excitations, Cerenkov radiation, and stopping power. Prereq: 522.

663 Advanced Plasma Physics I (3) (Same as Electrical and Computer Engineering 663.)

664 Advanced Plasma Physics II (3) (Same as Electrical and Computer Engineering 664.)


681-82 Molecular Spectroscopy (3,3) Spectroscopic methods of determining molecular properties, theoretical and experimental aspects of intra- and intermolecular energy and charge transfer, group theories, and introduction to quantum mechanical methods and selection rules in gases and condensed phases, normal coordinates and potential functions, vibration-rotation interaction theory, intensities, frequencies and line shapes of molecular transitions. Prereq: 532 and 542 or consent of instructor.

Planning

(Office of the Provost)

MAJOR

DEGREE

Planning..................................M.S.P.

James A. Spencer, Director

Professors:

Johnson, David A., Ph.D. ..............Cornell University
Kennedy, Disilvestro B., Ph.D. North Carolina State University
Smutek, L. (Emeritus), M.C.P. , M.C.P. National Oceanic and Atmospheric Administration
Spencer, James A., M.C.P.............Ohio State University

Associate Professors:

Bowen, George E., M.A. George Washington University
Fisher, Patricia, Ph.D. .................Florida State University

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 members who can attest to 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 requested of all applicants whose undergraduate GPA is below 3.0. Other applicants are encouraged to submit them.

The M.S.P. is approved for SREB Academic Common Market participation in Arkansas, Kentucky, South Carolina, and West Virginia.

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 classes in the proper sequence.

Each student is required to develop an area of concentrated competency 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 a plan of study that deviates from the standard curriculum. These criteria may present a proposal to his/her committee for a major study that will include at least 6 hours of subsequent coursework. The proposal shall justify the extension 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.
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 Urban 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 plan, implementation devices, Planning in society. Not for credit for M.S.P. degree.

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


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

510 Fundamentals of Planning (2) History of planning, structure and development of urban areas, operations of contemporary planning, 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 in 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 microcomputer in planning and government.

522 Computers in Planning II (2) Software and systems for planning and local government. Content varies. Projects in small group or individual 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; selected one and two sample tests; correlation and regression analysis. Prereq: 520 or consent of instructor.

524 Advanced Data Analysis (3) Applications of statistical data analysis in planning. Regression analysis, plus selected multivariate, non-parametric, and analytical techniques of computerized analysis for data analysis. Prereq: 521, 523 and consent of instructor.


528 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 population and economic 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 (3) Preparation of comprehensive plans for urban areas and 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.

S37 Planning and Transportation (3) (Same as Civil Engineering 555)

S38 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.

S39 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 role 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 physical growth and change; functioning of private sector 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 housing programs in housing supply, impact of new technology, and governmental programs to improve supply and quality of housing.


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 leading 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

DEGREES

Plant and Soil Science .......... M.S., Ph.D.

John E. Foss, Head

Professors:


Graveel, J. G., Ph.D. .......... Purdue Rhodes, G. N., Jr., Ph.D. .......... NC State

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 soil science, plant breeding and genetics, and crop physiology and ecology.

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 chairperson 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 credit for Thesis 500, is required. Of this number, 24 hours must be Doctoral Research and Dissertation 500. A minimum of 26 hours must be completed in courses numbered above 500.
exclusively of doctoral research and dissertation, of which 6 must be in courses numbered above 600. A minimum of 9 hours of these courses is to be taken during the doctoral program must be outside the department in one or more cognate areas.

The student and the major professor identify doctoral committee composed of at least four faculty members holding the rank of assistant professor or above, three of whom, including the chair, must be approved by the Graduate Council to direct doctoral research. At least one member must be from outside the department. The committee must approve all coursework applied toward the degree, certify the student's mastery of the major field and any cognate fields, direct the dissertation, and recommend the dissertation for approval and acceptance by the Graduate School.

**GRADUATE COURSES**

411 Soil Microbiology (3) Soil microbial population and role in soil ecosystem, microbial transformations of inorganic and organic compounds, decomposition of residues, dynamics of soil organic matter. Prereq: 210 and Chemistry 110 or 350 or consent of instructor. F

412 Soil Genesis, Classification, and Mapping (3) Soil genesis and formation; observing and describing morphology of soil cultural and forest soils, chemical and physical properties, classification; two Saturday field trips. Prereq: 210 or consent of instructor. 2 hrs and 1 lab. Sp

413 Soil Chemistry (3) Principles concerning structure and chemical properties of soil materials; colloidal fraction as related to exchange, chemical equilibria, soil acidity, oxidation-reduction, weathering, 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. Source in development planning; consideration 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

431 Crop Physiology and Ecology (3) Principles of plant 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

433 Agricultural Pesticides (3) Regulation of pesticidal substances, use, marketing and use. Structure, mode of action, degradation, and environmental impact of pesticides used in agriculture, forestry and related areas. Prereq: 1 yr biological sciences and 1 semester chemistry. 2 hrs and 1 lab. Sp

453 Principles of Plant Breeding (3) Genetic principles and techniques used in crop improvement. Prereq: Biology 220 or equivalent. 2 hrs and 1 lab. Sp

471 Statistics for Biological Research (3) Application of statistics to interpretation of biological research. Notation, descriptive statistics, probability, distribution, confidence intervals, 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 (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 to satisfy three requirements. May be repeated. S/JNC only. E

511 Advanced Soil Fertility (3) Concepts of soil chemistry as related to nutrient movement and adsorption by plant roots. Principles for 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 relationships among solid, liquid and gaseous phases of soil system. Dynamics, interrelationships and interaction of phases on soil moisture, temperature, aeration and relationship to plant growth. Prereq: 413 or consent of instructor. 2 hrs and 1 lab. F,A

520 Integrated Pest Management (3) (Same as Entomology and Plant Pathology 530.)

522 Advanced Crop Ecology (3) General and specific relations among environmental factors, crop organisms, and agricultural systems; quantification of macro- and microclimatic influences on crop growth; world climates, crop distribution and productivity, human cultures, and their interaction. Prereq: 471 or equivalent; 431 or consent of instructor. 2 hrs and 1 lab. F,A

551 Advanced Plant Genetics (3) Discovery of genetics: controlling elements, induced mutations, genome organization, polygenic inheritance, extrachromosomal inheritance, amorphous, 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. E

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 properties, interactions in the soil-plant environment. May be repeated. Maximum 6 hrs. E

603 Special Topics in Crop Physiology and Ecology (1-3) Micrometeorology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and geomorphology of agroecosystems 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, polygony, genetic engineering, interspecific hybridization, linkage, screening methods, and mapping of 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, and 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 to pests and environmental stresses. Prereq: 453 and 571 or equivalent or consent of instructor. 3 hrs and 1 lab. Sp

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

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**Political Science**

(Computer of Liberal Arts)

**MAJORS**

**DEGREES**

Political Science..............................M.A., Ph.D.
Public Administration.........................M.P.A., J.D.-M.P.A.

**Professors:**

Carlisle, D. H. (Emeritus), Ph.D.
North Carolina

Fitzgerald, Michael R., Ph.D. ...........Oklahoma

Gorman, Robert A., Ph.D. ...............New York

Henderson, Lenneal, Jr., Ph.D. ........California

Hopkins, Anne H., Ph.D. .................Syracuse

Iredell, Vernon R., Ph.D. ...............Chicago

Lyons, William Ph.D. .................Oklahoma

Plaas, Hyram, Ph.D. .........................Utah

Smith, T. Alexander, Ph.D. ...........Ohio State

Scheb, John M., II, Ph.D. .............Florida

Stephens, Otis H., Ph.D. .................Texas

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**Associate Professors:**

Cunningham, Robert B., Ph.D. ........Indiana

Dodd, Joseph W., Ph.D. .................Tulane

Evans, Gill C., Ph.D. .....................Columbia

Ferian, William, Ph.D. .................Harvard

Freman, Patricia K., Ph.D. ...........Wisconsin (Milwaukee)

Gant, Michael M., Ph.D. ..............Michigan State

Peterson, Robert L., Ph.D. ............Florida

Simpson, T. McN., Ph.D. ..............Tulane

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**Assistant Professors:**

Allende, Juan Augustin, Ph.D. ....North Carolina

Folz, David H., Ph.D. ......................Tulane

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The Department of Political Science offers the M.A., M.P.A., and Ph.D. The department also offers a dual program with the College of Law. Inquiries concerning all programs should be directed to the departmental office.

**ADMISSION REQUIREMENTS**

Three departmental recommendation forms must be submitted to The Graduate School, at least two of which must be completed by instructors at the institution most recently attended. In addition, each in the final portion of the Graduate Record Examination must be submitted.
THE MASTER OF ARTS PROGRAM

A Bachelor's degree or its equivalent is required for admission. Normally an overall average of 3.0 is also required together with an average of 3.2 in the last two years of political science or social science. In addition, applicants must pass the Graduate Record Examination (GRE) with at least 1100 on the verbal and quantitative parts of the GRE normally required.

Students pursuing the Master of Arts degree must pass the Graduate Record Examination (GRE) with an overall average of 3.0. At least 12 of these hours must be in political science, with 6 in the field of methodology (Political Science 510 and 512). No more than 6 hours may be earned through thesis credit.

Non-Thesis Option: (36 hours) Coursework, plus a written comprehensive examination in the student's first field of interest.

At least 12 of these hours must be in political science, with 6 in the field of methodology (Political Science 510 and 512), and 3 hours in the 600-level research seminar in the student's first field of interest.

THE MASTER OF PUBLIC ADMINISTRATION PROGRAM

The M.P.A. program is intended to prepare students for public service careers by acquainting them with management principles, analytical tools, and the ethical dilemmas they will face as public administrators. It consists of a total of 36 semester hours, including a core program, an elective specialization, and a recommended internship.

Applicants for admission to the program must have a Bachelor's degree or its equivalent. Normally, an overall average of 3.0 and an average of 3.2 in the last two years of political science or social science courses is required. In addition, a composite score of at least 1100 on the verbal and quantitative parts of the GRE is normally required.

The M.P.A. program is a non-thesis program. Specific requirements include the following:

1. Core - 21 hours
   b. General perspectives - elective courses (3 hours): 556 Policy Analysis; 558 The Politics of Administration.
   c. Analytical skills (8 hours): 512 Quantitative Political Analysis; 514 Research and Methodology in Public Administration.
   d. Management skills (6 hours). Choose two of the following: 560 Public Budgeting and Finance; 562 Public Management; 564 Human Resources Management in Public Organizations.

2. Specialization - 15 hours
   a. A specialization is designed by the student in consultation with the coordinator of the M.P.A. program. Possible specializations include general government, public health, budgeting and finance, planning, natural resources, program evaluation, criminal justice, public relations, personnel, and others.
   b. Recommended internship with a public agency.
   c. Internships are arranged in consultation with the coordinator of the M.P.A. program.

4. A written final examination, which may be followed by an oral examination, is required.

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 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 8 semester hours of credit toward the J.D. degree for successful completion of approved graduate level courses (500 or 600 level) offered in the Department of Political Science. The M.P.A. program will award a maximum of 9 semester hours of credit toward the M.P.A. degree for successful completion of approved courses offered in the College of Law. All courses for which such cross-credit is awarded must be approved by the J.D.-M.P.A. coordinators in the College of Law and the Department of Political Science. All candidates for the dual degree must successfully complete Administrative Law (Law 821) and are encouraged to take Local Government (Law 824). An internship is strongly recommended for students in the dual degree program, as it is for all M.P.A. candidates, but an internship is not required.

During the first two years in the dual program, students will spend one academic year completing the required first year of the College of Law curriculum and one academic year taking courses solely in the M.P.A. program. During the last 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 opposite program in the dual degree will be accepted by the Dual Degree Committee. For awarding of grades in courses in the opposite program, a student must meet the requirements for both the J.D. and the M.P.A. degrees, as well as the requirements for the dual program.

THE DOCTORAL PROGRAM

The Ph.D. program prepares students for careers in college teaching, as well as careers in other occupations related to public 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 fields 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 above 500.
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 discredibility 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 policies.
463 Contemporary Middle East Politics (3) Governments and movements in Middle East, their characteristics, bases, and interrelationships.
464 Special Topics in Comparative Government (3) May be repeated with consent of department. Maximum 9 hrs.
469 Soviet Foreign Policy (3) Overview of Soviet international behavior since 1917 and examination of selected problems 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 Marsilio of Padua.
476 Modern Political Thought (3) Survey of major western political thinker from Machiavelli to Marx.
500 Thesis (1-15) P/NC only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any 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 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.
528 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.
530 Topics in American Government and Politics (3) Survey of literature, approaches to research and analysis, critical examination of major works, and overview of research in various subfields. May be repeated with consent of department. Maximum 9 hrs.
531 Topics in Parties and Elections (3) Analysis of party systems and electoral behavior. May be repeated with consent of department. Maximum 9 hrs.
534 Topics in American National Institutions (3) Deals with government administration in the U.S. May be repeated with consent of department. Maximum 9 hrs.
536 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.
538 Urban Politics and Administration (3) American urban structures and public policies. 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.
542 The Politics of Criminal Justice (3) Selective examination of contemporary problems of research and public policy formulation: criminal process; law enforcement; courts; corrections; and prison administration; and prison management. May be repeated with consent of department. Maximum 9 hrs.
546 Law and the Administrative Process (3) Constitutional position; decisional processes, regulation and administration, 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.
554 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.
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 structures in public sector. May be repeated with consent of department. Maximum 9 hrs.
566 Ethics, Values, and Morality in Public Administration (3) Moral-and-value dilemmas confronting administrators in American political system.
567 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.
568 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration. May be repeated. Maximum 9 hrs.
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/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.
582 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.
588 Special Topics in International Politics (3) Selected issues and problems in international politics. Specific content determined by instructor. 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) Prereq: Consent of instructor. May be repeated. Maximum 15 hrs.
600 Doctoral Research and Dissertation (3-15) P/NC only. E
610 Research Seminar 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 Research Seminar in Political Theory (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.
630 Research Seminar in the American Political Process (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.
640 Research Seminar in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of public policy. May be repeated with consent of department. Maximum 9 hrs.
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 650 on the GRE by the end of the first year, and all students must pass the doctoral comprehensive examination (a comprehensive, two-day essay exam offered twice 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 outside of psychology; and at least 24 hours of dissertation research (Psychology 600).

General Psychology

This program allows students to select from a variety of specializations oriented toward careers in research and teaching 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 537-38, or equivalent, and two additional courses numbered above 500 in research methodology, quantitative methods, statistics, or psychometrics.

2. Competence in general psychology, demonstrated by completing Psychology 513 (Foundations of Psychology) or Psychology 420 (History and Systems of Psychology) or equivalent, plus at least one course or sequence or equivalent from each of four categories in the following list. (This requirement may be met by passing approved written examinations.)
   b. Comparative and ethnological psychology: 450-59 Comparative Animal Behavior and Laboratory in Comparative Animal Behavior; 545, Ethological Psychology.
   d. Developmental psychology: 511 Developmental Psychology; 512 Life-span Development; 574 Child Psychopathology.
   e. Individual differences and personality: 445 Measurement and Testing; 470 Theories of Personality.
   g. 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.
   h. 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.
   i. At least 4 graduate seminars in psychology numbered above 600.

Clinical Psychology

This program is designed to lay the groundwork for a professional career as a licensed 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 uses the scientist-practitioner model of clinical psychology. 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).

Assistant Professors:

Beavers-Larouche, Lorrie, Ph.D., Tennessee Lawrence, Lance T., Ph.D., Tennessee Laverley, Robert F., Ph.D., California Murray, James, Ph.D., Case Western Nash, Michael, Ph.D., Ohio
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. Ethical, Legal, and Professional Issues (653). 5. Satisfactory completion of at least 3 additional graduate-level courses in non-clinical topics in psychology. 6. Satisfactory completion of a one-year clinical internship at a site approved by the program.

GRADUATE COURSES


409 Group Facilitation (3) Study of theory and techniques through supervised experience in small groups. Prereq: 358 and consent of instructor. May be repeated. Maximum 6 hrs.


424 Psychology and the Law (3) Psychological aspects of legal systems. Prereq: 110 or equivalent, upper-division standing and consent of instructor.

430 Health Psychology (3) Survey of psychological factors related to health and illness: stress, personality, and environment. Applications of psychological treatments to physical illness. Prereq: 110 or equivalent, 210.

434 Psychology of Gender (3) Biological, psychological, and social factors in gender. Importance of gender roles and stereotypes 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, role-theory and systems theory. Prereq: 360.


450 Comparative Animal Behavior (3) (Same as Zoolology 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 sequences or equivalents.

469 Laboratory in Physiological Psychology (3) Laboratory studies of nervous system and physiological correlates of behavior. Coreq: 451.

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 contemporary community. Prereq: 110 or equivalent. Recommended prereq: 210, 220, 385, 395. May be repeated. Maximum 9 hrs.

489 Supervised Research (1-9) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs in 398, 489, 491, 495, and 499, combined may apply toward undergraduate major.

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

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


505 Research Design (3) Techniques for planning and conducting research in controlled and natural settings: experiments, quasi-experiments, observational studies, surveys, and program-evaluations. Development of questions and hypotheses for study. Design of studies to maximize validity. Prereq: Consent of instructor.

508 Readings and Special Issues in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

509 Research Practicum (2) Required of first-year graduate students in psychology. May be repeated. Maximum 9 hrs.

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 6 hrs.

512 Life-Span Development (3) Theories and research concerning normal human development throughout life, adulthood and old age. Prereq: Consent of instructor.

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 567-68.)

520 Interventions for Behavioral Change (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Interventions by people in community: teachers or supervisors. Token economics and strategies for self-control. Prereq: Consent of instructor.

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: 481, 489, or equivalent and 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 materials for teaching psychology at college and/or university level. Supervised practice. 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.

555 Psychometrics (3) Basic concepts: factor 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.


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 6 hrs.

560 Psychology of Learning (3) Review of current evidence from research involving human and/or nonhuman animals. Prereq: 400 and consent of instructor. May be repeated. Maximum 6 hrs.

570 Personality: Theory and Research I (3) Advanced survey of psychodynamic and neo-Freudian approaches to personality: related research. Prereq: 470 or equivalent.

571 Personality: Theory and Research II (3) Advanced survey of behavioral and humanistic approaches to personality: related research. Prereq: 470 or equivalent.

572 Descriptive Psychopathology (2) 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 psychotherapy, psychoanalysis, and psychoanalytic theory. Prereq: Admission to doctoral program in clinical psychology 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.

594 Psychological Assessment I (3) Basic concepts and techniques of adult assessment; intelligence tests and personality tests. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

595 Psychological Assessment II (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.

596 Laboratory in Psychological Assessment (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Prereq: 594 or 595. May be repeated. Maximum 6 hrs.
597 Evaluation of Development in Childhood (3) Structures 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.

601 Seminar in Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

605 Seminar in Research and Quantitative Methods (3) Prereq: 500, 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.

616 Seminar in Behavioral Neuroscience (3) Prereq: 461, 495, 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 625.)

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; 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 (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 670 or 671. May be repeated. Maximum 6 hrs.

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.

682 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.

684 Neuropsychology (3) Investigation of brain-behavior relationships in adults and children. Introduction to administration of RETAIN neuropsychological screening battery, Luria battery, and other tests of brain dysfunction. Prereq: Consent of instructor.

685 Psychopharmacology (3) 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 (1-3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 24 hrs.

696 Psychology Clinic (1-3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 24 hrs.

Religious Studies

(College of Liberal Arts)

Charles H. Reynolds, Head

Professors:
- Dungan, David L., Th.D. ............... Harvard
- Humphreys, W. Lee, Ph.D. ............. Union
- Linge, David E., Ph.D. ................. Vanderbilt
- Stanley, B.D. .......................... Colgate Rochester
- 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, Muriel L., Ph.D. ............ Harvard

Assistant Professors:
- Bovenkamp, Stephen R., Ph.D. ........ California
- 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 the ninth through the twentieth centuries. (Same as Philosophy 411.)

412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) Investigation of selected writings and philosophic problems of traditions of Samkhya, 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 Epistles of Paul, involving extensive independent research.

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.

499 Proseminar in Religious Studies (3) For advanced students in religious studies; required for majors. Selected specific topics: nature and function of myth in religion, problem of evil, transcendence, theories of religion, hermeneutics, integrating various disciplines involved in study of religion. 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

DEGREES

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
Hetlin, William H., Ph.D. .......... Florida State
Irving, Thomas B. (Emeritus), Ph.D. Princeton
Mauro, Ferdinando D. (Emeritus), Ph.D. Columbia
Petrovska, Marija, Ph.D. ............... Kentucky
Pinsky, Clara (Emeritus), Ph.D. ...... California
Romeiser, John B., Ph.D. .......... Vanderbilt
Vazquez-Bigi, A. M., 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
Delius, Robert M., Ph.D. .......... Illinois
DiMaria, Salvatore, Ph.D. .......... Wisconsin
DiPuccio, Denise M., Ph.D. .......... Kansas
Duncan, Cynthia K., Ph.D. .......... Illinois
Handelsman, Michael H., Ph.D. ...... Florida
Levy, Karen D., Ph.D. ................. Kentucky

Assistant Professors:

Brizio, Flavia, Ph.D. ................. Washington
Cazanave, Odile, Ph.D. .......... Penn State
Holmlund, Christine, Ph.D. .......... Wisconsin
Milleret, Margo, Ph.D. ........ Texas
Perez-Pineda, Federico, Ph.D. .... Penn State
Rodriguez, Alberto, Ph.D. .......... Brown
Rogers, Carmen V., Ed.D. .......... Georgia

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, among 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. Thesis. 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 500.

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 the 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 shall consist of a first concentration, a second concentration, and a cognate field.

1. First Concentration: French, German or Spanish. It will consist of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:

   A minimum of 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 550 (3), or Spanish 550 (3); German 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 shall consist 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 courses numbered 400 and above in a field outside the department of the first concentration but related to the student’s principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be administered after completion of the 6 cognate hours by the language section concerned.

4. Additional Requirements: A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized examinations that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI).

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

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

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct in at least two foreign languages, subject to staffing needs.

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

ACADEMIC COMMON MARKET

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

For additional courses, refer to Germanic and Slavic Languages.

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 writers from Lyon and members of the Plantagenet. Prereq: 212, 218 or equivalent.

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) 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.

Spanish

GRADUATE COURSES

421 Phonetics (3) 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 (3,3) Advanced conversational and written skills in Spanish for pre-professionals.
424 Introduction to Descriptive Linguistics (3) Same as French 425, German 425, Russian 425, and Linguistics 425.
425 Methods of Historical Linguistics (3) Same as German 426, Russian 426, Spanish 426 and Linguistics 426.
426 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. Same as Spanish 426 and Linguistics 426.
427 Modern Spanish (2-3) Performance in one or more Spanish plays. Prereq: 212, 218 or equivalent and consent of instructor. May apply toward major.
428 Contemporary French Culture (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.
429 Foreign Study (1-15) See page 31.
430 Advanced Grammar (3) Prereq: 212, 218 or equivalent.
431 Independent Study (1-15) See page 31.
432 Directed Readings (3,3) Maximum 6 hrs with consent of department. Same as Spanish 559 and Linguistics 559.
561-62 Lyric Poetry of the 19th Century (3,3) Reading and interpreting great French romantic poets, 'I'art pour l'art' movement, Parnassians, Charles Baudelaire and Symbolists.
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.
591 Directed Readings (3,3) May be repeated with consent of instructor.
593 Independent Study (1-15) See page 31.
594-95 French Directed Readings and Dissertation (3-15) P/NP only. E
600 Doctoral Research and Dissertation (3-15) P/NP only. E
621-22-23 Seminar in French Literature (3,3,3) Seminar in modern French literature. Prereq: 212, 218 or equivalent. May be repeated with consent of department. Maximum 6 hrs each.
631-32-33 Seminar in French Literature (3,3,3) 631-18th Century; 632-19th Century; 633-20th Century. May be repeated with consent of department. Maximum 6 hrs each.

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.

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.
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.)
561-62 Lyric Poetry of the 19th Century (3,3) Reading and interpreting great French romantic poets, 'I'art pour l'art' movement, Parnassians, Charles Baudelaire and Symbolists.
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.
583 Problems in Stylistics (3) Survey of comparative English-French stylistics. Development and improvement of one's written French.
584 Literary Criticism: the Foundations of Romance Criticism (3) Survey of critical ideas utilized over centuries and applied to various types of literature.
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.
594-95 French Directed Readings (3,3) Maximum 6 hrs with consent of department. (Same as French 425, German 425, Russian 425, and Linguistics 425.)
621-22-23 Seminar in French Literature (3,3,3) Seminar in modern French literature. Prereq: 212, 218 or equivalent. May be repeated with consent of department. Maximum 6 hrs each.
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 in 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 Romantismo to present day, theory and criticism of genre.
581 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 Literature (3, 3) Topics vary. May be repeated with consent of department. Maximum 9 hrs.

Rural Practice
(College of Veterinary Medicine)

MAJOR DEGREE
Veterinary Medicine.........................D.V.M.

G. M. H. Shires, Head

Professors:
Barron, H. T., D.V.M.........................Texas A&M University
Hall, R. F., D.V.M............................Illinois State University
Shires, G. M. H., B.V.Sc..........................Pretoria University

Associate Professors:
Blackford, J. T., D.V.M.......................Colorado State University
Goble, D. O., D.V.M.........................Kansas State University
Held, J. E., D.V.M...............................Berne University
Henton, J. E., D.V.M.........................Michigan State University
Hopkins, F. M., D.V.M........................Georgia Southern University
Kerr, L. A., D.V.M..............................Oklahoma State University
Linnabary, R. D., D.V.M........................Ohio State University
Toal, R. I., D.V.M..............................Georgian Court University

Assistant Professors:
Andrews, F., D.V.M............................Washington State University
Pringle, J. K., D.V.M.............................Oregon State University
Tarrier, M. A., D.V.M...........................Michigan State University

Residents:
Adair, H. S., D.V.M..............................Auburn University
Adams, W. H., D.V.M..............................Florida State University
Evans, R., D.V.M.................................North Carolina State University
Korner, N., D.V.M.................................Louisiana State University
Newkirk, K., D.V.M..............................Tuskegee University

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/NC 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 DEGREES
Social Work..............................M.S.S.W., Ph.D.

Eunice Shatz, Head

Professors:
Beasley, Lou M., Ph.D............................Denver University
Bleich, M. H., M.S...............................Ohio State University
Bonovich, Robert C., D.S.W............................Washington (St. Louis)
Fryer, Gideon W. (Emeritus), Ed.D........Columbia University
Gisson, C. A., Ph.D..............................Washington (St. Louis)
Granger, Ben P., Ph.D..............................Brandeis University
Hirayama, H., D.S.W..............................Pennsylvania State University
McLarnan, G. (Emeritus), M.S.S.W..............................Tennessee State University
Mullins, M. Kate, Ph.D..............................Chicago State University
Noe, Roger M., D.S.W..............................Tulane University
Orten, J. D., D.S.W..............................Alabama State University
Rubenstein, H., Ph.D..............................Chicago State University

Associate Professors:
Avery, R. S., Ph.D..............................Brandeis University
Bell, W. J., D.S.W..............................Tulane University
Ceilingok, M., Ph.D..............................Washington (St. Louis)
Cruthers, C. Thomas, D.S.W............................Tulane University
De Faver, C., Ph.D..............................Michigan State University
Moses, A. E., D.S.W..............................California State University
Rowen, R. B., Ph.D..............................Arizona State University
Tate, Nellie P., Ph.D..............................Brandeis University
Vaughn, H. H., Ed.D..............................Washington (St. Louis)
Wachter, Ann R., M.S.S.W..............................Tulane University
Wilks, C. S., Ph.D..............................Tulsa State University
Zarbock, Paul G., M.S.S.W..............................Wisconsin State University

See Social Work for Program Description.
Admission Requirements

Admission to the professional curriculum 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 BSW 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 15 hours of study in each 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.

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 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.

3. Successful completion of a comprehensive exam or thesis defense.

4. An overall GPA of 3.0 or better on all graded courses and satisfactory performance in field.
The emphasis of the doctoral program is upon:

- The analysis of direct intervention and social administration and of the interrelationship 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 available only in 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 Bachelor's degree, including a) completion of 21 credits of required coursework, b) completion of 15 credits of 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 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 committees 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 begins during the first year of study. The elective requirement is completed and dissertation research begins 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 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.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. The M.S.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 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 Practicum in Social Work Research (3-6) Supervised participation in the development 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.)

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 and selection of research designs. 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 levels derived from ecological perspective. Assessment, planning, communication, and evaluation skills. Classroom and skills 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-dysfunctional and normal-deviant continuum: stress, development and maturation. Open systems approach and developmental, biophysical, psychological, and social variables, implications of culture, race, ethnicity, and gender. Prereq: Admission to college or consent of instructor. F

515 Social Welfare Policy and Services (3) Development of contemporary social policy at local, state, national, and international levels. Contribution of social work professionals to formal policy-making process through which macrosocial change is effected and through which aggregate social welfare services are proposed, adopted, financed, and programmed. Theories of complex organizations applied to social welfare service delivery settings. Prereq: Admission to college or consent of instructor. F

516 Social Work with Oppressed Populations (2) Social work's professional role in working with individuals and groups in American society whose oppression is based upon distinguishing characteristics: age, sex, economic class, religion, sexual preference, handicap, immigration, etc. Prereq: Admission to college or consent of instructor. Sp

520 Social Work with Individuals and Families (3) Nature and process of practice with individuals and families in helping them deal with personal problems of living. Working with disadvantaged clients and enhancing client competence. Prereq: Foundation or consent of instructor. Sp

522 Social Work with Groups (3) Theories and practice of social work with small groups. Treatment groups, task groups. Prereq: Foundation or consent of instructor.

532 PSYCHOPATHOLOGY AND SOCIAL DEVIANCY (3) Theories of and recent research in etiology of psychic dysfunction and social variance. Categorical approach to psychopathology. Prereq: Foundation or consent of instructor.

536 Research for Assessment of Social Work Treatment (3) Application of research methods for assessment of social work treatment. Prereq: Foundation 550 or 522, or consent of instructor. Sp


531 EXAMINATIONS (2-3) Topics in theory and practice of planned short term treatment, emergency treatment, and crisis intervention. 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 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 adolescent. Prereq: 520 and 522, or consent of instructor.

540 FINANCIAL MANAGEMENT AND RESOURCE DEVELOPMENT (3) Administrative decision-making related to financial planning and resource allocation in human service organizations. Knowledge and skills in accounting, budgeting and auditing, techniques in fundraising, grant writing, marketing and other financial management and resource development techniques. Prereq: Foundation or consent of instructor.

544 MANAGEMENT INFORMATION SYSTEMS AND EVALUATIVE RESEARCH (3) Management information systems design and 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 (3) Administrative and leadership skills required for human resource 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.

560 Seminar in Human Behavior and Social Environment (3-2) Areas of current importance in understanding human behavior and social environment. Specific theories, research and/or 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 emotional problems arising from or 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 and 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 social and economic roles and statuses by race and ethnicity, class, age, and life-cycle. 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.

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. Prereq: Student's selected concentration in social work treatment or social welfare administration and planning. Prereq: Foundation. S/NC only. E

582 Field Practice (3) Instruction and supervision in social work treatment or social welfare administration and planning. Prereq: Foundation, 581. Prereq or coreq: Treatment: 520, 524. S/NC only. Sp

583 Field Practice (5) 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 practice. Prereq or coreq: 512. May be repeated. S/NC only. E


593 Independent Study (1-6) Individualized study, 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 and 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 for direct, indirect intervention, administration and planning. Prereq: First year required Ph.D courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

693 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

(College of Liberal Arts)

MAJOR

DEGREES

Sociology ............................................. M.A., Ph.D.

Professors:


Associate Professors:

Kurt, Suzanne B., Ph.D. ......... Illinois (Chicago) Perrin, Robert G., Ph.D. ........ British Columbia

Assistant Professors:

Benson, Michael L., Ph.D. .......... Illinois

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 655. The energy, environment and resource policy concentration includes 560, 563, 661, 662, 663, and 665. The political economy concentration includes 504, 540, 541, 643, 844, and 845. 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 total of 30 hours, including 24 hours of coursework and 6 hours of Thesis 500, is required. Students are strongly encouraged to complete 3-6 hours of theory (521, 622), 6 hours in methodology (531, 534), and 6 hours in statistics (535-36). Two-thirds of all credits must be completed at or above the 500 level. Sociology courses at the 400 level must be approved by the student's advisor. An oral final examination is given at the end of the program. Students planning to pursue a Ph.D. program are strongly encouraged to take the thesis option.

Non-Thesis Option

A total of 30 hours of coursework is required. Students are encouraged to complete 3 hours of theory (521), 6 hours of methodology (531, 534), and 6 hours of statistics (535-36). Non-thesis students may select one of two plans: Plan 1 (concentration and secondary area) or Plan 2 (special studies). Plan 1: A final written examination in one of the department's concentrations is required. Completion of 6 hours of coursework in a secondary area of specialization required. The secondary area may be chosen from outside the department, subject to the approval of the student's advisory committee. Plan 2: The student must complete a special course of studies, subject to the approval of the student's committee and the Graduate Program Committee. A final written examination in the area of specialization is required.
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
Forty-eight hours of coursework beyond the baccalaureate degree are required (exclusive of S/NC credits). Students who enter the program without the courses recommended for the M.A. program (521, 531, 534, 535-38) or equivalents are required to take remedial work beyond the minimum course requirements. Completion of 622 is recommended. Consumption of more than 12 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 committee and the Graduate Program Committee. Twelve hours of course credit in sociology at the 600 level is required. 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 examinations wherever offered. Substantive examinations are taken upon completion of theory and methodology examinations, specializations within concentrations, or other areas of specialization. Detailed information on examinations 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 UTK 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 Residence Assistant 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 405.)

413 Formal Organization (3) Analysis of organizational models, typologies, and theories; hierarchies of authority; communication; interpersonal relations in work settings; organizational change.

414 Organization of Medical 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, devalorization, and patterns of conflict. Analysis of who gets what, why, and how in global political economy.


458 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, organizational dynamics of crime, theories of corporate crime, and organized responses to this type of crime by governmental 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 the student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

504 Sociological Foundations of Political Economy (3) Survey of contemporary sociological theories of political economy, sources of political and economic power and conflict.

505 Foundations of Criminology (3) Critical overview of contemporary 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.

535-36 Statistical Analysis in Sociology I and II (3.3) Should be taken in sequence. 535—Data reduction, exploratory data analysis, general linear model. 536—Sampling: inferential statistics based on general linear model, introduction to multi-variate analysis. Prereq: Statistics 201 or consent of instructor.

540 Occupations (3) Occupations in relation to individuals and society, technology, economic stratification, and social organizations.

451 Collective Behavior, Social Movements, Social Change (3) Basic theory and research on conditions of social unrest in human collectivities and efforts of collectives to change existing society.

452 Sociological Aspects of Sports and Physical Education (3) (Same as Physical Education 542.)

453 Sociology of Development (3) Sociological theories and studies of development: modernization, colonization, dependency; comparative impact 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 measurements of demographic variables, life table analyses, increment-decrement models, and survey techniques of population analysis.

580 Advanced Rural Sociology (3) (Same as Rural Sociology 580.)

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 exploration of survey problems through student 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, participatory 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.

645 Advanced Studies in Political Economy (3) Topical seminar. Prereq: 504 or consent of instructor. May be repeated. Maximum 6 hrs.

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.
Education..........................................................Ph.D.

Laurence J. Coleman, Head

Professors:
Coleman, Laurence J., Ph.D. Kent State
Doll, E. E. (Emeritus), Ph.D. Pennsylvania
Frey, Roger M., Ed.D. Illinois
George, Thomas, Ed.D. Tennessee
Hargis, Charles H., Ed.D. Florida
K Kronick, Robert F., Ph.D. Tennessee
Miller, James H., Ed.D. Auburn
Schindler, W. Jean, Ph.D. Kent State
Woodrick, William E., Ed.D. Mississippi

Associate 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
McClain, T., Ph.D. South Carolina
Mulkey, S. Wayne, Ph.D. Florida State
Welch, Olga, Ed.D. Tennessee
Woodside, M. R., Ed.D. VPI

Assistant Professors:
McLean, J. D., Ph.D. Chicago
Warden, K., Ph.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 classwork and in internship.

Both majors have a thesis and non-thesis option. If a student elects to do a thesis, the Master's program will contain a minimum of 30 semester hours including 6 hours of Thesis. 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 16 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.I.), specialized institutes for the preparation of professionals to adapt their skills to services to hearing impaired and deaf people are provided. A federally supported Educational Consortium provides study and technical assistance for postsecondary 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 in-state tuition basis. The M.S. program in Special Education is available to residents of the state of 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. Sy/NC 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) Primarily for those planning to teach hearing impaired. Overview of research related to psychology, social adjustment, communication methodology, language development and education of hearing impaired. Survey of literature. Visits to programs.

433 Clinical Practice in Speech-Language Pathology (3-4) [Same as Audiology and Speech Pathology 433.]
434 Clinical Practice in Speech-Language Pathology I (1-4) (Same as Audiology and Speech Pathology 434.)

440 Voice Disorders (3) (Same as Audiology and Speech Pathology 440.)

451 Psychology and Education of the Mildly Handicapped (3) Nature and characteristics of mildly handicapped students with learning disabilities, emotions, and social characteristics; identification, assessment, intervention approaches, techniques, and evaluation and development of materials. Coreq: Cor640, F.

452 Psychology and Education of the Moderately and Severe Handicapped (3) Nature and characteristics of children with moderate and severe handicapping conditions, and educational strategies necessary to accommodate them. Traditional and innovative trends and approaches. Coreq: Cor640, Sp.


456 Speech and Language Basis of Learning Disabilities in the Classroom (3) Normal communication development; understanding of speech and language problems in school-age children; general characteristics and educational needs. Implications of developmental variations for functioning as adults. Opportunity to expand study upon particular exceptionality. Enrollment limited to non-special education majors.

470 Psychology of the Exceptional Child (3) Variances in characteristics of exceptional children; general characteristics and educational needs. Implications of developmental variations for functioning as adults. Opportunity to expand study upon particular exceptionality. Enrollment limited to non-special education majors.

471 Internship in Special Education (3-15) Intensive experience designed to allow student to practice art and science of teaching exceptional children under supervision of experienced teachers. Prereq: Cor640.

473 Audiology II (3) (Same as Audiology and Speech Pathology 473.)

480 Field Experience with Mildly Handicapped Students (3) Practicum in teaching mildly handicapped persons. Planning, developing, implementing, and evaluating instruction. Coreq: Cor641, F.

481 Policies, Procedures, and Practices in Special Education (3) Comprehensive review of Federal and State laws and regulations which direct implementation of special education programs in all public and private facilities and agencies. Multiple service delivery options; assessment and planning.

482 Speech and Language Services in the Schools (3) Organization and implementation of speech and language programs in schools. IEP process as it affects assessment, case-selection, and program planning for students age 4-21. Procedures and materials, group intervention, and classroom consultation.

483 Clinical Practice in Disorder in Disorders in Schools (3) Practiced with supervision of children with communication disorders. Prereq: Cor634, 434 (80-100 clinical contact hrs), Cor682.

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) On-site teaching experience with moderately and severely handicapped children and youth. Coreq: Cor642, 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 fees. Credit is not given for degree is completed. May not be used toward degree requirement. May be repeated. S/NC only. E.

503 Problems in Lieu of Thesis (1-3) May be repeated. Maximum 9 hrs. S/NC only. E.

504 Clinical Experience in Teaching and Supervision of Exceptional Children (6) Placement in educational settings. May be repeated. Maximum 9 hrs. S/NC or letter grade.

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

509 Vocational Guidance and Career Planning With Hearing Impaired (3) Utilization of psychologies, educational, social and vocational, diagnostic materials and resources appropriate for hearing impaired persons to provide for description, career decisions and individualized rehabilitation plan.

519 Speech Development of Hearing Impaired (4) Theories of speech development, approaches in training perception and production of speech, and aural habilitation. Practicum experiences.

521 Language Development of Hearing Impaired I (3) Language problems of hearing impaired contended with scope and sequence of normal language development. Formal linguistic systems used to describe language development problems.


523 Practicum in Hearing Impairment (3) Receptive and expressive language capabilities of hearing impaired student. Designing, teaching, and post-testing unit of instruction for remediation of specific language errors. Prereq: Cor652.

524 Linguistics in the Education of the Hearing Impaired (3) Recent research and developments in theoretical and applied linguistics. Prereq: Cor651, Cor652, Cor653, Cor652.

525 Manual Communication (3) American Sign Language (ASL) and culture of American deaf community. Acquiring 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 communication with deaf people and structure and history of language. Prereq: Cor652 or equivalent.

528 Curriculum Development Applied to Programs for the Hearing Impaired (3) Current curriculum trends adapted for hearing impaired individuals. New curriculum options and current educational theories. Development and implementation of instructional techniques. Prereq: Cor643, Cor645, Cor651, Cor652.

529 Teaching Reading to the Hearing Impaired (3) Specific methods necessary to teach the prelingually hearing impaired student. Practice in preparation of developmentally appropriate reading materials. Methods which assist in integrating hearing impaired students in regular reading curricula and materials. Prereq: Cor652.

530 Orientation to Rehabilitation (3) History, philosophy, 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. Identification and utilization, and utilization of rehabilitation resources.

532 Case Management in Rehabilitation (3) Techniques and procedures involved in management of caseloads in Federal-State vocational rehabilitation agencies, private rehabilitation companies, and public or private rehabilitation facilities. Analysis of appropriate industrial management models related to rehabilitation field.

533 Job Analysis, Development, and Placement (3) Determining employment-readiness of people with disabilities, identifying appropriate jobs for selected clients, and assisting in placement and retaining employment. Job analysis, job modification and re-engineering, marketing, and employer-serving techniques; legislation impacting job placement; supported work; and use of occupational information.

535 Vocational Evaluation: Statistical Methods (3) Process, principles and techniques used to determine vocational assets and liabilities to people with disabilities. Functional analysis of biographical and interview data selection and validation of psychometric and computer-based diagnostic models; 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 individuals in determining and understanding their own work 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 evaluation. Clinical interpretation of data through formal staff conference, vocational 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. Evolving perspectives of work, attributes of effective programs, and interface between school-based programs and rehabilitation agencies.

541 Psychosocial Aspects of Exceptionalities (3) Psychosocial issues and processes used to assist individuals in determining and understanding their own work 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 evaluation. Clinical interpretation of data through formal staff conference, vocational counseling, and report writing.

545 The Rehabilitation Interview (3) Interview as used in assessment and planning with people who have disabilities and vocational handicaps.

547 Practicum in Rehabilitation (3) Supervised experience 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 clock hrs required).

551 Psychology of Learning Disabilities (3) Overview of learning disabilities: review of field's historical perspectives and emerging direction; basic theories of learning disabilities; medical aspects of research, assessment and treatment; characteristics of children and youth, educational implications. Restrictive measures to eliminate or minimize resulting handicaps. Skills necessary to communicate with disabled and professional persons.

554 The Rehabilitation Interview (3) Interview as used in assessment and planning with people who have disabilities and vocational handicaps.

557 Practicum in Rehabilitation (3) Supervised experience in area of rehabilitation; application of concepts, principles, and skills. Prereq: Consent of instructor.

559 Internship in Rehabilitation Counseling (12) Supervised practice in rehabilitation counseling. Full-time clinical experience for second-year students (600 clock hrs required).

551 Psychology of Learning Disabilities (3) Overview of learning disabilities: review of field's historical perspectives and emerging direction; basic theories of learning disabilities; medical aspects of research, assessment and treatment; characteristics of children and youth, educational implications. Restrictive measures to eliminate or minimize resulting handicaps. Skills necessary to communicate with disabled and professional persons.

553 Instructional Systems for Learning Disabilities (3) Informal assessment for determining what and how to teach, data collection, instructional programming and decision making, nature and needs of persons with learning disabilities.

555 Assessment of Exceptional Students (3) Historical and legal issues related to assessment; concepts of evaluation models; test instruments and assessment processes demonstrated, practiced, results applied to educational programming; basic statistics relative to norm and criterion-referenced testing covered. Coreq: Cor653, F.

557 Assessment in Early Childhood Special Education (3) Development of knowledge and skills in appropriate formal and informal assessments of handicapped infants and young children; identification, diagnosis, placement and program assessment issues. Prereq: Cor653 or consent of instructor.

559 Characteristics of Social and Emotional Disturbance in Children and Adolescents (3) Identification, symptoms of disturbed child compared and contrasted to normal social and emotional growth.

565 Instructional Systems for the Emotionally Disturbed (3) Development of educational strategies and models of instruction; simulation, demonstration, and media. Teaching techniques, materials, and teacher/parent-family relationships. Vocational education, work experience, and expressive communication through art, music, role play, puppetry, bibliography, and group interactions.
558 Neuromuscular and Health Disorders: Educational Implications (3) Neurological impairments, physical disabilities and their interactions, health conditions, autism, investigation of instructional techniques and adaptations.

561 Psychology of Mental Retardation (3) Psychological, social, legal, and ethical issues related to mental retardation.

562 Instructional Systems for the Mentally Retarded (3) Specific developmental, behavioral strategies and techniques, Curricular design techniques and evaluation, Educational needs of mentally retarded children and youth.

564 Psychosocial Development of Gifted and Talented Children (3) Phenomena of talent development in context of home, school, and society. Implications of misattribution, Practices for promoting social and emotional development.

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

568 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 9 hrs. S/NC or letter grade.

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


590 Application of Microcomputer Technology in Special Education (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.

593 Directed Independent Study (1-15) Prereq: Consent of instructor. May be repeated. Maximum 15 hrs. S/NC or letter grade.

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. F

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

601 Seminar in Educational Theories in Special Education and Rehabilitation (3) Education theories: education 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) Specific development, phenomena which influence impact of disability on person and on significant others. Implications for habilitation. Prereq: Admission to doctoral program or consent of instructor.

603 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 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: 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 State
Lester, Lorayne W., Ed.D., Ohio State University
Yeomans, G. Allan (Emeritus), Ph.D., Louisiana State University

Associate Professors:

Ambrester, M. L., Ph.D., Ohio State University
Buckley, J. E., Ph.D., Northwestern University
Cook, N. C., M.A., Alabama University
Glenn, Robert W., Ph.D., Northwestern University

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 organizations. May be repeated. Maximum 6 hrs.

460 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 campaign for women's rights from 1850's to present. (Same as Women's Studies 466.)

470 Theories of Argumentation (3) Studies of conceptually based 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) Pr/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 faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

505 Fundamentals in Graduate Research in Speech (3) Techniques of historical, descriptive and experimental research.

510 Studies in Persuasion (3) Prereq: 310 or equivalent consent of instructor.

530 Topics in Group and Interpersonal Communication (3) Prereq: 320, 330, 420, or consent of instructor. May be repeated. Maximum 9 hrs.

560 Communication Theory (3) Analysis of contemporary theories of human communication; similarities and differences of communication processes in interpersonal, small group, organizational, and public communication. Prereq: 350 or equivalent consent of instructor.

561 Directed Reading and Research (3) May be repeated. Maximum 6 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.

Statistics

(College of Business Administration and Intercollegiate Program)

MAJORS

DEGREES

Statistics.............................................M.S.

Business Administration..........................MBA

David L. Sylwester, Chair

Professors:

Downing, Darryl J. (Adjunct), Ph.D., Florida McLean, Robert A., Ph.D., Purdue McPherson, John W., Ph.D., VPI Sanders, William L. (Adjunct), Ph.D., Tennessee Sylwester, David L., Ph.D., Stanford Thigpen, Charles C., Ph.D., VPI

Associate Professors:

Ranney, Gipsie B., Ph.D., NC State University O'Brien, Ralph, Ph.D., North Carolina Sanders, Richard D., Ph.D., Texas Wright, Tommy (Adjunct), Ph.D., Ohio State University Younger, M. S., Ph.D., VPI

Assistant Professors:

Leitaker, Mary G., Ph.D., Kentucky Schmidhammer, James L., Ph.D., Pittsburgh Walker, Esteban, Ph.D., VPI
Instructors:
Cwik, Charles, M.S.................Tennessee
Neidert, Sharon, M.S............Miami (Ohio)
Wright, S. Paul, M.S............Tennessee

Additional Intercollegiate Program Committee Members:
Bunting, Dewey, Liberal Arts
Dessart, Don, Education
Fribourg, Henry, Plant and Soil Science
Glisson, Charles, Social Work
Huck, Schuyler W., Educational Counseling
Ladd, R. T., Management
McLaren, J. B., Animal Science
Miller, Mark, Communications

THE MASTER'S PROGRAM

The M.S. program in Statistics provides students with the foundations in theory and practice required for careers in applied statistics. In addition to the education traditionally offered in such a program, the department offers a concentration in industrial statistics, which provides unique opportunities for experiences in practical applications of statistics. Through involvement in The University of Tennessee Institute for Productivity Through Quality and related programs, department faculty participate in a variety of consulting and research projects in industry. Students may supplement their classroom study with an industrial internship and participation in research projects dealing with industrial problems.

Department faculty also collaborate with researchers from many academic disciplines and hold joint appointments with the College of Agriculture, the Computing Center and the Medical Center. Statistics graduate students can gain extensive non-industrial consulting experience by becoming research assistants within such organizations. All students are required to participate in supervised internship or consulting activities as part of their graduate program.

Individuals with undergraduate or graduate degrees in other disciplines are encouraged to enter the program. The candidate's background should include differential and integral calculus of several variables. Individuals with limited mathematics background should seek departmental guidance regarding specific ways in which they may prepare themselves for the program by taking coursework as non-degree students. Requests for application forms and further information may be sent to the Director of Graduate Studies, Department of Statistics, Stokely Management Center, University of Tennessee, Knoxville, TN 37996-0532.

Admission Requirements
General admission requirements for The Graduate School are stated beginning on page 13. Applicants for Statistics must submit results of the Graduate Record Examination (GRE) general portion, although GMAT exam scores may be substituted. Applicants for the statistics program must have completed two years of college-level mathematics, including the calculus of several variables and matrix algebra, and be proficient in a computer language. Applicants whose native language is other than English must submit results of the Test of English as a Foreign Language (TOEFL).

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 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 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. 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 reviewed and approved 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 of the Statistics minor/major is recognized by appropriate documentation on the student's transcript. Students who do not complete all requirements for the Statistics major/minor will still receive academic credit for statistics courses they have successfully completed.

Degree Program:
Hours:
M.S. in Statistics, minor outside of
Statistics 21
M.S. outside of Statistics, minor in
Statistics 8
M.S. outside of
Statistics, requirements for
M.S. in Statistics or both degrees
Doctorate outside of Statistics,** minor
in Statistics 16
Doctorate outside of Statistics,** M.S.
in Statistics 24

*Approved Statistics courses from the Department of Statistics and/or other departments.
**Courses 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 prereq or 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 as 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, statistical process control, correlations and regression, basic time series. Open only to MBA students.

502 Registration for Use of Facilities (5-15) Required for the student not otherwise registered during any semester who uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Spec./course only. E

531 Statistical Methods for the Social Sciences I (3) Probability distributions, 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 college mathematics and 1 course in statistics.

532 Statistical Methods for the Social Sciences II (3) Multiple regression and correlation, use of dummy variables, generalized linear models, 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, integrated with considerable use of major statistical computing system. Probability and probability distributions, forming and testing hypotheses using parametric 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 models are applied to multiple regression and analysis of variance. Diagnostic and influence techniques. One-way, factorial, and repeated measures designs, planned versus post-hoc contrasts. Random factors and repeated measures. Prereq: 537.

561 Introduction to Computing for Data Management and Analysis (1) UT Computing environment for beginning graduate students; use of operating system commands, system editor, utility programs and major statistical packages, SAS, for data entry and editing, file management, and statistical analysis in interactive and batch environments, IBM, CMS, and MVS. Use of microcomputers 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: 503.


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 (1-4) Directed readings and active participation in colloquium program of Department of Statistics and of student's minor program. Prereq: Consent of statistics department head or graduate advisor. May be repeated. Maximum 2 hrs. S/NC only.


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 538. May be repeated. Maximum 6 hrs.

596 Applied Multivariate Methods (3) Methods based on multivariate general linear model: analysis of covariance, discriminant analysis and classification, multivariate analysis of variance and covariance, and multivariate approach to repeated measures analysis. Principal components and factor analysis. Logistic regression and log-linear models for multidimensional contingency tables. Principal component analysis and analysis of variance, experience using SAS or SPSS from terminals.

597 Multivariate Analysis (3) Review of full rank models and models not of full rank with application to unbalanced designs, generalized inverses, estimable functions, b.i.l.u.e., linear hypothesis testing, reductions in sums of squares, least squares means, mixed model equations, methods of variance component estimation from unbalanced data. Prereq: Analysis of variance.

597 Categorical 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.

598 Multivariate Analysis (3) Applications of multivariate techniques in detail to specific areas of data analysis. Prereq: Consent of instructor.

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

600 Education (3) Statistical theory underlying common statistical procedures of hypothesis testing and estimation. Prereq: 503.

681 Special Topics in Probability (1-3) Presentation of specialized topics in probability and stochastic processes. May be repeated. Maximum 6 hrs.

682 Special Topics in Statistics (1-3) Presentation of specialized topics in statistics. May be repeated. Maximum 6 hrs.

676 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 tolerancing, estimation of variance components, problems of measurement, special industrial applications. Prereq: 571 or equivalent.


673 Linear Models (3) Review of full rank models and models not of full rank with application to unbalanced designs, generalized inverses, estimable functions, b.i.l.u.e., linear hypothesis testing, reductions in sums of squares, least squares means, mixed model equations, methods of variance component estimation from unbalanced data. Prereq: Analysis of variance.

675 Categorical 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.

682 Special Topics in Statistics (1-3) Presentation of specialized topics in statistics. May be repeated. Maximum 6 hrs.

Technological and Adult Education

MAJORS DEGREES

Technological and Adult Education............M.S., Ed.D.

Vocational-Technical Education.............Ed.S., Ed.D.

Education..................................Ph.D.

Gerald D. Cheek, Head

Professors:

Cameron, W. A., Ph.D...............Ohio State
Campbell, C. P., Ed.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 I., Ph.D..........Arizona State
Peters, John M., Ed.D.............North Carolina
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..............South Carolina
Hanson, R., Ph.D.................Purdue
Kasworm, Carol, Ed.D..........Georgia
Ledford, B. J., Ed.D..............South Carolina
Mann, E. C., Ed.D.......Penn State
Petty, G. C., Ph.D...............Missouri
Raddif, 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

Instructors:

Wright, C. W., M.T...............Arizona State

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 degree has two options: a thesis option and a problem in lieu of thesis option, both requiring a minimum of 36 hours. 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 must be in 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. The minimum requirements in the doctoral program consist of the following:

- departmental specialization, 12 hours
- departmental core and electives, 21 hours
- cognate field, 9 hours
- professional education core, 9 hours
- research techniques, 12 hours
- dissertation, 24 hours

A minimum of 90 hours above the baccalaureate is required.

The Doctor of Philosophy with a major in Education includes concentrations and specializations 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 UTC on an in-state tuition basis. The M.S. and Ed.D. programs in Technological and Adult Education are available to residents of the state of South Carolina; the Ed.D. program is available to residents of West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

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

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

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

432 Methods and Materials in Business and Marketing Education (3) Teaching techniques, aids and evaluation in subject matter fields. Prereq: 3 yrs teaching experience. Sp

436 Supervised Occupational Experience (3) Practical field experiences in selected settings under supervision of practitioner and departmental representative. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

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 9 hrs. E

510 Foundations of Technological and Adult Education (3) Historical, philosophical, economical, 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) Academic, socioeconomic, cultural, and other handicaps of special students. Prereq: 9 hrs of graduate credit. F, Su

513 Special Topics in Technological and Adult Education (1-3) Special topics, 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

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

516 Microcomputer Software Development (3) Advanced software design in BASIC: random access and binary files, search and sort algorithms, and bit-mapped picture processing. Hands-on learning and program development. Prereq: 515 or consent of instructor. E

518 Education Specialist Research and Thesis (3) May be repeated. Maximum 9 hrs. P/NP only. E

521 Program Development and Operation in Technological and Adult Education (3) Theories and methods from research to practice in planning and operating adult education programs. Prereq: Consent of instructor. F,Su

522 Adult Development (3) Changes in characteristics of adults over life span for planning and organizing adult education programs. Prereq: Consent of instructor. F,Su

523 Post-Secondary Education for Adults (3) History, evolution, philosophy, structure and functions of post-secondary, sub-university institutions, their programs and clientele. Prereq: Consent of instructor. Sp,Su

524 Continuing Professional Education (3) Theories and concepts supporting design and management of educational programs for adults. Prereq: 510 or equivalent, Sp

530 Methods and Materials for VOE Programs (3) Development of instructional aids, recent developments and research, individualized and occupational clusters. Prereq: 510 or equivalent. Sp,Su

531 Organization and Supervision of VOE and Marketing Programs (3) Developing office and marketing programs, guidelines in cooperative laboratory, and model office programs. Trends in office and marketing education, physical facilities, state plans, instructor qualifications and advisory committees. Prereq: Consent of instructor. F,Su

532 Improvement of Instruction in Basic Business and Marketing Education (3) Issues, research findings, methods, and materials for 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 materials in typical office procedures in data processing, automated accounting and data processing at secondary and post-secondary levels. Prereq: Consent of instructor. F,Su

535 Curriculum in Business and Marketing Education (3) Curriculum designs in career, secondary, post-secondary education, Legislation, legislation, social, economic and research results that affect business and marketing education. Prereq: Consent of instructor. F,Su

536 Organizing and Teaching Adult Business and Marketing Education (3) Planning, organizing, promoting, teaching and evaluating marketing educational, business and sales programs in business and marketing education; utilizing trade associations, employment agencies, business groups, and advisor committees in program implementation. Prereq: 3 yrs teaching experience and consent of instructor. F,Su

537 Measurement in Business and Marketing Education (3) Testing and evaluation of learner performance in business and marketing education; teacher-made tests. Prereq: Consent of instructor. Sp,Su

540 Special Topics in Business and Marketing Education (1-3) Special topics, activities, and evaluations vary. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

541 Practicum in Business/Marketing Education (3) Practicum in upgrading and upgrading experiences in non-traditional settings for business and marketing teachers. Prereq: 15 hrs of graduate credit. E

542 Problems in Business and Marketing Education (3) Selective research in problems of teaching business and marketing education and related areas. Prereq: Consent of instructor. E

550 Administration of Industrial Education Programs (3) Developing, staffing, administering and evaluating of programs for business and education programs in secondary and post-secondary school settings. Prereq: Consent of instructor. Sp,Su
551 Supervision of Industrial Education Programs (3) Techniques used to improve industrial education programs. State, local, and central level. Prereq: 455 or equivalent. F, Su

552 History and Philosophy of Industrial Education (3) Historical and philosophical events that impact development 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 process of planning technical education facilities. Prereq: Consent of instructor. F, Su

554 Technical Program Planning (3) Instructional systems attending to analysis, design, development, implementation, and evaluation of trade, technical supervisory, and related training. Prereq: Curriculum development course and consent of instructor. F, Su

555 Curriculum Planning for Industrial Education Programs (3) Developing performance-based, criterion-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

557 Advanced Methods of Teaching Technical Subjects (3) Advanced techniques in selection and effective application of innovative methods and teaching specialized skills and technical information. Diversifying and individualizing teaching of technical subjects. Prereq: 373. Sp, Su

558 Seminar in Industrial Education (1-3) Current issues, innovations, problems associated with technical programs. Prereq: 12 hrs of graduate courses. May be repeated. Maximum 6 hrs. F, Su

559 Evaluation of Technical Training Programs (3) Internal and external evaluation of training programs to maintain quality control and/or to justify revisions. Prereq: 455 and consent of instructor. Sp

571 Supervisory Skills for Improving Industrial Productivity (3) Philosophy of improving industrial productivity through quality and introduction to basic tools of statistical process control. Deming philosophy, charting and interpretation, process capability, techniques for training hourly workers in quality control, and measurement procedures for quality control. Prereq: Statistics course and consent of instructor. F, Su

572 Advanced Training Methods for Industrial Productivity (3) Techniques of training hourly workers in use of statistical process control tools. Techniques for involving hourly workers and supervisors in quality assurance, inventory control, and productivity improvement groups. Prereq: 571. Sp, Su

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

601 Curriculum Planning in Technological and Adult Education (3) Curriculum theory, models, concepts, planning evaluation and implementation of specialized program areas. Prereq: 555 or equivalent. Sp, Su

602 Planning and Evaluation of Programs in Technological and Adult Education (3) Techniques utilized in planning, developing, and evaluating instructional programs. Prereq: 500-level planning course and consent of instructor. Sp, Su

604 Seminar in Technological and Adult Education (1) Required 2 consecutive semesters during doctoral residency. May be repeated. Maximum 3 hrs. S, NC only. E

605 Administration and Supervision of Technological and Adult Education (3) Leadership, policy, organization, planning, personnel, student development services, and budgeting relating to vocational, technical, and adult education at secondary, post-secondary, and higher education levels. Prereq: Program, problem solving, and management activities. Prereq: Administrative theory course and consent of instructor. F, Su

610 Research Development in Technological and Adult Education (3) Proposal development, theoretical base, research design, sampling, application of statistics, and evaluation of research in technological and adult education. Prereq: 6 hrs of advanced statistics courses and consent of instructor. Sp, Su

611 Internship in Technological and Adult Education (3) Field experience in relevant organizations. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

613 Special Topics in Technological and Adult Education (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

615 Advanced Microcomputer Software Applications (3) Advanced programming and applications of intelligent or program-generating software. Progression of commercial relational data-base management programming environments. Concepts and applications of communications and networking. Hands-on environment. Prereq: 516 or equivalent. Sp, Su


620 Seminar in Adult Education (3) Issues in adult education theories and concepts, philosophical positions, research trends and methodologies. Prereq: 510 or equivalent. Sp, Su

621 Advanced Seminar in Program Planning (3) Concepts, principles, and theories related to program planning in adult education. Prereq: 521 or equivalent. Sp

622 Advanced Seminar in Adult Development (3) Adult development research and designing research for studies of life cycle. Prereq: 522 or equivalent. Sp, Su

626 Adult Problem Solving and Learning (3) Contemporaneous research and theories in adult problem solving and learning. Prereq: 522 or equivalent. F, Su


621 Higher Education in Business and Marketing Education (3)

Textiles, Merchandising and Design

(Majors in College of Human Ecology)

MAJORS

Textiles and Apparel.............................................M.S.

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

Larry Wadsworth, Acting Head

Professors:

Blakemore, Robbie G., Ph.D...........................Florida State

DeLong, A. J., Ph.D...............................Penn State

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

Drake, M. F., Ph.D...............................Penn State

Duckett, Kermit E., Ph.D..........................Tennessee

Ford, Imogene M., Ph.D...........................Penn State

Moran, W. J., M.S.................................Wisconsin

Wadsworth, Larry C., Ph.D..................NC State

Associate Professors:

Bressee, Randall R., Ph.D...........................Florida State

Dyer, C. L., Ph.D...............................North Carolina

Raban, Josette, Ph.D...........................Tennessee

Assistant Professors:

Crouse, J. L., Ph.D...............................NC State

Dillard, S. J., M.S..............................Florida State

Havasy, J. B., Ph.D..............................Ohio State

Houser, T. L., M.S...............................Tennessee

Simpson, Ethel, Ph.D..........................Oklahoma State

Interior Design

The Department of Textiles, Merchandising and Design offers a Master’s degree in Interior Design. This program is the only Master’s degree program in the nation accredited by the Foundation of Interior Design Education Research (FIDER). To enter the program, students are expected to have a good foundation in this area. The program of study will prepare students for careers in interior design or architectural firms, public and private agencies, and educational institutions. Interested students should contact the department head for more information.

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. Prospective graduate students pursuing a degree in advanced interior design should submit a portfolio of their undergraduate studio work to the department. This portfolio may include slides or original work.

ACADEMIC STANDARDS

1. Evaluation of student progress will normally occur prior to enrollment for thesis hours 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, 556, 590

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.
Textiles, Merchandising and Design

581 Directed Study in Historic Preservation (1-3) Independent advanced research in area of historic preservation relevant for interior design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

582 Directed Study in Historic Design (1-3) Independent advanced research in area of historic stylistic movements relevant for interior design course. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

583 Directed Study in Furniture Design (1-3) Independent advanced research in furniture design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

584 Directed Study in Environmental Design (1-3) Independent advanced research in environmental design analysis. Prereq: 574 or consent of instructor. May be repeated. Maximum 9 hrs. E

590 Research Seminar (1-2) S/NC only. E

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 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.

ACADEMIC STANDARDS

1. Each graduate student will be evaluated at the end of the second semester (or after completing a minimum of 18 graduate hours).
2. 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) 19 hours
Cognate Area 6 hours
Statistics 3 hours
Thesis 6 hours
TOTAL 34 hours

*Students with textile science background must take 550; students without it must take 522.

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 in a cognate area;
6. Textiles and apparel courses in area of specialization (16-20 hours); and
7. Dissertation (24 hours).

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 who uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

510 International Retail Systems (3) Acquisition and management of information for retail decision; analytical decision making in problems in system planning and strategy designs in retail areas. Prereq: 410 or equivalent. Sp

520 Textile Microscopy and Physical Testing (3) Optical and electron microscopy techniques for textile fibers, yarns, and fabrics. Methods and equipment used in physical testing following approved textile standards. Prereq: 320 or equivalent. Sp

522 Fiber Chemistry (4) Chemistry of textile fibers; structure, preparation and reactions; dying and finishing of fabrics. Introduction to color science. Prereq: Organic chemistry, 2 hrs and 4 labs. Sp

530 Practicum in Interior Design (1-12) Field experience in selected agencies, organizations, or firms who are residents of Kentucky or Louisiana among southern states for sharing academic information. Consent of instructor. May be repeated. Maximum 48 hrs. Sp,A

550/552*, 580, 590) (3) Style in relation to contemporary conditions (cultural, economic, and historic textiles; influence of culture, economics and commerce. Prereq: 3 hrs textiles. Sp,A

580 Directed Study in Interior Design (1-3) Independent advanced research in selected areas from field of interior design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

562 Research Methods in Interior Design (3) Methodology for historic preservation problems in interior design. Prereq: Architecture 403 or consent of instructor. Sp

563 Seminar in Interior Design (3) Twentieth-century design concepts, persons, motivation, and creative components leading to visual innovation. Prereq: 470 or consent of instructor. F

564 Environmental Factors in Interior Design (3) Human factors and associated research techniques and design methodologies related to interior architectural environments. Design requirements from anatomy, physiology, anthropology and social and behavioral sciences. Prereq: 6 hrs behavioral science and 6 hrs natural science, or consent of instructor. Sp

566 Research Methods in Interior Design (3) Methodological approaches appropriate to interior design. Prereq: 9 hrs graduate level interior design or consent of instructor. May be repeated. Maximum 9 hrs. E

567 Environmental Design Analysis (3) Integrative problem-solving/studio from multidisciplinary perspective, Systems approaches. Available to students from design disciplines and social and behavioral sciences. Prereq: 564 or consent of instructor. May be repeated. Maximum 6 hrs. F,A

568 Environmental Design Analysis (3) Integrative problem-solving/studio from multidisciplinary perspective, Systems approaches. Available to students from design disciplines and social and behavioral sciences. Prereq: 564 or consent of instructor. May be repeated. Maximum 6 hrs. F,A

569 Directed Study in Textiles and Apparel (1-3) Independent advanced research in areas of interior architectural environments. Design requirements from anatomy, physiology, anthropology and social and behavioral sciences. Prereq: 564 or consent of instructor. May be repeated. Maximum 6 hrs. F,A

570 Research Methods in Textiles and Apparel (3) Methodology for historic preservation problems in textiles and apparel design. Prereq: Architecture 403 or consent of instructor. Sp,A

571 Program Planning and Management (3) Professional planning and management in the textile/apparel industry. Prereq: 564 or equivalent. Sp

572 Environmental Design Analysis (3) Integrative problem-solving/studio from multidisciplinary perspective, Systems approaches. Available to students from design disciplines and social and behavioral sciences. Prereq: 564 or consent of instructor. May be repeated. Maximum 6 hrs. F,A

573 Program Planning and Management (3) Professional planning and management in the textile/apparel industry. Prereq: 564 or equivalent. Sp

574 Research Methods in Textiles and Apparel (3) Methodological approaches appropriate to interior design. Prereq: 9 hrs graduate level interior design or consent of instructor. May be repeated. Maximum 9 hrs. E

581 Directed Study in Historic Preservation (1-3) Independent advanced research in area of historic preservation relevant for interior design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

585 Research Methods in Textiles and Apparel (3) Methodology for historic preservation problems in textiles and apparel design. Prereq: Architecture 403 or consent of instructor. Sp,A


593 Directed Study (1-3) Individual problems in textiles, merchandising or apparel. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs.

595 Advanced Topics in Textiles and Apparel (1-3) Lecture, group discussion on specialized topics: apparel production management, functional design, handicapped/elderly, historic costume, historic textiles, international issues, non-wovens, thermal properties. Prereq: 9 hrs textiles/apparel graduate coursework may be repeated. Maximum 9 hrs. Su.

600 Dissertation (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 251, or equivalent. Sp, A.

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. F, A.

641 Social and Psychological Theories of Apparel Consumption (3) Theories and concepts from social science, fashion, consumer behavior in relation to apparel. Prereq: 540 and 6 hrs of sociology and/or psychology, or consent of instructor. Sp, A.

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, disadvantaged. Prereq: 550 or 592, or consent of instructor. Sp. A.

685 Integrative Design: Development and Marketing (3) Systems-oriented approach to strategies involved in product development; methods for identifying critical factors central to decision making and techniques for synthesizing information. Prereq: 24 hrs graduate coursework. F.

695 Advanced Topics in Textiles and Apparel (3) Lecture, group discussion, individual research on advanced topics and research areas of current significance: future direction, professional issues, theoretical approaches. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs.

Theatre

(College of Liberal Arts)

MAJOR

THEATER

DIRECTING

Tom Cooke, Head

Professor:

Cooke, Tom, Ph.D. ....... Florida State University
Orthan, R., M. ......... Miami (Ohio)
Field, R. C., M.A. ............ Cambridge University
Field, J., Fred (Emeritus), M.A. .... Ohio State University
Garvie, Peter, M.A. ......... Pennsylvania State University
Henshaw, H., Wandalie, Ph.D. ............ Tennessee State University
Hewald, Robert R., Ph.D. ....... Florida State University
Soper, L., Paul (Emeritus), Ph.D. ......... Penn State
Cornell

Associate Professor:

Custer, M., M.F.A. ....... Wisconsin State University

Assistant Professors:

Black, W., M.F.A. ....... Illinois Institute of Technology
DeCuir, H., M.F.A. ............ Tulane University
Schmitt, P., Ph.D. ....... Wisconsin State University

Adjunct Faculty:

Arnoult, P., M.A. ............ Catholic University
Parris-Bailey, L., B.F.A. .......... Howard University

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 of Master of Fine Arts with a major in Theatre, which is normally completed in three consecutive years of full-time study. Theatre 501 is required the first semester of residence. Also required are Theatre 401, 310-11, and at least 3 hours in dramatic theory and criticism. 310-11 may be waived by the committee for the MFA program. Satisfactory completion of the comprehensive examination is prerequisite to entry into the third year. Thesis and oral defense (Theatre 500, 6 hours minimum) must be completed satisfactorily 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 Directing is required of scene design students lacking an appropriate undergraduate foundation in directing.

Acting

Theatre 520-21-22-23-24-25 Master Class is 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 theory and criticism are required asare 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 completion 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 perception.

409 Stage Make-up (2) Problems in make-up design and application, character analysis, physiognomy and chiroscuro. Prereq: 100.

410 Dramatic Theory and Criticism (3) Theatre aesthetics from Aristotle to present.


425 Advanced Phonetics (3) Phonetic aspects of contemporary dialects of English language. Prereq: Consent of instructor.

430 Principles of Play Directing (4) Problems in composition, picturization, rhythm, movement. Prereq: 220, 221, and 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 Pattern Drafting (3) Draping patterns for period costumes. Composition and study of historic patterns 1500-1900. Prereq: 345 or consent of instructor.

450 Advanced Scenery Technology I (3) Study and practice of theatre woodworking; production participation required. Prereq: 450. Graduate credit to Theatre M.F.A. students only.

451 Advanced Scenery Technology II (3) Study and practice of metalworking and plastics for theatrical
463 Sound Design (3) Sound design for performing theatre, opera, and dance. Prereq: 362 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 historical and technical 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-design practitioners. Study of directors, actors, choreographers, and architects. Not open for specializations in lighting design.

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 direction 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.


545 Millinery for the Stage (2) Pattern making and construction techniques for hats from antiquity to present. Prereq: Consent of instructor.

546 Advanced Costume Patternmaking (3) Advanced studies in patterning period costume. Development of historic 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 Scene Design (1-3) Concept and completion of major projects, both hypothetical and actual, in scene design. May be repeated. Maximum 9 hrs.

554 Studies in Scene Design (3) Advanced scene 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) Concept 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.

563 Projects in Sound Design (1-8) Production assignment as sound designer on approved plays 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.

576-78 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 scenic 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 DEGREE
Veterinary Medicine D.V.M.
D. J. Krahwinkel, Head

Professors:
Brace, J., D.V.M. California (Davis)

Bright, R. M., D.V.M. Ohio State
Dorn, A. S., D.V.M. Illinois
Krahwinkel, D. J., D.V.M. Auburn
Legendre, A. M., D.V.M. Auburn
Walker, M. A., D.V.M. Texas A&M

Associate Professors:
DeNovo, R. C., Jr., D.V.M. Illinois
Gompf, R. E., D.V.M. Ohio State
Paddfield, R. R., D.V.M. Missouri
Selcer, R. R., D.V.M. Texas A&M
Wiegels, J. P., D.V.M. Colorado State

Assistant Professors:
Bright, J. M., D.V.M. Purdue
Brooks, D. E., D.V.M., P.D. Florida
Daniel, B. G., 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:
Augeris, S., D.V.M. Tennessee

Residents:
Cook, S., D.V.M. Minnesota
Golden, D. L., D.V.M. Florida
Graefehl, R., D.V.M. Auburn
Hodges, R., D.V.M. Tuskegee
Hoskinson, J., D.V.M. Washington State
Okrasinski, E., D.V.M. Georgia
Ross, W., D.V.M. Tuskegee
Sackman, J. E., D.V.M. Michigan State
Thompson, L., D.V.M. Aurora
Wantsche, L., D.V.M. Texas A&M

Intern:
Gartrell, C., D.V.M. Tuskegee

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

Veterinary Medicine
(College of Veterinary Medicine)

MAJOR DEGREE
Veterinary Medicine D.V.M.
Comparative and Experimental Medicine M.S., Ph.D.
 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 an 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.

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<tr>
<th>Subject Area</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>English</td>
<td>6</td>
</tr>
<tr>
<td>Humanities and Social Sciences*</td>
<td>18</td>
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<tr>
<td>Calculus</td>
<td>6</td>
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<tr>
<td>Physics</td>
<td>8</td>
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<tr>
<td>General Chemistry</td>
<td>8</td>
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<td>Organic Chemistry</td>
<td>8</td>
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<tr>
<td>Biochemistry**</td>
<td>4</td>
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<tr>
<td>Genetics</td>
<td>3</td>
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<tr>
<td>Cellular Biology***</td>
<td>3</td>
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*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 UTK 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 excepted 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 years later in May. The first three years follow the traditional fall and spring semesters with the summer break following years one and two. The final year of the professional curriculum begins immediately following semester six and is a continuous clinical training schedule extending over one calendar year.

The first year consists mostly of preclinical subjects such as anatomy, physiology, histology, and microbiology. Included in this first year also are subjects such as physical diagnosis and anesthesiology. Considerable integration of subject matter is incorporated during this time.

The second and third years include the study of diseases, their causes, diagnoses, treatment and prevention and are taught on a rotated basis. 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 credit hours and these hours will be credited toward the D.V.M. The semester of elective study offers a dual 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 medical 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 course 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 must represent 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. Because of 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), Pathology (including 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 involved 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 UTK 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 genetics to patterns of disease and mode of action of antimicrobials, antigens and antibodies. Immunobiology, study of mechanisms of immune reaction, diagnostic immunology, and role of immune response.

817 Special Problems in Microbiology (1-8) Extra- and speciality designed study for students interested in select topics in bacteriology, mycology, virology and immunology.

821-22 Anatomy I-II (4.4) Gross and applied anatomy; neural structures of common domestic animals: dog, cat, horse, cow. Dissection of embalmed specimens, projections, slides, models, and living animals.

823-24 Physiology I-II (4.4) Introduction to concepts and principles in physiologic base for dental applications and for formal training in pharmacology, medicine, pathology, and surgery. Cellular, cardiac, cardiovascular, renal, 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 (1-8) Extra- and specialty designed study for students interested in select topics in anatomy, histology, and physiology.

630 Art of Veterinary Medicine I (1) Paramedical subjects important to veterinary practice. Practice management, interpersonal relations, communications, jurisprudence, ethics, careers, animal behavior and veterinary history. May be repeated. S/N only.

631 Physical Diagnosis I (Basic care, leading, restraint, and handling domestic animals. Introduction to physical examination and diagnostic techniques used by veterinarian.

632 Anesthesiology (2) Principles of anesthesiology: pharmacology of anesthetic agents, and introduction to anesthetic techniques in veterinary medicine.

633 Epidemiology/Public Health (4) Principles of epidemiology and public health: Host-agent relationships, public health aspects of veterinary medicine, and role of veterinarian in ecology and food hygiene.

834 Hematopoietic System (Pathophysiology, special pathology, and clinical management of diseases of the hematopoietic and lymphoid organs and tissues. Principles, methods of laboratory evaluation of diseases from other organ systems.

835 Medical Interaction (2) Multidisciplinary laboratories and lectures of physiology, pharmacology 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.
The Department of Zoology offers the Master of Science and Doctor of Philosophy with concentrations in aquatic biology, ecology, and cell and molecular biology, physiology, genetics, and reproductive and developmental biology.

REQUIREMENTS FOR ADMISSION

Applicants for graduate study are expected to have a background no less extensive than that required of undergraduate majors in this department. This includes a knowledge of the basic principles of cell biology, genetics, and ecology. Other requirements for admission are:

1. one year of general zoology or biology;
2. 18 semester hours of upper division zoology or biology;
3. two years of chemistry including one year of general inorganic chemistry;
4. one year of mathematics including calculus;
5. one year of physics;
6. Graduate Record Examination scores (general and biology); and
7. a grade-point average of 3.0 out of 4.0. Otherwise superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the department's Graduate Affairs Committee.

THE MASTER'S PROGRAM

Special requirements in Zoology are as follows: (1) completion of course requirements as determined by the candidate's faculty committee, including a course in biostatistics; (2) achievement of a 3.0 or better GPA in all courses taken for graduate credit; (3) completion of a thesis.

THE DOCTORAL PROGRAM

Special requirements in Zoology are as follows: 1. courses as determined by the candidate's faculty committee, including a course in biostatistics; 2. an oral and comprehensive written examination in zoology and allied fields in which the candidate has had training; 3. a reading knowledge of at least one foreign language in which there exists a sizeable amount of literature relevant to the major field of study. The student has the option of demonstrating a reading knowledge of this foreign language by (a) passing the official reading examination given by the language department or (b) earning a grade of at least B in the second semester of a special language reading course for graduate students. This foreign language requirement must be fulfilled before a student can take the comprehensive 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 UTK 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 organism—Drosophila. Prereq: Biology 220. 2 labs.

404 Cytological Technique (2) Practical experience with various techniques: microscopy, embedding and sectioning, chromosome preparations, autoradiography, in situ hybridization, histochemistry, and immunofluorescence. Prereq: Biology 210, 2 labs.

405-06 Minicourse in Zoology (1,1) Select advanced topics in zoology, concentrated in time and subject matter. Consent departmental listing for topics offered. Prereq: Announced. May be repeated. Maximum 3 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.

415 Parasitology (3) Parasitic relationships: physiological, ecological, evolutionary and economic aspects. Prereq: Biology 230 or consent of instructor, 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. Coreq: 469. (Same as Psychology 450.)

459 Comparative Animal Behavior Laboratory (3) Introduction to observational and experimental research in ethology. Coreq: 450. (Same as Psychology 459.)

460 Evolution (3) Modern concepts of animal evolution. Prereq: Biology 220.

465 Human Genetics (3) Genetic and molecular principles and problems of human inheritance. Prereq: Biology 220.

470 Aquatic Ecology (3) Introduction to physicochemical nature of inland waters with description of botic communities and their interrelationships. Prereq: Chemistry 120-30 and Biology 230. 2 hrs and 1 lab.

470H Aquatic Ecology (3) Honors. 2 hrs and 1 lab.

471 Archaelology (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) Evolution, classification, collection and identification, distribution and biology of fishes, freshwater fauna of Eastern North American. Prereq: Biology 230 or consent of instructor. 2 hrs and 1 lab.

475 Ornithology (3) Behavior, ecology, populations, evolution and field identification of birds. Prereq: Biology 230. 2 hrs and 1 lab.

476 Mammalogy (3) Evolution, classification, biogeography, ecology, behavior and functional anatomy of mammals. Prereq: Biology 230 or equivalent. 2 hrs and 1 lab.

480 Physiology of Exercise (3) Functions of body in muscular work: physiological aspects of fatigue, training and adaptation to environment. Prereq: 230 or 440. 2 hrs and 1 lab.

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 only to 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 the student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.


504 Special Topics (1-3) 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 (1-3) Instruction in methods and techniques of research. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 6 hrs.

507 Animal Cell Culture (2) Techniques for culture of animal cells, tissues and organs. Prereq: Basic techniques in cell culture. S/NC only.

508 Methods of Taxonomy (2) Speciation, taxonomic decisions, approaches to systematic rules and 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 and Biochemistry 410 or equivalent. Coreq: 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 animal. Prereq: 440 or 445.

523 Physiology of Hormones (3) Cellular and organ-specific action of hormones in invertebrates and vertebrates. Prereq: 490 or consent of instructor. Recommended prereq: Biochemistry 410. 2 hrs and 1 lab.
524 Physiology of Animals (3) Adaptive physiological response of animals to natural changes in or extremes of physical and biotic environment. Prereq: Undergraduate courses in animal physiology and ecology, 440 and Biology 230 or equivalent.

525 Physiological Ethology (3) Behavioral endocrinology 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 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 cellular 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 (3) Second-level course in ethology, stressing evolution, genetics, physiology, ecology and human behavior. Prereq: 450 or equivalent. (Same as Psychology 545.)

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

560 Biometry (3) Statistical methods in analysis of quantitative biological data. Prereq: Statistics course or consent of instructor.

573 Population Biology (3) 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.)

583 Zoogeography (3) Processes determining geographic distribution of animals and distribution and composition of animal communities. Prereq: Ecology course 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.

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

601 Advanced Topics (1-3) Readings and discussion of recent advances. Consult the departmental listing for offerings. May be repeated with consent of department. Maximum 9 hrs.

602 Seminar in Cell and Molecular Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

603 Seminar in Genetics (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

604 Seminar in Developmental Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

605 Seminar in Physiology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

606 Seminar in Aquatic Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

607 Seminar in Ecology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

608 Seminar in Ethology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

610 Current Topics in Cell and Developmental Biology (1) Critical analyses of current literature in journal club format. May be repeated. Maximum 10 hrs. S/NC only.