Fields of Instruction

Accounting and Business Law
(College of Business Administration)

MAJORS

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

Keith G. Stanga, Head

Professors:

Dittrich, Norman E. (Emeritus), CPA,
Ph.D. ........................................ Ohio State
Fisher, Bruce D., LL.M. ......... George Washington
Herring, Hartwell C., III, CPA, Ph.D. .... Alabama
Kiger, Jack E. (Warren L. Slagle Prot. of Acct),
CPA, Ph.D. ................................... Missouri
Read, W. H. (Emeritus), CPA,
MBA ........................................ Northwestern
Reeve, James M., CPA,
Ph.D. ........................................ Oklahoma State
Roth, Harold P., CPA, Ph.D. .................. VPI
Stanga, Keith G. (Arthur Andersen Prot.), CPA, 
Ph.D. ........................................ Louisiana State
Townsend, Mahlon L. 
(Emeritus), J.D. ......................... Tennessee
Williams, Jan R. (Ernst & Young Prot.), CPA, 
Ph.D. ........................................ Arkansas

Associate Professors:

Anderson, Kenneth E., CPA, 
Ph.D. ........................................ Indiana
Borthick, A. Faye, CPA, DBA ............. Tennessee
Izard, C. Douglass, CPA, Ph.D. ..... Mississippi
Massingale, Cheryl S., J.D. ............. Tennessee
Posey, Imogene A., CPA, M.S. .......... Tennessee
Slagle, Warren L. (Emeritus), CPA, 
M.S. ........................................ Tennessee
Townsend, Richard L., CPA, Ph.D. ......... Texas

Assistant Professors:

Bentley, Denise D., J.D. .............. Vanderbilt
Carcello, Joseph V., CPA, Ph.D. ....... Georgia State
Galian, Amy W., Ph.D. ............. VPI
Hethox, Kathleen B., Ph.D. .......... Oklahoma
Letsinger, M. Clyde (Emeritus), CPA, 
M.S. ........................................ Tennessee
Murphy, Daniel, CPA, Ph.D. .......... North Carolina
Staubaugh, Michael D., CPA, Ph.D. ..... Indiana

Distinguished Lecturers:

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

Lecturers:

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

THE MASTER OF ACCOUNTANCY PROGRAM

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

Admission Requirements

Application deadlines for international students are: Fall and Summer, January 15. Application deadlines for U.S. citizens and permanent residents are: Fall and Summer, March 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 503 is available.

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

Course Requirements for the M.Acc. Program

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

Accounting Core (9 hours): 511, 513, Business Law 511.
Accounting Concentration (15 hours):

Three concentrations are available:
1. Financial/Auditing: 512, 514, 518, 519, 521.
3. Taxation: 531, 532, 533, 534, 539.

Non-accounting Electives (6 hours): Non-accounting courses taken in either other business or non-business areas, upon approval of M.Acc. advisor.

Transfer Credits

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

Other Requirements

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

**BUSINESS ADMINISTRATION CONCENTRATIONS**

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

**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 approved by Ph.D. accounting program advisor.

**ACADEMIC STANDARDS**

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

**Accounting**

**GRADUATE COURSES**

512 Seminar in Advanced Auditing (3) Theory and concepts underlying application of philosophy of auditing to current auditing issues. Prereq: Auditing and admission to M.Acc. program or consent of instructor.

513 Seminar in Advanced Auditing (3) Theory and concepts underlying application of philosophy of auditing to current auditing issues. Prereq: Auditing and admission to M.Acc. program or consent of instructor.


518 Seminar in Professional Accounting Practice (3) Topics in financial reporting and auditing: taxation of business enterprises and emerging professional accounting standards. Development of written and communication skills. Prereq or coreq: 511 and admission to M.Acc. program.


521 Seminar in Advanced Managerial Cost Accounting (3) Analysis of conceptual and current issues; impact on developments and practice of managerial and cost accounting. Approaches to management accounting, decision and control models, and planning and control under conditions of uncertainty. Prereq: Cost and Managerial Accounting and admission to a graduate business program or consent of instructor.

522 Budgetary Planning and Control Systems (3) Alternative approaches to budgeting and use of planning and control systems to meet organizational objectives. Control systems and corporate structure, discretionary expense centers, profit centers, transfer pricing, and control in manufacturing, service, and not-for-profit organizations. Prereq: Admission to a graduate business program or consent of instructor.

530 Advertising (3) Analysis of decision-making in budgeting, creative strategy, media strategy, and Auditing; 539, Tax Policy and Special Topics; and 549, Systems Policy.

**BUSINESS LAW**

**GRADUATE COURSES**

511 Business Law and Professional Responsibility (3) Legal framework and ethical implications of business transactions. Principles and practices in law of contracts, commercial transactions, real property, trusts, estates and professional responsibility. Prereq: Legal Environment of Business and admission to M.Acc. program or consent of instructor. Not available for students with credit for 401.

**Advertising**

**MAJOR**

**DEGREES**

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 accounting. Prereq: Consent of Ph.D. program advisor. May be repeated. S/NC only.

**Business Law**

**GRADUATE COURSES**

511 Business Law and Professional Responsibility (3) Legal framework and ethical implications of business transactions. Principles and practices in law of contracts, commercial transactions, real property, trusts, estates and professional responsibility. Prereq: Legal Environment of Business and admission to M.Acc. program or consent of instructor. Not available for students with credit for 401.
Aerospace Engineering
See Mechanical and Aerospace Engineering

Agricultural and Extension Education
(College of Agricultural Sciences and Natural Resources)

MAJOR

Agricultural and Extension Education 
.. M.S.

Roy R. Lessly, Head

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

Associate Professor:
Waters, Rando G., Ph.D. ......... Penn State

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

THE MASTER’S PROGRAM

Thesis Option
A candidate for the Master’s degree who elects the thesis option must successfully complete:
1. A minimum of 30 hours of graduate credit in courses approved by the student’s advisory committee. Six hours of thesis may be counted toward this requirement.
2. A minimum of 20 hours of graduate credit in courses numbered at or above the 500 level.
3. A minimum of 12 hours of graduate credit in courses appropriate to the area of concentration taught in the department and a minimum of 6 hours taught from outside the department.
4. A minimum of 3 hours of graduate credit in coursework in each of at least two of the requirements stated in 1-3 above.
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 each of at least two of the requirements stated in 1-3 above.
5. A creative component designed by the student and approved by the student’s advisory committee for 3 hours of graduate credit.
6. A written and oral comprehensive examination.

GRADUATE COURSES

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

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

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

521 Extension Program Planning (2) Methods of developing county extension programs. Sources of essential information; information 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 methods and techniques applicable to extension work. Interrelationships and relative effectiveness. Result demonstrations, methods 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 to appraise planning and teaching and to determine program effectiveness. 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 inferential 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 instructional activities in selected centers and visits by instructor. Prereq: 435, 436. Sp

Agricultural Economics and Rural Sociology
(College of Agricultural Sciences and Natural Resources)

MAJOR

DEGREES

Agricultural Economics ......... M.S., Ph.D.

Handy Williamson, Head

Professors:
Badenhop, M. B. (Emeritus), Ph.D. ....... Purdue
Brooker, J. R. (Liaison), Ph.D. .............. Florida
Cleland, C. L., Ph.D. ....................... Wisconsin
Eastwood, D. B., Ph.D. .................... Tufts
English, B. C., Ph.D. ....................... Iowa State
Keller, L. H. (Emeritus), Ph.D. ............ Kentucky
Klindt, T. H., Ph.D. ......................... Clemson
Leuthold, F. O., Ph.D. ..................... Wisconsin
McLemore, D. L., Ph.D. .................... California
McManus, R. B. (Emeritus), Ph.D. ........ Purdue
Martin, J. A. (Emeritus), Ph.D. .......... Michigan
Mundy, S. D., Ph.D. ....................... Tennessee
Orr, R. H., Ph.D. ......................... Illinois
Park, W. M., Ph.D. ....................... Virginia Tech
Pantost, B. H., J.D. ....................... Tennessee
Ray, Daryl E. (Distinguished Prof.), Ph.D. ......... Iowa State
Roberts, R. K., Ph.D. ..................... Iowa State
Sappleton, C. B. (Emeritus), Ph.D. ....... Illinois
Whatley, T. J. (Emeritus), Ph.D. .......... Purdue
Williamson, H., Ph.D. .................... Missouri

 Associate Professors:
Jensen, K. L., Ph.D. ...................... Oklahoma State
Pompeii, G. K., Ph.D. .................... California (Davis)
Thesis Option

The Master's Program

Option with concentrations in agricultural policy, farm management and agricultural marketing and price analysis, and Rural Sociology offers programs of study for graduate students in these areas. 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 33 hours of graduate credit in courses approved by the student's Master's committee. Six hours of thesis may be counted toward this requirement. At least 27 hours of graduate credit must be earned in courses numbered at or above the 500 level. In the agricultural economics concentration, 15 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 30 hours must be in courses numbered at or above the 500 level. The program must include a minimum of 21 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- or 600-level courses. The student's committee must include a member of the faculty from the department who will be responsible for designating courses required for the minor.

THE DOCTORAL PROGRAM

A minimum of 78 hours of graduate credit beyond the B.S. degree, including 24 hours of dissertation research, but excluding any Master's research credit, is required. A minimum of 27 hours of coursework in agricultural economics, 15 hours of economic theory, and 9 hours of quantitative methods are required. The program must include a minimum of 9 hours in courses numbered at or above the 600 level (excluding dissertation credits).

Agricultural Economics

GRADUATE COURSES

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

420 International Agriculture Trade and Marketing (3) Real and monetary aspects of international trade and effect of agricultural commodity flows; partial equilibrium analysis of international trade in agricultural products; institutional aspects of international marketing of agricultural products. Prereq: Intermediate Agricultural Economics or consent of instructor.

430 Agricultural Policy (3) Values, goals and policy problems; economic and institutional aspects of policy. Historical development and current characteristics of commodity, credit, food, and trade policy. Prereq: Intermediate Agricultural Economics or consent of instructor.

440 Agricultural Production Economics (3) Application of microeconomic theory to problems of resource allocation, enterprise selection, scale of operation of agricultural firms; economic interpretation of technical agricultural production relationships. Prereq: Intermediate Agricultural Economics or consent of instructor.

442 Agribusiness Management (3) Advanced decision analysis in farm and agribusiness settings. Planning and organizing functions, analyzing investment alternatives, evaluating financial statements, assessing profitability and solvency, development of student models, and decision making in business decisions. Prereq: Farm Business Management, Microcomputer Applications to Production, Statistical Methods, and Principles of Managerial Accounting or consent of instructor.

450 Agricultural Price Analysis (3) Analysis of demand and supply mechanisms in agriculture; price determination; spatial equilibrium; temporal price patterns; pricing institutions. Prereq: Intermediate Agricultural Economics, Marketing of Agricultural Products and Statistical Methods.

460 Rural Economic and Community Development (3) Historical and theoretical perspective on problems facing rural communities; linkages between farm and nonfarm sectors; models and tools for analyzing rural development. Prereq: 210 or consent of instructor.

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

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

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

505 Microeconomic Analysis (3) Theory of utility maximization and demand, production, cost, firm behavior, and supply; price in production and consumption; efficiency and welfare. Prereq: Calculus and Intermediate Microeconomic Equilibrium or equivalent. F

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

522 Mathematical Programming Methods in Agricultural Economics (3) Linear, integer and quadratic programming methods and applications. Prereq: economics 305 or 315 and 511 or 512. F

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

530 Agricultural Policy Analysis (3) Evaluation of public policy as related to agricultural industry and rural areas. Prereq: 505 and Economics 513 or consent of instructor.

540 Advanced Agricultural Production Economics (3) Theoretical and empirical concepts in agricultural resource allocation; evaluation of both static and dynamic implications of production, supply and demand effects; role of agriculture, sectoral interdependence and trade in development; application of theory to specific development issues. Prereq: 460 or consent of instructor.

550 Advanced Agricultural Marketing (3) Analysis of structure, conduct and performance of agricultural marketing systems; application of price theory concepts to existing circumstances in agricultural industries; examination of methods used to evaluate conduct and performance; analysis of transportation issues and location theory. Prereq: Economics 511 or consent of instructor.

560 Advanced Rural Economic Development (3) Theoretical and historical perspectives on process of economic development; analysis of agriculture, sectoral interdependence and trade in development. Prereq: 505 or 511 and Economics 513 or consent of instructor.

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.

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

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

620 Advanced Quantitative Methods (3) Discussion and evaluation of advanced statistical and mathematical techniques in current agricultural economics research. Prereq: 522, 524, and Economics 581-82, or consent of instructor. Sp.

640 Agricultural Supply Analysis (2) Advanced analytic and empirical procedures used for forecasting agricultural supply relationships using regression techniques, production functions, mathematical programming, firm growth models and simulation in supply analysis. Prereq: 540 or consent of instructor. Sp.

650 Analysis of Agricultural Markets (2) Advanced theory and application of market analysis. Analysis of theoretical and technical discussions and efficient and infeasible equilibrium and exchange issues in agricultural and food markets. Prereq: 450 and 550 or consent of instructor. F,A

652 Consumer Demand and Food Consumption (2) Simultaneous consumer decision making; food demand; Constraints on demand. Complete demand system models. Prereq: Economics 511 and 512 or consent of instructor. Sp.

660 Seminar in Rural Economic Development (2) Current topics in economic development of rural areas. Current literature; evaluation of issues in both international and domestic development. Prereq: 560 or consent of instructor. Sp.
in Agricultural Engineering are available to graduates of a recognized curriculum in engineering, mathematics, or one of the physical or biological sciences. A graduate program leading to the Master of Science in Agricultural Engineering Technology is available to graduates in a recognized curriculum in agriculture or other related fields. Each applicant will be advised about any prerequisites 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.

A significant aspect of graduate education beyond formal courses and thesis projects is active participation in the professional community which exists within academic departments at universities. Student/faculty seminars are one of the professionally rewarding activities of the community. Accordingly, all graduate students are encouraged to participate in each Agricultural Engineering Department seminar regardless of whether they are registered for seminar credit.

THE MASTER’S PROGRAMS

Agricultural Engineering

Applicants who have not previously earned a degree from an ABET-accredited engineering program must submit scores from the GRE general and engineering subject examinations. Applicants accepted into the program must complete at least 30 semester hours to earn a degree. Of these 30 hours, 20 must be in courses numbered 500 or greater (6 hours of thesis plus 14 hours of other courses). Other specific requirements for the 30 hours are:

- Agricultural Engineering 504 (1), 505 (1), and other major subject courses
- Coursework in computational methods (mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department)
- Program electives
- Thesis 500

In addition to completing the 30 semester hours, Master’s students must pass a final oral examination covering the thesis, related areas, and graduate coursework.

Non-Thesis Option: A non-thesis option in Agricultural Engineering Technology is available to qualified students. Applicants who have not previously earned a degree from a professionally accredited program within the U.S. must submit scores from the GRE general examination. Applicants accepted into the program must complete at least 33 semester hours to earn a degree. Of these 33 hours, 20 must be in courses numbered greater than 500. Other specific requirements for the 33 hours are:

- Agricultural Engineering Technology 504 (1), 505 (1), and other major subject courses
- Coursework in computational methods (mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department)
- Program electives
- Coursework in special emphasis area
- Capstone Experience (project and report, typically 508)

In addition to completing the 33 semester hours, non-thesis students must pass a comprehensive written final examination covering the graduate program, including the capstone experience. At the discretion of the candidate’s committee, an oral examination may also be required.

THE DOCTORAL PROGRAM

Departmental Requirements

Students applying for admission into the doctoral program must submit evidence of ability to perform and report independent research to the satisfaction of the faculty of the department. An approved Master’s thesis will usually be acceptable for this purpose. Scores on the GRE general and engineering subject examinations also are required for applicants who have not received a degree from an ABET-accredited engineering program.

To earn a degree, each doctoral student must complete at least 75 hours of approved graduate credit (beyond the baccalaureate degree) in agricultural engineering and supporting areas (engineering, computational methods, agricultural and biological sciences, and other related areas). Of the 75 hours, 48 must be in courses numbered greater than 500 (including 24 hours of course 600) and 6 hours of courses at UTC numbered greater than 600. Other specific requirements for the minimum 75 hours are:

- Major subject courses
- Coursework in computational methods (mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department)
Agricultural Engineering

GRADUATE COURSES

413 Component Design and Machine Synthesis (3) Synthesis of design: structural, kinematic, power, control system development; preparation of design drawings, specifications, model of device; written and oral report on project. Prereq: Engineering Design Fundamentals. 1 hr and 2 labs. F

423 Irrigation and Waste Management System Design (3) Design of irrigation and agricultural waste management systems with consideration given to livestock waste characteristics, climate, water quantity, system characteristics, and impact on crop yield and water quality. Prerequisites: Engineering Science and Mechanics 321, 341. 1 hr and 1 lab. Sp

430 Mobile Hydraulic Power System Design (2) Functional and operational characteristics of mobile hydraulic system components: pumps, valves, actuators; analysis and synthesis of power transmission and control circuits. Prereq: Engineering Science and Mechanics 331. 1 hr and 1 lab. Sp,A

433 Food and Bio-processing System Design (3) System design for processing, handling, and storage of food and biological materials. Mass and energy balances, product characteristics, equipment specifications, economic analysis, safety and human factors considerations. Prereq: Processing Food and Biological Materials. 1 hr and 2 labs. Sp

451 Electronic Systems (3) Basic electronics with biological applications. Analog and digital electronics, sensors and controls, computer interfacing, laboratory experiments and design projects. Prereq: Circuits and Electromechanical Components. 3 hrs and 1 lab. Sp

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

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

504 Professional Development Seminar (1) Planning and executing research program; ethics and professionalism; departmental procedures and resources. (Same as Agricultural Engineering Technology 504.) S/NC only. F

505 Professional Communications Seminar (1) Reviews, reports and discussion of ideas, recent advances and current topics, presentations by students. Prereq: 504. May be repeated in changing program. Maximum 6 hrs. (Same as Agricultural Engineering Technology 505.) S/NC only. F

510 Similitude in Design and Research (3) Dimensional analysis; governing equations; theory of models; true, distorted, and similar models; prediction equations; interpretation of data; applications to machinery, soil and water structures, agricultural buildings and other agricultural systems. Prereq: Engineering Science and Mechanics 521. 2 hrs and 1 lab. F,A

525 Soil Erosion and Sediment Yield (3) (Same as Environmental Engineering 525.)

530 Research Problems in Agricultural Engineering (1-3) Theoretical and experimental studies relating to current problems in agricultural engineering. May be repeated. Maximum 6 hrs. E

543 Instrumentation and Measurement (3) Modern instrumentation techniques. Static and dynamic response of instrumentation; signal conditioning; temperature, moisture, optical radiation, displacement, strain, pressure, velocity, acceleration, and flow measurements; digital data acquisition and control. Prereq: 451 or Electronics and Computer Circuits or equivalent. 2 hrs and 1 lab. (Same as Environmental Engineering 543.) F,A

545 Monitoring Hydrologic Phenomena (3) Application of instrumentation theory to hydrologic phenomena; selection of components, control systems, and design of measurement devices; equipment operation and solution of environmental monitoring problems. Prereq: 543. 2 hrs and 1 lab. (Same as Environmental Engineering 545.) Sp,A

552 Biological Treatment Theory (3) (Same as Environmental Engineering 552.)

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

600 Doctoral Research and Dissertation (3-15) P/N only. 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 and model output; verification and calibration of simulation model results. 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 compensation, and system analysis. Application to agricultural systems. Prereq: 451, Mathematics 231. Basic Engineering 101, 201, or equivalent. 2 hrs and 1 lab. F,A

650 Selected Topics (1-3) Lecture, group discussion, and individual study on specialized developments. May be repeated. Maximum 6 hrs. E

Agricultural Engineering Technology

GRADUATE COURSES

422 Food and Process Engineering Technology (3) Application of basic engineering principles to agricultural and food processes. Fluid handling, drying, evaporation, thermal processing, heating and cooling, refrigeration systems, and materials handling. Prereq: Introductory Physics. Calculus. 2 hrs. and 1 lab. F

432 Agricultural Machinery and Tractors (3) Agricultural machinery and power units; adaptation to agricultural practices; management considerations; field efficiencies; capabilities; adjustment and servicing. Prereq: Calculus A. 2 hrs. and 1 lab. Sp

442 Agricultural Waste Management and Pollution Control (3) Waste rennovation fundamentals; character of animal waste; techniques for collection, transporting, storing, and utilizing livestock waste. Prereq: Mathematics 121. 2 hrs and 1 lab. F

452 Internal Combustion Engines (3) Theory, concepts, and mechanics of internal combustion engines; basic principles of engine design, operation, adjustment, troubleshooting and repair of single and multi-cylinder engines. Prereq: Introductory Physics or consent of instructor. 2 hrs and 1 lab. Sp

462 Chemical Agricultural Application Technology (3) Equipment for application of liquid, solid, and gas agricultural chemicals; system components; operational characteristics; calibration; selection and management; safety considerations; materials handling and disposal methods. Prereq: Physics 121 or consent of instructor. 2 hrs and 1 lab. Sp

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

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

504 Professional Development Seminar (1) (Same as Agricultural Engineering 504.) S/NC only.

505 Professional Communications Seminar (1) (Same as Agricultural Engineering 505.) S/NC only.

506 Physical Phenomena (3) Properties of materials, fundamentals of hydraulics, principles of electricity, thermal phenomena, applications in biological systems. Prereq: Consent of instructor. F

508 Special Problems in Agricultural Engineering Technology (1-3) Individual studies of current problems. May be repeated. Maximum 6 hrs. E

512 Agricultural Machinery Systems Analysis (3) Analysis of field machinery, adaptation planning for seasonal use and alternate production and harvesting systems, operational management. Prereq: 432 and 506. 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, crop processing and materials handling. Prereq: 506. 2 hrs and 1 lab. Sp,A

523 On-Site Domestic Water Supply and Wastewater Renovation (3) Basic principles of water and sewer systems, and design and operating criteria for on-site wastewater renovation systems. Prereq: 506. 2 hrs and 1 lab. F,A

542 Simulation of Agricultural Systems (3) Synthesis and analysis of agricultural systems using computer simulation, philosophy of system simulation, critical path, discrete and continuous systems. Prereq: 506 and scientific computer programming. 2 hrs and 1 lab. F,A

546 Automation Devices and Applications (3) Basic electronics as applied to simple automation systems, programmable controllers, data acquisition, digital logic, and transducers. Prereq: 506 or consent of instructor. 2 hrs and 1 lab. Sp,A

560 Selected Topics in Agricultural Engineering Technology (1-3) Lecture/group discussion on specialized topics. May be repeated. Maximum 6 hrs. E

Agriculture

(College of Agricultural Sciences and Natural Resources)

GRADUATE COURSES

512 Teaching Internship in Agriculture (1) Supervised internship in agriculture. May be repeated. Maximum 2 hrs. for M.S. students, 4 hrs. for Ph.D. students.

Animal Science

(College of Agricultural Sciences and Natural Resources and College of Veterinary Medicine)

MAJOR DEGREES

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

Kelly Robbins, Head

Professors
Barth, K. M. (Emeritus), Ph.D. ............ Rutgers
Bell, M. C. (Emeritus), Ph.D. ............. Oklahoma State
Bletner, J. K. (Emeritus), Ph.D. ............ Ohio State
Chamberlin, C. C. (Emeritus), Ph.D. ........ Iowa State
Erickson, B. H., Ph.D. ............ Kansas State
probationary (non-degree) basis and a minimum of 9 hours of graduate coursework must be completed the first term with a minimum grade-point average of 3.0 for admission to the M.S. program.

The program requires the writing of a thesis based on original research; the completion of a minimum of 24 hours of graduate coursework of which at least 14 hours must be taken in courses numbered at or above the 500 level; and 6 hours of thesis. Included in the course requirement are 1 hour of Agriculture 512 and a minimum of 3 hours in statistics. These statistics courses must be chosen from the 400, 500, or 600 level of courses approved for use in the Intercollegiate Graduate Statistical Program (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 faculty members, one of whom may be outside of the Animal Science Department. The advisory committee approves the student's coursework and research project and conducts the final oral examination which consists of a comprehensive oral examination and a defense of the thesis.

THE DOCTORAL PROGRAM

The doctoral program requires a minimum of 48 semester hours of coursework beyond the B.S. and a minimum of 24 hours of doctoral research and dissertation. 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, excluding of doctoral research and dissertation, of which a minimum of 12 hours must be at the 600 level. Students in the concentration must complete Animal Science 581 and 9 hours at the 500 and 600 level in the respective concentration or 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.

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

GRADUATE COURSES

420 Advanced Reproduction (3) Collection, evaluation, and preservation of semen, spermatozoa, and embryos; application of methods of natural breeding and techniques of artificial insemination and embryo transfer; hard sire and dam evaluation; pregnancy determination; gestation and parturition; infertility; recent advances in theriogenology. Prereq: 320 or equivalent. 1 hr and 2 lab. F

430 Advanced Ration Formulation (2) Advanced ration formulation for beef and dairy cattle, sheep, swine, poultry, laboratory, zoo, and companion animals. Mathematical and computer solutions and applications to formulate complete rations with constraints. Prereq: 330 or equivalent and introductory computer science course. 2 labs. Sp

440 Advanced Animal Breeding (2) Computer simulation of genetic improvement for multiple traits in swine, beef, and dairy cattle; evaluation of alternative strategies; industrial programs in swine, poultry, sheep, beef, and dairy cattle; breed development, improvement, and utilization. Prereq: 340 or equivalent. 1 hr and 1 lab. F

481 Beef Cattle Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production responses and economic returns. Prereq: Completion of 300-level core courses or equivalent or consent of instructor. 2 hrs and 1 lab. F

482 Dairy Cattle Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production responses and economic returns. Prereq: Completion of 300-level core courses or equivalent or consent of instructor. 2 hrs and 1 lab. F

483 Pork Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production responses and economic returns. Prereq: Completion of 300-level core courses or equivalent or consent of instructor. 2 hrs and 1 lab. F

484 Poultry Production and Management (3) Integration of principles of nutrition, breeding, physiology, and marketing into complete production and management programs. Structure of industry, enterprise establishment, systems of production, production practices, and improvement programs. Management evaluated in terms of production responses and economic returns. Prereq: Completion of 300-level core courses or equivalent or consent of instructor. 2 hrs and 1 lab. F

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

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


524 Advances in Mammary Physiology (3) Development, anatomy, and function of mammary glands; endocrine interactions associated with mammary development and function; factors affecting yield and composition of mammary secretions. Prereq: 320 or consent of instructor. Sp, Fa

530 Animal Nutrition and Metabolism (4) Comparative digestive physiology; digestion, absorption and metabolism of nutrients in ruminant and nonruminant species. Concepts and methodologies of animal growth and nutrient requirements; relationships, availability and deficiencies of nutrients. Prereq: Animal Nutrition, Feeds, and Ration Formulation or consent of instructor. F, Sp

534 Physiological Biochemistry (3) Principles, concepts and methodologies applied to characterization and mechanistic study of cells, organelles and biologically active molecules. Demonstration of methodologies: nutrient analyses, histology and ultrastructural morphology, immunohistochemical, competitive binding assays, protein biochemistry and molecular biology. Prereq: Organic Chemistry and Lab or equivalent. 1 hr and 2 labs. S/N only. Sp

535 Ruminology (2) Anatomy, physiology, and microbiology of ruminant systems: microbial fermentation and metabolism of polysaccharides, lipids and nitrogen. Prereq: 330 or consent of instructor. Sp

541 The Genetics of Populations (2) Application and extension of principles and concepts learned in basic genetsics to breeding and animal selection. Biochemical and statistical studies to convey the practical importance of the genetic populations. Prereq: Basic courses in genetics, breeding and statistics. 1 hr and 1 lab. F, Sp

542 Applied Animal Breeding (3) Procedures for estimating population parameters, determination of response to various selection methods and breeding system, estimation of genetic and phenotypic relationships among metric traits, estimation of breeding values, optimum methods of simultaneously altering several metric characters, industrial application of animal breeding methodology. Prereq: 541 or equivalent. Sp, Fa

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

572 Least Squares Analysis (3) Least squares estimation and hypothesis testing procedures for linear models; mixed model methodology; full rank and non-full rank situations; covariance structures; estimation of variance components. Prereq: 571 or equivalent. 2 hrs and 1 lab. Fa, Sp

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

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

596 Seminar (1) Advanced topics in animal science. Required of all first- and second-year graduate students. May be repeated. Maximum 4 hrs. S/N only. Fa, Sp

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

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

631 Advanced Topics in Animal Nutrition (1-4) Recent advances in the application of new research techniques, current problems. May be repeated. Maximum 6 hrs. E

632 Advanced Energy-Protein Nutrition (4) Chemical forms, digestion, absorption, intermediary metabolism, deficiencies, excesses and interaction of energy and protein. Prereq: 531 or 533, and Biochemistry 410 or Nutrition 511 or consent of instructor. Sp, Fa

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

Animal Science-Veterinary Medicine
See Veterinary Medicine for program description.

GRADUATE COURSES

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

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

521 Advanced Mammalian Physiology I (4) Membrane, neuron, central nervous system, muscle, cardiovascular system, and control mechanisms. Prereq: general undergraduate anatomy and physiology and Biochemistry 410 or equivalent. 4 hrs and 1 lab. Sp

522 Advanced Mammalian Physiology II (4) (Same as Zoology 522.) 3 hrs and 1 lab. Sp

535 Nutritional Aspects of Companion Animal Health (2) Nutritional concepts applied to veterinary management of normal and disease states for pets including dogs, cats, horses and exotic species. Sp

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

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

554 Comparative Hematology (5) Morphology, physiology and development of blood and blood forming organs: similarities and differences of major domestic and laboratory species. Prereq: Undergraduate physiology and anatomy. Consent of instructor. 2 hrs and 1 lab. Sp

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

573 Disorders of the Endocrine System (2) Pathological and physiological aspects of diseases of endocrine glands of various animal species. Prereq: Consent of instructor. Sp, Fa

Anthropology

(College of Liberal Arts)

MAJOR

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

Jan F. Simek, Head

Professors:

Bass, William M., Ph.D. ................................ Pennsylvania
Faulkner, Charles H., Ph.D. ................................ Indiana
Jantz, Richard L., Ph.D. ........................................ Kansas
Klippe1, Walter E., Ph.D. ........................................ Missouri
Parmalee, Paul W. (Emeritus), Ph.D. ......................... Texas A&M

Wheeler, Margaret C. (Emeritus), Ph.D. ............ Yale

Associate Professors:

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

Research Associate Professor:

Königseger, L., Ph.D. ..................................... Northwestern
Kramer, A. (Liaison), Ph.D. ................................... Michigan

Research Assistant Professor:

Elam, Michael, Ph.D. ........................................ Missouri
Frankenberg, Sison, Ph.D. ................................ Northwestern
Tardif, Suzette D., Ph.D. ................................... Michigan State

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

THE MASTER'S PROGRAM

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

M.A. Requirements

1. A minimum of 30 hours for graduate credit. A minimum of 24 of these hours must be in anthropology, including the following:
   a. 510 and 560
   b. one of the following courses: 512, 513, 514, 515
   c. one of the following courses: 520, 531, 561, 564
   d. two of the following courses: 580, 581, 582, 583

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

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

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

THE DOCTORAL PROGRAM

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

1. Formation of an advisory committee and
establishment of a program of study in consultation with the committee.  
2. Specific courses to be taken are determined by students and their advisory committees. Students should plan to devote a minimum of 4 years beyond the B.A. to attain the Ph.D.  
3. Demonstration of competencies in statistics by completing Statistics 531 and 532 with a grade of B or better.  
4. Demonstration of knowledge of one foreign language. This language should normally be French, German, Russian or Spanish, but another language may be substituted at the committee's discretion. This requirement may be met by:  
a. Successful performance on a language examination administered by the appropriate language department. Students electing this alternative should consult with their advisor.  
b. Completion of the intermediate (200 level) sequence of a language with a grade of B or better in the second semester.  
c. Completion of the second semester of specialized reading courses for graduate students with a grade of B or better.  
d. Written comprehensive examinations in three areas of specialization to be determined by the committee.  
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 an in-state tuition basis. The M.A. program in Anthropology is available to residents of the states of Louisiana or Mississippi (concentration in zoological science only), South Carolina, Virginia, or West Virginia. The Ph.D. program is available to residents of Alabama, Arkansas, Louisiana, Mississippi, South Carolina, or West Virginia. Additional information may be obtained from the Admissions Specialist 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 folklore materials from various tribal, peasant, and complex societies. Prereq: 130 or consent of instructor.

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

414 Political Anthropology (3) Organization and dynamics of power and politics in both stateless and state-level societies. Role of symbols, rituals, and ideologies in producing and reproducing power relations. Relationship among actors (individuals and structures). Encapsulation of traditional political forms and systems within modern states. Prereq: Cultural anthropology or consent of instructor.

431 Ethnographic Research (3) Conceptual and practical exploration of methods and techniques cultural anthropologists use in fieldwork. Prereq: Cultural Anthropology or consent of instructor.

425 Historical Archaeology Laboratory (3) Laboratory procedures for processing, identification, and interpretation of artifacts from historical sites. Antifactual material from historic East Tennessee sites used for class projects. Recommended prereq: Historical Archaeology.

440 Cultural Ecology (3) Concepts and methods in studying dynamic interaction between prehistoric and present day cultures and their environments: ecological theory, methods of interpreting selected case studies. Prereq: 120, 140, 410, or consent of instructor.

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

459 Selected Topics in Anthropology (3) Theoretical issues in anthropology for undergraduate students. Topics may include practical experience or laboratory study of anthropological materials. Prereq: Either Human Origins, Prehistoric Archaeology, Cultural Anthropology, or consent of instructor. May be repeated. Maximum 6 hrs.

461 African Prehistory (3) African cultural history from earliest evidence of human activity to times of European contact. Stages of African development include earliest man, Paleoanthropology, and Mesolithic chronology and lifeways. Prereq: 120 or consent of instructor. (Same as African Studies 461.)

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

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

464 Principles of Zoological Science (3) Basic zoological studies of major vertebrate groups: amphibian role in subsistence and culture. Identification and interpretation of archaeologically deposited remains; introduction to laboratory use of comparative collections. Prereq: 120 or consent of instructor.

465 Urban Archaeology (3) Field archaeology and interpretation of archaeological remains on historic urban sites in U.S. Lectures and field and laboratory research on urban sites in East Tennessee. Recommended prereq: Historical Archaeology.

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

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

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

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


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

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

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

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

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

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

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

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

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

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

515 Medical Anthropology (3) Cultural impact on disease patterns, theories of disease causation, and models of therapy. Therapeutic 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 past and present populations. Prereq: 110, 120, 130, or consent of instructor. Recommended prereq: Basic nutrition course.

517 Forms of Social Inequality (3) Anthropological perspectives on societies stratified along lines of race, class, gender, ethnicity, age, and other characteristics, especially as influenced by sex role structure. Construction of social distinctions before and after rise and consolidation of modern world system: intersections of race and ethnicity with class and gender.

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

521 Laboratory Studies in Zoological Science (4) Examination and comparison of skeletal remains of major vertebrate groups, shells of terrestrial and aquatic molluscs, in relation to animal remains in 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, cultural origins, and regional archaeological cultures. May be repeated. Maximum 9 hrs.

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

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

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

551 Archaeological Resource Management (3) Federal legislation and regulations affecting identification, protection, and management of archaeological resources. Professional ethics and responsibilities and relationships of federal and state agencies, public interest groups, and academic and professional archaeologists. May be repeated. Maximum 6 hrs.
562 Problems in Old World Archaeology (3) (Same as Classics 562.)
563 Lithic Artifact Analysis (3) Methods for analyzing prehistoric stone tools in practical laboratory/lecture format. Stone tool production, use, stylistic variability, and discard processes.
564 Archaeology of Southeastern United States (3) Archaeological research on prehistoric American Indian cultures in Southeastern United States, Tennessee prehistory.
580 Advanced Human Variation (3) Genetic and morphological variation among extant human groups; relationships of variation to geography, ecology and subsistence.
581 Forensic Anthropology (3) Application of physical anthropology to problems in human identification. Determination of age, race, and sex of skeleton and preparation of reports for legal medicine. Prereq: 480; 480 hrs.
583 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 an adaptive unit. Prereq: 480. 480 hrs.
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 microstructure, 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.
589 Anthropological Genetics (3) Application of population and quantitative genetic theory to study of human and nonhuman primate populations. Prereq: Consent of instructor.
591 Foreign Study (1-15) See College of Liberal Arts.
592 Off-Campus Study (1-15) See College of Liberal Arts.
593 Independent Study (1-15) See College of Liberal Arts.
600 Doctoral Research and Dissertation (3-15) P/NP only: E.
601 Advanced Graduate Research (1-6) Independent investigation of special problems in anthropology by advanced graduate students. May be repeated. Maximum 12 hrs. Only 3 hrs may count toward 600-level requirement.
610 Seminar in Cultural Anthropology (3) Selected topics, primarily for doctoral students in cultural anthropology. May be repeated. Maximum 6 hrs.
611 Theory in Cultural Anthropology (3) Critical evaluation of current issues in theory and data interpretation, primarily for doctoral students in cultural anthropology.
660 Advanced Seminar in Archaeology (3) Selected topics in prehistoric and historic archaeology. May be repeated. Maximum 6 hrs.
680 Selected Topics in Physical Anthropology (3) For doctoral students in biological anthropology. May be repeated. Maximum 6 hrs.
681 Selected Topics in Paleoenthropology (3) May be repeated. Maximum 6 hrs.
695 Gross Human Anatomy (9) Skeleton, muscles, and cardiovascular system. Dissection of cadavers. Prereq: 480 or Human Biology. 5 hrs and 6 labs.

### Architecture

**College of Architecture and Planning**

**MAJOR**

- Architecture

**DEGREE**

- MArch.

**Professors:**

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

**Associate Professors:**

- M. O."O. Conley, B. Arche., University of Maine
- F. M. Granger, M. Arche., Harvard University
- M. L. Kolos, M. S., M. E., University of Tennessee
- J. A. S. Karsavage, J. F. D. Sc., Southern California University
- W. J. (LaFae), M. Arche., Eng., Iowa State University
- L. A. Lister, A. M., M. Arche., Virginia University
- P. L. Lizon, P. Ph.D., Pennsylvania State University
- M. Moffitt, Ph.D., MIT
- M. A. Robinson, M. Arche., University of Pennsylvania
- R. W. Rudd, J. W., M. A., Northwestern University
- S. H. Shell, M. S. Arche., Columbia University
- J. S. Watson, J. S., M. Arche., University of Pennsylvania
- S. Wodehouse, L. M. (On leave), St. Andrews University

**Assistant Professors:**

- J. L. Fox, L. D., M. Arche., Cranbrook Academy of Art
- R. R. French, R. C., B. Arche., Texas University
- J. M. Livingston, M., M.P.A., Michigan State University
- W. W. Moir-McClenan, T. W., M. Arche., University of Tennessee
- J. W. Ware, S. M., M.P.A., University of Tennessee

**Masters of Architecture Program**

The School of Architecture offers two tracks leading to the Master of Architecture degree. Track 1 is for students seeking the first-professional degree who already hold a Bachelor's degree or an advanced degree in another field. Track 2 is for students with an accredited first-professional degree who seek to develop an area of specialization.

**Admission Requirements**

In addition to meeting The Graduate School's minimum requirements, the following specific admission requirements to the Master of Architecture program must be met.

**For Track 1 applicants:** A bachelor's degree with a 3.0 GPA from a regionally accredited college of architecture is required. International applicants must have an equivalent 4-year degree and 3.0 GPA. Candidates with a GPA less than 3.0 may be considered for conditional admission when evidence of exceptional promise is identified. Undergraduate work must include at least twelve semester hours of humanities, a basic understanding of physical principles, systems and analytical procedures, and an understanding of mathematical principles

and analytical procedures, as well as a general understanding of the use of computers. The School requires a separate application for Architecture including an essay and three letters of recommendation. A personal on-site interview is desirable but not mandatory.

**For Track 2 applicants:** A Bachelor of Architecture degree from an NAAB accredited program, or foreign equivalent. Candidates with a GPA less than 3.0 may be considered for conditional admission when evidence of exceptional promise is identified.

Submission of a portfolio with a separate application to Architecture to include an essay and three letters of recommendation are also required. A personal on-site interview is desirable but not mandatory.

**Degree Requirements**

**Track 1** requires a minimum of 42 semester hours of undergraduate preparation and 60 semester hours of graduate coursework, taking approximately 3 1/2 years of full-time study.

**Track 2** requires a minimum of 30 semester hours of undergraduate coursework. Both tracks require 6 hours of Thesis 500 with a public presentation and oral defense of the thesis. An enrollment in the program is contingent upon evidence of satisfactory progress toward the degree. Each student's progress will be reviewed each semester by the Coordinator of Graduate Studies. Any questions regarding progress will be reviewed by the Graduate Program Advisory Committee.

**For further information, contact the School of Architecture.**

**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 B.Arch. program in Architecture is available to residents of the states of Maryland, South Carolina, or West Virginia.

Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

- 400 Service Practicum (0) Experience in architectural or equivalent office for a minimum of 3 months to be completed prior to fifth year entry.
- 403 Introduction to Preservation (3) History, theory, and legal aspects of architectural preservation and restoration.
- 405 Descriptive Analysis of Historic Buildings (3) Identification and analysis of characteristic elements of buildings from various architectural periods, American architecture. Survey techniques.
- 406 Ideas in Architecture (3) Historical and critical review of major ideas of architecture through the ages. Open to all students.
- 409 Cultural Comparison of Housing Patterns (3) Networks of spatial organization and discrete elements of design for specific cultures with emphasis on housing. Cultural, social, economic, climatic, and technical forces as sources of form.
- 410 History and Theory of Urban Form (3) Patterns of community development. Selected 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.
for the student not otherwise registered during any
502 Registration for Use of Facilities (3-15) Required
500 Thesis (1-15) P/NP only. E
511 Graduate Seminar: Environmental Influences (3) Environmental factors which influence regional character of architecture. Natural forces associated with these factors, cultural interpretation and response regarding importance and impact. Coreq: 571.
514 Graduate Seminar: Ethical Imperatives (3) Social, cultural, philosophical and moral issues which impact professional responsibilities. Attitudes, values, and ideas that address formation of profession's ethos.
521 Principles of Architectural Form (3) Historical and contemporary architectural form through investigation of literature and related examples. Theorizing of the cultural and environmental focus. Coreq: 571.
551 Introduction to Research Methods (3) Quantitative and qualitative research methods in architectural inquiry. Systematic study of applied and speculative investigations in the field of architectural research. Review of theories and methodologies for architectural research and scholarship.
552 Application of Research Methods (3) Projects and case studies applied to methods of architectural research and scholarship identified in 551.
562 Professional Practice (3) Management and organizational theories and practices for delivering professional design services: assessment of building industry and its influence on practice; analysis of management structures within professional firms; legal and ethical concerns facing practitioners today and introduction to special obligations and privileges of design professional.
571 Architectural Design Studio/Seminar I: Environmental Forces (6) Environmental forces influencing regional character of architecture. Examination of associated natural forces and cultural interpretation. Readings and discussions; application in design studio to specific projects. Prereq: Design II. 1 hr and 5 labs.
573 Architectural Design Studio/Seminar III: Cultural Aesthetics (6) Role of cultural influences on architectural form. Investigations into relationship between place and culture and impact on architectural character. Readings and discussions; process of formal synthesis in design studio. Prereq: Design II. 1 hr and 5 labs.
591 Foreign Study (1-9)
592 Off-Campus Study (1-9)
593 Independent Study (1-9)

The Master of Fine Arts is the terminal degree in studio art. It is offered in the concentration areas of ceramics, graphic design/illustration, drawing, fiber-fabrics, painting, printmaking, sculpture, and watercolor. Interdisciplinary areas 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 including statement requesting assistantship, if desired.
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. Further information is available by writing to the Department of Art.
M.F.A. Requirements
A minimum of 60 hours is required:
1. Successful completion of 20 hours of studio in a concentration area. An 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 academic 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 directly address the need and relevance of this substitution to the student's concentration.

Four semesters beyond the Bachelor of Fine Arts degree are required in residence. An exception is made for working professional designers who may complete their first 20 hours, with the permission of the faculty, on a part-time basis. Residence is defined by the Department of Art as (1) a minimum enrollment of 6 hours per semester and (2) use of Department of Art facilities so that students are available for discussion and 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. Each member of the committee shall be as follows: one from the candidate's concentration area who shall be the major professor, one from art history, and one from a studio discipline outside the concentration area.

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

Academic Standards
1. First-year evaluation: At the end of the first 2 semesters in residence, the student must present a portfolio for evaluation by the faculty and receive permission to continue in the program.
2. Second-year evaluation: With completion of all courses, 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 Knoxville on an in-state tuition basis. The M.F.A. program in Art is available to residents of the following states: Alabama (concentration in watercolor only) or Arkansas (concentration in graphic design/illustration only).

Additional information may be obtained from the admissions specialist 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 German, French, or Italian, unless waived by the Art History faculty.

GRADUATE COURSES
400 History of Photography (3) Survey of history of photography from introduction of daguerreotype and calotype to more recent trends. Aesthetics and use of photography as medium for artistic expression. Prereq: 201 and 300. May be repeated. Maximum 6 hrs.

401 Individual Class Projects in Fabric (3-6) Prereq: Two-Dimensional Fabric. Three-Dimensional Fabric or consent of instructor. May be repeated. Maximum 12 hrs.

402 Individual Class Projects in Fiber (3) Prereq: Two-Dimensional Fiber. Three-Dimensional Fiber or consent of instructor. May be repeated. Maximum 12 hrs.

404 Computer Enhanced Design (3) Exploration of computer systems, software and techniques. Prereq: Introduction to Computer Enhanced Design or consent of instructor. May be repeated. Maximum 6 hrs.

405 Advanced Computer Enhanced Design (3) Prereq: 404 or consent of instructor. May be repeated. Maximum 6 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; supervision 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 Glasses (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 vessel aesthetic. Slide lectures and individual presentations. May not be used toward art history requirement. Prereq: 321 and 322.

426 Klinx: 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.
562 Graduate Printmaking-intaglio II (2-6) May be repeated. Maximum 10 hrs.

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

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

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

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

Astronomy

See Physics and Astronomy

Audiology and Speech Pathology

(Majors of Liberal Arts)

DEGREES

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

Patrick J. Carney, Head

Professors:

Asp, Carl W., Ph.D. ................................ Ohio State
Carney, Patrick J. (Liaison), Ph.D. .............. Iowa
Luper, Harold L., Ph.D. ........................... Ohio State
Nabelel, Igor V., Sc.D. ............................. Prague
Peterson, H. A., Ph.D. ............................. Illinois
Silverstein, B., Ph.D. ............................. Purdue

Associate Professors:

Buchfield, Samuel B., Ph.D. ....................... Michigan State
Farrell, Charles J., M.A. ........................... Tennessee
Thelin, J. W., Ph.D. ................................ Iowa
Wallace, Gloria Jean L., Ph.D. ............... Northwestern

Assistant Professor:

Gordon, Pearl A., Ph.D. ............................ Tennessee
Krishnan, Ravi A., Ph.D. .......................... Texas

THE MASTER'S PROGRAM

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

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

Students majoring in one of the two areas are expected to complete the academic requirements for clinical certification from the American Speech-Language-Hearing Association, including the required number of clock hours of clinical practicum (minimum 250 hours as a graduate student, 375 total). An exception to this rule must be approved by the appropriate departmental committee. Enrollment in clinical practicum courses is required for all clinical practice experiences. If the undergraduate preparation does not include sufficient coursework in speech pathology, audiology, psychology, and related fields, the student may be required to make up such deficiencies.

Students may elect either the thesis or the non-thesis option. Students in both programs are required to take 511. The Master's program with thesis will include a minimum of 30 semester hours of approved graduate credit in
speech language pathology or a minimum of 33 semester hours of approved graduate credit in audiology, including 6 semester hours of independent study, the preparation of an acceptable thesis representing original independent work, and a final oral examination. At least two-thirds of these total hours must be at the 500 or 600 level, including no more than 6 hours of thesis and no more than 6 hours of practicum. Students in the thesis option program must present a total of 36 semester hours in the speech language pathology program or 39 semester hours in the audiology program of approved graduate credit and pass a final written examination.

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

The total program is a minimum of 60 semester hours, including a minimum of:
1. 24 semester hours in dissertation 600.
2. 6 semester hours in a research tool.
3. 6 semester hours in a cognate area outside the department.
4. 24 semester hours in 600-level course work 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;
   d. 3 semester hours in supervised teaching experience.
5. A comprehensive examination to demonstrate scholarly knowledge of audiology, speech and language pathology, and speech and hearing science; and advanced knowledge of the specific area of concentration.
6. A final oral examination.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

411 Stuttering (3) Nature, appraisal and treatment. Prereq: 504 or consent of instructor. May be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.

423 Observation of Clinical Practice (1) Prereq: Speech and Language Development, Articulation Disorders, or consent of instructor. (Same as Special Education 433.)

433 Clinical Practice in Speech-Language Pathology II (1-4) Prereq: 423 and consent of instructor. Enrollment for less than 2 hrs must have prior departmental approval. (Same as Special Education 434.)

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

455 Problems in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

461 Introduction to Language Pathology in Children (3) Nature, etiology and language treatment in children: observations of language therapy. Prereq: 520 or consent of instructor.

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

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

494 Aural Habilitation/Rehabilitation of the Hearing Impaired (3) Psychosocial aspects, amplification components/characteristics, assistive devices, speech acoustics, speech perception, speech reading, parent-infant, preschool school years of children, communication impairments/ handicaps/ remediation of adults, effects of aging/ remediation on the elderly, and case studies. Prereq: Phonetics and Acoustics of Speech and 473, or equivalents or consent of instructor.

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 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 Appraisal of Speech and Language Disorders (3) Diagnostic procedures for children and adults with speech and language problems including observation and practical with diagnostic tests. Prereq: Communication Disorders, Phonetics and Acoustics of Speech, and 433, or equivalents or consent of instructor.

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

507 Anatomy and Physiology of Hearing (3) Structure and function of the peripheral and central auditory systems, and their roles in mediating auditory processes. Prereq: 473 or equivalent or consent of instructor.

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

512 Clinical Practice in Audiology (1-4) Prereq: 473 and 494. May be repeated. Maximum 5 hrs.

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

514 Practicum in Verbal-Tonal Habilitation (1-4) Prereq: 494, 565, or consent of instructor. May be repeated. Maximum 6 hrs.

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

517 Instrumentation in Audiology and Speech Pathology (3) Principles of instrumentation in audiology and speech pathology assignment for familiarization of students 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 and clinical diagnosis and management of articulation and voice disorders. 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.

532-53-54 Advanced Clinical Practice in Speech-Language Pathology (1-4, 1-4) Prereq: 433 or equivalent and consent of instructor. 534 may be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.

535-38-37 Advanced Clinical Practice in Speech-Language Pathology: 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.

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

539 Motor Speech Disorders (3) Neurophysiology, organization for speech production: types of motor speech disorders and associated neuromuscular symptomatology; diagnosis and management of motor speech disorders. Prereq: 506.


542 Hearing Disorders (3) Effects of heredity, development, aging, diseases, and physical agents on hearing. Prereq: 473 or equivalent or consent of instructor.


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 Audiology Theoretical (3) Theoretical bases for behaviorial and acoustic immittance measurement. Prereq: 473 or equivalent or consent of instructor.

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 test of audiology. May be repeated. Maximum 6 hrs.

549 Hearing Science (3) Study of psychoacoustic phenomena and how they relate to perception and diagnostic audiology. Prereq: 473, 507, and 546 or equivalents or consent of instructor.

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

552 Seminar in Speech Pathology (2-3) Special significant research in speech pathology. Topics vary. Prereq: 504 or consent of instructor. May be repeated. Maximum 9 hrs.

554 Seminar in Multicultural Issues in Communication Disorders (3) Discussion of current research relevant to cultural language differences. Prereq: 465 or equivalent or consent of instructor.
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-Heavy Personnel (3) Management system accountability, performance appraisal and clinical supervision 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. Prereq: 461 or consent of instructor. May be repeated. Maximum 6 hrs.

562 Practical Applications of Language Habilitation Techniques (3) Various methods and procedures used in treating delayed/disordered preschoolers. Alternatively, pragmatics of research on acquisition and use of language: phonology, syntax, semantics and pragmatics. Prereq: 517 or consent of instructor. May be repeated. Maximum 6 hrs.

563 Practical Applications of Language Habilitation Techniques (3) Various methods and procedures used in treating delayed/disordered preschoolers. Alternatively, pragmatics of research on acquisition and use of language: phonology, syntax, semantics and pragmatics. Prereq: 517 or consent of instructor. May be repeated. Maximum 6 hrs.

569 Seminar in Speech Science (2) Experimental areas: speech physiology, acoustic analysis, recognition and intelligibility of speech, communication theory, and psychological measurement of speech and language. Topics vary. Prereq: 601 or consent of instructor. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) P/NP only. May be repeated. Maximum 8 hrs.

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

602 Psychocoustics (3) Auditory perception and reception of non-speech and speech stimuli. Prereq: 517.

603 Language Science (3) Seminar in theories and paradigms of speech production and overall oral communication. Prereq: Graduate standing and consent of instructor.


608 Seminar in Speech Science (2) Experimental areas: speech physiology, acoustic analysis, recognition and intelligibility of speech, communication theory, and psychological measurement of speech and language. Topics vary. Prereq: 601 or consent of instructor. May be repeated. Maximum 6 hrs.

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

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

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

652 Advanced Seminar in Speech and Language (2) Topics vary: aberrations of voice, articulation, speaking time and rhythm, language development or use, and language symbolization. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

655 Practicum in College Teaching (1-3) Supervised experience in college teaching. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. SNC only.

656 Directed Research (1-4) Participation in ongoing or non-dissertational research. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

660 Directed Study in Speech Science (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

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

665 Practicum in College Teaching (1-3) Supervised experience in college teaching. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. SNC only.

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

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

690 Directed Study in Speech Science (1-3) Prereq: 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:
Collins, F. G., Ph.D. .................. California
Mason, A. A., Ph.D. ...................... Tennessee
Wu, J. M., Ph.D. ............ Cal Tech
Young, R. L. (Emeritus), Ph.D. .... Northwestern

Associate Professors:
Kimberlin, R. D. (Liaison), Ph.D. ................................ RWTH (Germany)

Assistant Professor:
Sollies, U. P., Ph.D. .................. Tennessee

The University of Tennessee Space Institute offers a program leading to the Master of Science degree with a major in Aviation Systems. The Aviation Systems program is designed for those who possess a Bachelor's degree in engineering or science and wish to study under a "system philosophy" toward careers in research and development or administration in areas pertinent to aviation. Current emphases include flight testing, aircraft design, aviation meteorology, air traffic control, and airport management.

To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science from an accredited institution, show evidence of ability to pursue and benefit from the program, and fulfill The University of Tennessee at Knoxville 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 550.
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.
Biochemistry (College of Liberal Arts)

**MAJOR DEGREES**

**Biochemistry**

M.S., Ph.D.

John W. Koontz, Head

**Professors:**

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

Howell, Elizabeth E., Ph.D. .......... Lehigh
Koontz, John W. (Liaison), Ph.D. ....... Kentucky
Roberts, Daniel M., Ph.D. .......... California (Davis)
Serpersu, Engin H., Ph.D. .......... Kestate

**Assistant Professors:**

Bruce, Barry, Ph.D. ................. California (Berkeley)
Feinberg, R. H. (Emeritus), Ph.D. .... California
Peterson, Cynthia B., Ph.D. ....... LSU

**Adjunct Faculty:**

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

**THE MASTER’S PROGRAM**

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

**THE DOCTORAL PROGRAM**

1. Introductory Organic Chemistry*.
2. Differential and Integral Calculus*, approved physical chemistry, and at least 12 hours of biology beyond the introductory level.
3. Biochemistry 511-12 and 515-16.
4. At least two approved graduate courses in chemistry, physics, or other physical sciences.
5. Participation in 601 and 603 during the entire period of residence.
6. A comprehensive examination, taken before the end of the third year of study.
7. A dissertation reporting the results of original and significant research carried out during the term of candidacy.
8. A final oral examination which will be concerned primarily with the student’s dissertation.

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

**Petitioning for Master's Degree**

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

1. The preparation of a research report or thesis appropriate for publication in a major scientific journal.
2. A scholarly presentation before an examining committee of three faculty members appointed by the head of the department, at least two of whom shall be members of this department; or
3. Publication of at least one full-length paper in a major biochemistry journal as senior author.

**GRADUATE COURSES**

- Biochemistry
- Mechanical Engineering 588 and Aerospace Engineering 588.

**599 Measurement Science II (3)** (Same as Nuclear Engineering 588 and Engineering Science and Mechanics 589.)

**550 Project in Aviation Systems (3)** Enrollment limited to Aviation Systems students in non-thesis program. May be repeated. Maximum 3 hrs allowed toward degree.


**550 Project in Aviation Systems (3)** Enrollment limited to Aviation Systems students in non-thesis program. May be repeated. Maximum 3 hrs allowed toward degree.

**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.)

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

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

**502 Registration for Use of Facilities (3-15)** Required for the student not otherwise registered during any semester. Prereq: Consent of University facilities and/or faculty. May be repeated. Maximum 24 hrs allowed toward degree requirements. May be repeated. S/N/C only.

**503 Air Vehicles (3)** Current capabilities and future requirements for civilian and military air vehicles. Parameters significant for the selection and integration of an air vehicle into its systems. Prereq: 501.


**505 Environmental Policies for Aviation (3)** Environmental and legal basis for economic and governmental regulation of aviation. Historical and legislative development of aviation regulations. Interfaces, administrative and enforcement procedures. Prereq: 501.

**561 Aircraft Design (3)** Design process, compromise of conflicting requirements, economical, industrial, and legal aspects. Definition and requirements, synthesis and optimization techniques, safety and reliability systems, integration, standards and regulations, teamwork and decision-making process. Prereq: Consent of instructor. May be repeated with consent.


**585 Experimental Techniques I (3)** Modern experimental philosophy and instrumentation in laboratories. 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. Prereq: 515. Sp

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; reductive toxicology: mutagenesis, teratogenesis, carcinogenesis; pathologic changes and environmental impact. Prereq: 410. Chemistry 350-5100-60 of consent of instructor. (Same as Ecology 561.) F

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

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

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

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

605 Current Topics in Regulation of Protein Function (1) Covalent modifications of proteins by phosphorylation-dephosphorylation allosteric interaction. Prereq: 410 or equivalent. May be repeated. Maximum 5 hrs. S/N only. F,Sp

606 Current Topics in Biological Membrane Research (1) Required. Prereq: 410 or equivalent. May be repeated. Maximum 9 hrs. (Same as Microbiology 606.) S/N 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 biochemistry. Prereq: 511-12 or consent of instructor. May be repeated. Maximum 9 hrs.

Cook, John S., Ph.D. Princeton
Fry, R. J. M., M.D. Dublin
Godfrey, Virginia L., D.V.M., Ph.D. Tennessee
Jacobson, K. Bruce, Ph.D. Johns Hopkins
Kendall, Steve Ph.D. California (San Diego)
Lee, Kai-Lin, Ph.D. Florida State
Littlefield, Gayle, Ph.D. Georgia
Maur, Peter, Ph.D. Harvard
Mizuki, Richard, Ph.D. Georgia
Nigogi, Sali K., Ph.D. Northwestern
Popp, Raymond A. (Lausanne), Ph.D. Michigan
Russell, Jane B., Ph.D. Chicago
Shugart, Lee H., Ph.D. North Dakota
Solomon, A. M., Ph.D. Duke
Stevens, Audrey L., Ph.D. Western Reserve
Stubbis, Lisa J., Ph.D. California (San Diego)
Terzaghi-Howe, Peggy, D.Sc. Harvard
Vo-Dinh, Tuan, Ph.D. Swiss Fed IT
Watters, Larry C., Ph.D. Georgia
Whitcomb, Richard R., Ph.D. Case Western
Yang, Wen K., M.D., Ph.D. Tulane

The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, located within the Biology Division of Oak Ridge National Laboratory, offers programs leading to the Master of Science and the Doctor of Philosophy. The National Laboratory is a well- known center of basic research. The school utilizes the staff and facilities of this laboratory and thus brings students directly into the mainstream of full-time graduate study in the life sciences the talent and experience of that staff, as well as the most advanced research methods and technology. The program of study, which incorporates a high faculty-student ratio, is based on extensive and efficient courses supplemented by tutorial instruction, participation in a wide variety of seminars, and a heavy emphasis on communication skills, research training, and independent study. The program encourages students to pursue advanced studies in the limits of their abilities.

Each student's curriculum is planned to meet individual needs, with the aim of giving: (1) strength in the basic sciences; (2) perception of the biomedical sciences as a whole; and (3) experience and training in a chosen specialty. The concentration areas available for Master's thesis and Ph.D. dissertation work are biochemistry, biophysics, biopharmaceuticals, genetics, cellular development and mammalian biology, and radiation biology. Included are such subjects as immunology, protein and enzyme chemistry, nucleic acid chemistry, cytology, radiation and environmental biology, virology, development and experimental pathology, microbial and mammalian genetics, and problems of aging.

ADMISSION REQUIREMENTS
A Bachelor's degree or its equivalent is required. Students with M.S., D.V.M., or M.D. degrees are also encouraged to apply. Completed applications, Graduate Record Examination scores and letters of recommendation should be submitted. The student will need preparation in biology, calculus, physics, and organic 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 admissions, financial support, and housing should be sent to Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, Box 2009, 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); Cell Biology (518); 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 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 (518-19); plus any three of the following courses: Genetics (515); Molecular Genetics (517); Statistics for Biologists (574); or Computing for the Life Sciences (526).

Additional credits may be obtained (6 to 15 hours) with electives.
2. Thirty hours of approved graduate courses including B hours for thesis.
3. For admission to candidacy: Completion of any required prerequisite courses and one semester of graduate coursework with a B average. Admission to candidacy forms must be filed at least one full semester prior to receipt of degree.
4. A Master's committee of three approved faculty members upon admission to candidacy.
5. A thesis reporting results of original and significant scientific research.
6. Passing a final oral examination.

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

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

MAJOR

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

Edward E. Schilling, Head

Professors:

Caponetti, J. D., Ph.D. ................. Harvard
Clausch, E. E. C., Ph.D. .......... Duke
DeSelms, H. R. (Emeritus), Ph.D. .... Ohio State
Evans, A. M. (Emeritus), Ph.D. ......... Michigan
Hernon, W. R. (Distinguished Prof.), Ph.D. .... Vanderbilt
Hickok, L. G., Ph.D. .... Massachusetts
Holton, R. W., Ph.D. .................. Michigan
Hughes, K. W., Ph.D. ................. Utah
Jones, L. W., Ph.D. ................. Texas
Mc Cormick, J. F., Ph.D. ............... Emory
Mullin, B., Ph.D. .................. NC State
Norris, F. H. (Emeritus), Ph.D. ........ Ohio State
Petersen, R. H. (Distinguished Prof.), Ph.D. .... Columbia
Schilling, E. E. (Liaison), Ph.D. ....... Indiana
Sharp, A. J. (Emeritus), (Distinguished Prof.), Ph.D. .... Ohio State
Smith, W. O., Ph.D. ................. Duke
Wu, P. L. (Distinguished Prof.), Ph.D. .... Texas

Associate Professors:

Amundsen, C. C., Ph.D. ............... Colorado
Heilman, A. S., Ph.D. ............... Ohio State
Schwarz, O. J., Ph.D. .............. NC State
Smith, D. K., Ph.D. ................. Tennessee
Wolfford, B. E. (Curator), Ph.D. .... Tennessee

Assistant Professor:

Cruzan, M. B. C., Ph.D. .... SUNY (Stony Brook)

Lecturer:

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

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, biology, botany, cytology, cytogenetics, ecology, genetics, lichenology, morphology, mycology, phytology, physiology, psychology, pteridology, and taxonomy.

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

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

ADMISSION REQUIREMENTS

The Botany Department requires scores from the general and biology subject 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 and 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; general 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 sciences is considered to be of much more importance than the particular courses taken as an undergraduate. Accordingly, students lacking specific prerequisite 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-term 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 usual route taken by botany students for the M.S. It is important that the entering student promptly identify a major professor and a suitable research project. The requirements for the thesis option consist of the following:

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 502.
2. Successful completion of 30 hours of graduate credit, at least two-thirds of which must be at the 500 level or higher.
3. Satisfactory completion of two hours at the 600 level.
5. Presentation of a 30 minute departmental seminar.
6. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.

Non-Thesis Option

1. 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 required for the degree.

The student's committee may also require that an oral examination follow the written examination.

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

506 Phycology (4) Comparative study of major algal phyla, both freshwater and marine; morphological, developmental, ecological, and taxonomic 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 graphic design, photography, and presentation for research and publication of data in pictorial and graphic form.

509 Morphology and Evolution of Basidiomycetes (4) Structure and function of somatic and sexual life cycles as applied to evolution in groups. Prereq: 310 or equivalent.

510 Introduction to Electron Microscopy - Transmission Electron Microscopy (4) (Same as Zoology 510.)

516 Biosystematics (3) Major experimental methods in heritability in plants and their classification and order in systematic studies. Prereq: 310 or equivalent.

521-22 Advanced Plant Physiology I, II (3, 3) 521- Advanced Plant Physiology I: Plant biochemistry and metabolism; respiration, photosynthesis, Calvin cycle, and biosynthesis of specialized plant products. Prereq: 310 or equivalent. 2 firs and 1 lab. F, A

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

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

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

538 Seminar in Botany (1) Readings and discussion of current literature and selected topics in botanical research. May be repeated. Maximum 8 hrs. S/N/C only.


565 Phytoplankton Ecology (3) Interaction between environment and phytoplankton. Nutrient uptake, primary production, competition, 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.)

580 Bryophytes and Lichenophytes (4) Taxonomy, phycology, ecology and development of mosses and liverworts. Prereq: 431, 535 or 573.

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

582 Methods and Instrumentation in Laboratory Investigation (3) Project experience and theoretical background in various research methods, ion exchange resins, adsorption spectrophotometry, electron microscopy, polyacrylamide gels, ultracentrifugation, gas chromatography, atomic absorption spectrometry, mass spectrometry, and modern techniques. 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 sites, designing methods, and location for research on populations, communities, and ecosystems. Field practice. Development of and critique of research proposals and techniques required by granting and contracting agencies. Prereq: 431, 535 or 573.

584 Methods and Instrumentation in Field Investigation (1) Approaching 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 plants from vegetative and reproductive organogenesis, and of organ differentiation and development. Prereq: 310, 320 or 412 and 321 or 521 or consent of instructor. 2 hrs and 1 lab. F, A

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

606-07 Advanced Topics in Botanical Sciences (1-3) Experimental botanical science: nomenclature, morphology and systematics of vascular plants, cryptogamic botany, cytology and cell biology, genetics, plant physiology, palynology and ecology. May be repeated. Maximum 12 hrs.

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

635 Environmental Assessment and Sustainable Development in Third World Countries (3) (Same as Geography and Planning 635.)

662 Seminar in the History of Botany (2) History of botanical exploration and advances from early civilization to modern period. May be repeated. Maximum 4 hrs.

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**Broadcasting**

(Graduate Courses)

**MAJOR DEGREES**

Barbara Moore, Acting Head

Professors:

Holt, Darrel W. (Emeritus), Ph.D. ........................................ North Central

Howard, Herbert H., Ph.D. ........................................ Ohio

Swan, Norman R., Ph.D. ........................................ Missouri

Associate Professors:

Moore, B. A., Ph.D. ........................................ Ohio

Ziegler, Dhyana, Ph.D. ........................................ Southern Illinois

Assistant Professor:

Miller, Evelyn, Ph.D. ........................................ Ohio State

Wilkinson, Jeffrey, Ph.D. ........................................ Georgia

Adjunct Professor:

Nelson, Lindsey, B. A. ........................................ Tennessee

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

**GRADUATE COURSES**

410 Television News (3) Writing, reporting, performing, and producing news for television. Experience as reporter or producer for television news program. Electronic news gathering equipment and techniques, video editing. Prereq: 310. 1 hr and 4 labs. E

420 Television Sales and Promotion (3) Problems and practices of television and cable sales and promotion. Case studies in sales and sales management; use of
Business Administration

(Admissions Office)

MAJOR DEGREES

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

The College of Business Administration offers two college-wide programs, the MBA and the Ph.D. with a major in Business Administration. Two tracks are available for the MBA: the regular, full-time program and the executive program. A dual degree program is also available with the College of Law leading to the J.D.-MBA. To obtain application materials, write or call: Office of Graduate Programs, Suite 527, Stokely Management Center, College of Business Administration, The University of Tennessee, Knoxville, TN 37996-0556. Telephone: (615) 974-5033. For the executive program, telephone (815) 974-1660.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state basis. The Ph.D. in Business Administration is available to residents of Alabama, Florida, or Kentucky; concentration in logistics and transportation only), West Virginia; the MBA is available to residents of Alabama, Florida, Louisiana (concentration in logistics and transportation only); Kentucky (concentration in venture analysis and entrepreneurship only) or Arkansas. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

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 exposed to the assessment and delivery of the ethical and legal environment of the firm); the role of the firm in society (with attention to stakeholder value, economics, and the ethical and legal environment of the firm); and personal and team development. Students will be exposed to the assessment and delivery of the 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. However, admission preference will be given to applicants with full-time work experience after obtaining the undergraduate degree.

Restrictive

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

MBA Core

The MBA core consists of two 15-hour courses, one taken each semester. The courses are taught by the MBA core faculty in an integrated fashion and provide a year-long simulation requiring students to learn the functional fundamentals (accounting, finance, management, marketing) when they need to apply them to solving a specific business problem. The topics introduced within this course follow these themes: the functional fundamentals (learned within a cross-functional framework); the role of the firm in society (with attention to stakeholder value, economics, and the ethical and legal environment of the firm); and personal and team development. Students will be exposed to the assessment and delivery of the 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. However, admission preference will be given to applicants with full-time work experience after obtaining the undergraduate degree.

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of customer value, statistical process control, continuous systems improvement, and the role of quality in competitive organizations.

Students in the first-year core undertake active learning within a team-based environment. Many core requirements are experiential exercises in which self-discovery within a team setting is an important element of the learning process. Individualized support is provided for developing both written and oral communication skills.

Concentration andElectives

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 15 hours of MBA program coursework. Requests for changes in concentration area must be submitted for approval to the Office of Graduate Business Programs.

Among the 24 credit hours in the concentration-electives block, at least 9 but not more than 12 must be in one of the following concentration areas. Specific courses required in concentration areas, see the appropriate field of instruction:
- Economics
- Environmental Management
- Finance
- Forest Industries Management
- Global Business
- Management
- Management Science
- Marketing
- New Venture Analysis and Entrepreneurship
- Statistics
- Logistics and Transportation

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

Transfer Credits

Graduate level courses taken at other institutions accredited by the American Assembly of Collegiate Schools of Business that otherwise conform to University policy may be credited toward MBA degree requirements within the following limits:
- Concentration Area: 3 hours (provided at least 6 hours of work at this institution are included in the concentration area).
- Elective Area: 3 hours.

Because of the fully integrated nature of the first-year curriculum, no credit hours are transferred into this core curriculum. The maximum number of hours that may be transferred to elective and concentration areas is 6 semester hours. Transfer credit will be considered upon formal petition to the Director of 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 in the College of Business Administration. It should be submitted to the Graduate Office at least one full semester prior to the date the degree is conferred. (Admission to candidacy in the fall semester permits graduation in the following spring semester.)

To qualify for the degree, the student must achieve a B average (3.0) or above in MBA core courses required in his/her program, a B average or higher in courses comprising the concentration area, and a B average or higher in the overall program. Each student must write a satisfactory analysis of a comprehensive case administered at the end of the first year.

BUSINESS ADMINISTRATION CONCENTRATIONS

For complete listing of MBA program requirements, see above.


In recognition of the growing globalization of business activity and the importance of the international environment to successful management of every firm, the MBA program offers a concentration in global business. The concentration comprises at least two courses taken from Economics 242, Logistics 507, Management 571, and departmental special topics courses with international content; and at least one but not more than two additional courses from the previous list, or from a list of electives as approved by the Director of Graduate Business Programs. Students pursuing a concentration in global business are strongly encouraged to pursue an international internship to develop skills required by the global business environment.

Students pursuing this concentration are also strongly encouraged to pursue an international internship to develop skills required by the global business environment. Students pursuing this concentration may also be required to complete an additional course in the concentration area. Students pursuing this concentration must be approved by the Director of Graduate Business Programs. Students pursuing a concentration in global business have the option to complete a dual concentration.

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

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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. Each student must write a satisfactory analysis of a comprehensive case administered at the end of the first year.

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

Because of the fully integrated nature of the first-year curriculum, no credit hours are transferred into this core curriculum. The maximum number of hours that may be transferred to elective and concentration areas is 6 semester hours. Transfer credit will be considered upon formal petition to the Director of Graduate Business Programs.
assign students to advisors who will be responsible for course approval and supervision of the student's progress through the dual program.

Curriculum

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

The College of Law will award up to 9 semester hours of credit toward the J.D. for acceptable performance in approved graduate-level courses offered by the College of Business Administration. The College of Business Administration will award up to 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 may not enroll in J.D. coursework while completing the first year of the business curriculum. During the first year in the J.D. program, students register through the College of Law. For any term 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 Director of Graduate Business Programs.

Awarding of Grades

Grades for graduate business courses accepted by the College of Law and grades for law courses accepted by the College of Business Administration will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college in which such grades are so converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for a 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.

Approved Dual Credit

MBA courses to be counted toward the J.D. program must include 9 semester hours approved by the College of Law. Law courses to be counted toward the MBA must be selected from those approved by the Director of Graduate Business Programs.

EXECUTIVE MBA PROGRAM

The executive MBA is designed for professionals holding middle and upper level positions in organizations that wish to support their attainment of an MBA degree for the benefit of both company and individual. The objective of the program is to provide advanced management skills to individuals who play key roles in leading their organizations.

The executive track of the MBA is three consecutive terms completed in one year. Each term requires two residence periods on campus alternating with a continuous program of reading, study and on-the-job applications off campus. The off-campus work requires substantial and regular contact with program faculty and other participants and includes scheduled assignments to be carried out.

The program consists of four core courses and a 9-hour sequence which is a project of diagnosis and analysis of a significant strategic issue in the sponsoring organization.

Admission Requirements

All participants begin and complete the program together in one twelve-month period. Sessions begin in January of each year. Final deadline for applications is October 10 of the preceding calendar year. For applicants who wish to make plans early in the preceding year, there is an advance reservation deadline of August 1. International students and students whose native language is not English must meet special requirements for admission to The Graduate School of the University of Tennessee, College of Law, and they are advised to make inquiries well in advance of the program application deadline.

To be considered for admission, the applicant must have a bachelor's degree and 10 or more years of work experience. Applicants must submit a complete application file including transcripts of prior college work, the executive MBA program application with a recommendation from his/her company, and the Graduate Management Admissions Test (GMAT) score report. The first items should reach The Graduate School one month before the MBA application deadline to allow for processing.

For admission to this program, primary consideration is given to the applicant's work history and the recommendation from the sponsoring organization and the GMAT. There is no cut-off for either grade-point averages or GMAT scores, however, admission to the program is competitive, and applicants will be evaluated on their ability to operate on a par with other high achieving participants.

Curriculum

The program is taught by a core faculty of 10 professors assisted by other faculty on an ancillary basis. The core faculty develop the entire curriculum and teach it in an integrated, interdisciplinary manner.

The MBA program for executives is completed in three terms and requires registration for 15 hours in each term. The first term is comprised of Executive Core I and Management Project I; it includes two residence sessions. The second term is comprised of Executive Core II and Management Project II; it includes two residence sessions. The third term is comprised of Executive Core III and Management Project III. It includes two residence sessions, the first of which will be in some international venue.

The core courses are a full-term curriculum with reading and study, case work and problem solving, as well as analyses and applications within the sponsoring organization during the off-campus periods. The topics introduced within these courses follow five major themes: the functional fundamentals (learned within a cross-functional framework); the role of the firm in society (with attention to the stakeholder value, economics, and the ethical and legal environment of the firm); the role of the firm in the global environment; organizational culture change management; and personal and team development.

Students will be exposed to the assessment and delivery of customer value, statistical process control, continuous improvement, and the role of quality in competitive organizations.

The management project, to be carried out as an independent study project, involves the development and analysis of some significant aspect in the sponsoring organization and will be based on applying major themes in the core courses. The written project and presentation to senior management and faculty serves as the comprehensive examination.

All of the off-campus work will require substantial and regular contact with faculty and other program participants.

Transfer Credits

Because of the integrated nature of the curriculum, no credit hours for courses already taken may be substituted for those in the executive program of the MBA.

Other Requirements

The Application for Admission to Candidacy must be approved by three faculty members and the Dean of the College of Business Administration. It should be submitted to the Office of Graduate Admissions and Records by the end of the fourth residence session, for graduation at the end of the third term.

THE DOCTORAL PROGRAM

The primary objective of the Ph.D. in Business Administration is to prepare a select number of qualified 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 standing compared with other applicants and with the number of vacancies in each department. The Graduate School requires the Graduate School Application, transcripts from all previous college work, and additional information from international students. The college requires the Ph.D. application, scores from the GMAT, and four written recommendations. All materials should be received by the College of Business Administration not later than March 1. Late applications are considered only if space is available.

Under exceptional circumstances, a student may be considered for acceptance into the Ph.D. program without having a Master's degree. An applicant in this situation should have an outstanding academic 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, 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/Transportation

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

Degree Requirements

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

1. Students must complete at least three years of full-time coursework beyond the baccalaureate degree, with two years of residence on the Knoxville campus.
2. Students must complete appropriate courses at the graduate level, or other approved concentrations of coursework, in the following areas:
   - Accounting
   - Behavioral Science
   - Calculus
   - Computer Science
   - Economics
   - Finance
   - Management
   - Marketing
   - Statistics
   - Business Policy
   - Legal Environment
   - Calculus
   - Computer Science
   - Economics
   - Finance
   - Management
   - Marketing
   - Statistics

All work in the above areas is subject to approval by the temporary doctoral advisory committee and the Director of 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 psychometrics.

5. Concentrations: The concentration is the focal point of the Ph.D. program. Students are expected to master the literature and research techniques in the concentration area and to do quality research as evidenced by the preparation of an acceptable dissertation. A minimum of 12 semester hours of coursework is required, including at least 9 hours of doctoral seminars. Graduate work taken in the concentration at other institutions is considered by the temporary doctoral advisory committee in approving the specific coursework required. Available concentrations are: accounting, finance, management (operations management and strategic management), marketing, and logistics/transportation. 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 person seeking candidacy for the Ph.D. The concentration area examination is administered in two sessions of approximately four hours each and the cognate area examination in one session of approximately four hours. Written examinations may be supplemented with oral examinations. For a doctoral student having a cognate area in the College of Law, the results of 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 exam must be passed within the next 13 months.

Doctoral Committee

A doctoral student is advised to give serious attention early in the program to the composition of his/her doctoral committee. In accordance with Graduate School policy, the student and the major professor identify a doctoral committee composed of at least four faculty members, three of whom, including the chair, must be approved by the Dean of Graduate School. The doctoral committee must also include the major professor. The doctoral committee is responsible for the student's research and for the completion of the dissertation.

Admission to Candidacy

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

504 Core I (15) Development of roles and responsibilities of business manager. Functional fundamentals (accounting, finance, marketing, operations, human resource management) through year-long case in which knowledge is applied to solution of simulated real-world enterprise. Continuous systems improvement and delivery of customer value, role of firm in society (with attention to stakeholder value, economics, and the ethical and legal environment of firm). Personal leadership skills: teamwork, written and oral communication, and assessment of students' leadership abilities. Prereq: Admission to MBA program or consent of Director of Graduate Business Programs.

505 Core II (15) Continuation of 504. Functional fundamentals through year-long case. Study work on organizational, globally, competition, managing technology, ethics and social responsibility, and strategic planning. Capstone integrated business simulation. Prereq: 504 or consent of Director of Graduate Business Programs.

506 Information Engineering and Management (3) Design and management of information necessary to accomplish organizational objectives using activity blueprints, entity-relationship case design principles, view diagrams and ICASE (Computer-Aided Software Engineering) tools.

510 Management of Responsive Service Organizations (3) Management of organizations which respond to customer requests rather than to produce inventory: non-product economics, relationship building and management methods built on enabling, empowering, monitoring, and mentoring as they diagnose and respond to individual customer needs.

551 Executive Core I (12) Integrated semester course: two 11-day periods in residence with substantial reading, study and analyses during off-site periods. Integration of major business functions through strategic perspective, application of functional knowledge to tactical and strategic issues. Role of firm in society as it treats economic, legal, environment and develops purpose of firm as delivering value to customers and other stakeholders. Ethical issues. Personal development for leadership: individual, interpersonal skills of communication, negotiation, leadership and motivation. Customer value and systems management: determination and delivery of customer value. Cases, simulations and exercises. Prereq: Admission to executive program of MBA. Coreq: 561.
552 Executive Core II (12) Continuation of 551. Role of firm in environment and personal development for leadership. Customer value determination and delivery; systems management; strategic management issues at functional, business unit and corporate level. Prereq: 551. COREQ: 552.

553 Executive Core III (12) Continuation of 552. One 11-day period and one two-week period of residency at international site. Reading and study, analyses and applications within sponsoring organization. Role of firm in environment: global economic, legal and cultural issues; strategic management; policy deployment; topics and organizational culture, design and change management for global competition. National and international current issues. Prereq: 552. Coreq: 553.

561 Management Project I (3) Company project. Preliminary investigation of significant strategic issue (new initiative, program or significant organizational change) to enhance organizational effectiveness in sponsoring organization. Work within firm under guidance of faculty to develop proposal which defines issue and scope of project. Proposal to be approved by company and faculty. Prereq: Admission to executive program of MBA and cooperation of sponsoring organization. Coreq: 551.


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

Chemical Engineering

(College of Engineering)

MAJOR

DEGREES

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

Charles F. Moore, Head

Professors:

Bienkowski, Paul R., Ph.D..............Purdue

Bogue, Donald C., Ph.D..............Delaware

Byers, Charles H. (Adjunct), Ph.D........California

Clark, Edward S., Ph.D..............California

Counco, Robert M., Ph.D..............Tennessee

Crawford, Lloyd W. (UTSI), Ph.D........Cincinnati

Culberson, Oran L. (Emeritus), Ph.D........Texas

Cummings, Peter T. (Distinguished Scientist), Ph.D........Melbourne

Frazier, George C., Jr. (Condrea Prof.), D.Eng...........Johns Hopkins

Hansen, Marion G., Ph.D..............Wisconsin

Holmes, John M. (Emeritus), Ph.D........Tennessee

Hu, Helen-Wen (Emeritus), Ph.D........Wisconsin

Moore, Charles F. (Alumni Prof.), Ph.D........Louisiana State

Parish, Trueman (Adjunct), Ph.D........Rice

Perona, Joseph J., Ph.D, Ph.D........Northwestern

Prados, John W. (University Prof.), Ph.D........Tennessee

Scott, Charles D. (Adjunct), Ph.D........Tennessee

Sheht, Atul C. (UTSI), Ph.D............Northwestern

Thomas, Carl O., Ph.D..............Tennessee

Watson, Jack S., Ph.D..............Tennessee

Associate Professors:

Basaran, Osman A. (Adjunct), Ph.D........Minnesota

Brune, Duane D., Ph.D..............Houston

Cochran, Henry D. (Adjunct), Ph.D........MIT

Davison, Brian H. (Adjunct), Ph.D........Cal Tech

Downs, James E. (Adjunct), Ph.D............Tennessee

Phipps, Tommy J. (Adjunct), Ph.D............Wisconsin

Scott, Timothy C. (Adjunct), Ph.D............Wisconsin

Vogel, Ernest F. (Adjunct), Ph.D............Texas

Wang, Tse-Wei, Ph.D..............MIT

Weber, Frederick E., Ph.D..............Minnesota

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

THE MASTER’S PROGRAM

The Master of Science program includes a thesis and the Master of Science. Minimum departmental requirements are as follows:

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

Non-Thesis Option: 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 hours chosen from either 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, consisting of a written part and an oral part. The written part covers thermodynamics, reactor analysis, and transport phenomena and analysis.

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

GRADUATE COURSES

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

403 Introduction to Optimization (3) Principles and applications of optimization techniques to chemical processes; design unconstrained and equality constrained optimization problems; linear programming; dynamic programming, and geometric programming.

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


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

461 Advanced Process Dynamics and Control (3) Advanced control systems simulation and advanced industrial system design. Cascade, feedforward, multivariable, optimum, adaptive, and nonlinear control system design. Both computer and laboratory work. Lab. Prereq: 360.

466 Hydrocarbon Processing (3) Chemical and physical properties of hydrocarbons and those processes utilized in conversion of raw materials into various fuels and selected chemical feedstocks. Prereq: Mass Transfer and Separation Processes, Organic Chemistry.

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

501 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. S/NCR only. F, Sp

502 Registration for Use of Facilities (3-15) Required for resident 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/NCR only. E

505 Engineering Analysis (3) Formulation and solution of problems in chemical engineering and related areas; ordinary and partial differential equations; types of ODEs, boundary value problems; integral equations; conformal mapping; variational methods, introduction to numerical methods. (Same as Materials Science and Engineering 505.)

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

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

531 Advanced Chemical Engineering Thermodynamics (3) Phases, phase equilibrium, 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 Stage-wise Mass Transfer Operations (3) Analysis of mass transfer phenomena, coupled mass transfer and reactor operations, mass transfer in packed towers and agitated vessels, membrane separations. Equilibrium-stage concepts applied to mass transfer operation, emphasizing nonisothermal and multicomponent systems.

551 Chemical Reactor Analysis (3) Rate models for heterogeneous reactions, properties of porous catalysis, catalyst deactivation, fluid-fluid and fluid-solid reactors.

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

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

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


581 Industrial Pollution Prevention (3) Principles and practical aspects of industrial waste minimization. Regulatory environment, waste minimization strategies, econom
chemistry, inorganic chemistry, organic chemistry, physical 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 from the beginning of research.
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 600.
5. 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, and 590-94-95.
6. A final oral examination.

The Ph.D. program in concentration in chemical physics is conducted jointly with the Department of Physics. 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 5.

GRADUATE COURSES

430 Advanced Inorganic Chemistry (3) Atomic and molecular structure, bonding theories, descriptive chemistry of elements, kinetics and mechanisms of inorganic reactions, applications of modern techniques for characterization, coordination and organometallic chemistry. Prereq: 293. Prereq or coreq: 392 or 391. 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 or physics majors or minors. Prereq: Mathematics 122 or equivalent and 1 yr of general chemistry. F


471-81 Biophysical Chemistry (3,3) (Same as Biochemistry 471-81) 2

473-83 Physical Chemistry (3,3) Students may not receive credit for both 471 and 475 nor for both 481 and 483. 473—Properties of gases; first, second, and third laws of thermodynamics; chemical equilibria; simple phase equilibria; properties of solutions; introduction to statistical thermodynamics. 478—Kinetics of chemical reaction; introduction to quantum mechanics and applications to electronic structure of atoms and molecules; molecular spectroscopy. Prereq: General Chemistry, Fundamentals of Physics, and Calculus III. E

479-89 Physical Chemistry Laboratory (2,2) Experiments on topics discussed in 471-81. Prereq or coreq: Corresponding course 471 or 473-83. F

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

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

501 Chemistry Seminar (1) Lectures and discussion on current research. Prereq: 500. F

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

505 Special Problems (3) Special projects or experimental work on problems not covered in other courses. Prereq: Consent of department. May be repeated. Maximum 6 hrs. S/N only. E

510 Analytical Spectroscopy (3) Principles and practice of electronic and mass spectrometric techniques in quantitative chemical analysis. Prereq: 1 yr of physical chemistry. E

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

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

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

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. F

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

532 Experimental Methods of Inorganic Chemistry (3) Nuclear infrared, Raman, microwave, NMR, ESR, nuclear quadrupole Mössbauer, mass, and photoelectron spectroscopies for characterization of inorganic compounds. Prereq: 530. F

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

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


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

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

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

570 Quantum Chemistry and Spectroscopy (3) Basic principles of quantum mechanics and their applications to molecular orbital theory, molecular structure, and spectroscopy; introduction to group theory. Prereq: 1 yr of physical chemistry. F

571 Advanced Quantum Chemistry and Spectroscopy (3) Prereq: 570 or consent of instructor. Sp

572 Thermodynamics and Statistical Mechanics (3) Statistical thermodynamics and statistical mechanics of equilibrium systems; basic principles of thermodynamics and statistical mechanics, and application to selected chemical systems. Prereq: 1 yr of physical chemistry. F

573 Chemical Kinetics and Transport (3) Time-dependent phenomena in systems; chemical kinetics, chemical dynamics, transport theory. Prereq: 1 yr of physical chemistry. Sp

580 Fundamental Topics in Physical Chemistry (3) Quantum chemistry, spectroscopy, chemical kinetics, transport properties, thermodynamics, and statistical mechanics. Prereq: 1 yr of physical chemistry. F

590 Polymer Chemistry (3) Fundamentals of polymer synthesis and characterization through application of organic and physical chemical principles. Prereq: 1 yr of each of organic and physical chemistry.


595 Physical Chemistry of Polymers (3) Conformation of macromolecules, solution and bulk properties, rubber elasticity, kinetics of polymerization, polymer thermodynamics. Prereq: 590 or equivalent. Sp

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

601 Chemistry Research Proposal (2) Preparation and oral defense of original written research proposal based on thorough survey of chemical literature. Prereq: Consent of department head. S/N only. E

610 Selected Topics in Analytical Chemistry (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

650 Selected Topics in Inorganic Chemistry (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

655 Selected Topics in Organic Chemistry (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


670 Selected Topics in Physical Chemistry (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

690 Selected Topics in Polymer Chemistry (3) Topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

Child and Family Studies

(College of Human Ecology)

MAJORS

Child and Family Studies .......................... M.S.

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

Connie Steele, Head

Professors:

Blanton, Priscilla, Ed.D. ................. Tennessee

Cunningham, Jo Lynn, Ph.D. .............. Michigan State

Donohue, Ph.D. .................................. Michigan

Moran, James D., Ph.D. .................... Oklahoma State

Nordquist, V. Mick, Ph.D. ............... Tennessee

Steele, Connie, Ed.D. ..................... Texas Tech

Twardosz, Sandra (Liaison), Ph.D. ...... Kansas

Associate Professors:

Allen, J., Ph.D. .......................... Purdue

Buehler, C., Ph.D. ....................... Minnesota

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

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

ADMISSION REQUIREMENTS
A completed file for review includes a College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section, and completion of three Graduate School Rating Forms by individuals who can attest to the potential for graduate education. Forms may be obtained from the department or 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 special education, early childhood administration, and child development. Specializations in the family studies concentration consist of family life science and interdisciplinary science. Thesis and non-thesis options are available in both concentrations. Students should consider an interdisciplinary minor in gerontology to provide a lifespan perspective to human development or family studies.

All students in the child development concentration must enroll in CFS 510, 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 concentration, 5 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 concentration; and a written comprehensive examination.

Students in the child development/early childhood education licensure must enroll in College of Education courses: 574, 575, 591, and C&I 505. Thesis students are required to take the following: 3 hours of 500-level research methods; CFS 510, 512, 570, 571, and 3 hours selected from 520, 521, 530, 540, 590; 6 hours of thesis credit and an oral comprehensive examination. Non-thesis students are required to take the following: CFS 570 or 3 hours of statistical methods or interpretation of methods and research. CFS 510, 512, 570, 571, and 3 hours selected from 520, 521, 530, 540, 590; and a written comprehensive exam.

Students seeking the M.S. in Child 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 integration of child development and family studies within the context of human ecology and related areas, concentration in child development or family studies, and an emphasis on becoming proficient producers and consumers of research. A doctoral program that is concurrently specialized and integrated in nature reflects the complexity of the interdisciplinary subject matter, provides a broader context to formulate theoretical questions, and broadens the empirical literature for addressing those questions.

Requirements include:
2. Minimum 12 credits in 500- and 600-level courses in child development or family studies, with at least 3 credits in 600-level courses (in addition to the required courses described in #1);
3. Minimum 6 credits in a cognate area;
4. Minimum 9 credits in graduate-level statistics, with at least 3 of these credits in a more specialized area than a sequence of survey courses;
5. Minimum 3 credits of specialized research methods;
6. Pre-doctoral research project approved by student's committee;
7. College Professional Seminar, Human Ecology 610;
8. Minimum 8 credits of electives;

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state basis. The M.S. in Child and Family Studies (concentration in family studies only) is available to residents of Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES
500 Thesis (1-15) P/NP only. E
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
510 Survey of Theory and Research in Child Development (3) Theoretical models and research literature in child development (concrete through adolescence); application to research intervention and education. Prereq: 9 hrs of either upper division undergraduate or graduate social science or consent of instructor. F
512 Survey of Research in Early Childhood Education (3) Current literature and issues in early childhood education. Prereq: 510 or equivalent or consent of instructor. Sp
521 Organizational Management in Early Childhood Education (3) Designing, implementing, and evaluating physical and human resources in educational environments. Development of skills in environmental organization, interpersonal leadership, and supervision of staff. Prereq: 512 or equivalent or consent of instructor. F
522 Naturalistic Interventions for Parents and Teachers of Young Children (3) Common problems faced by parents and teachers; methods in attitude to modify problem behavior. Prereq: 510 or equivalent or consent of instructor. F
525 Seminar on Play (3) Comparison and contrast of theoretical framework and research methodologies on play. Developmental perspective on play.
530 Families of Handicapped Children (3) Developmental nature of family's experiences in caring for handicapped children, especially during infancy and early childhood. Prereq: 510 or consent of instructor.
540 Parent-Child Relations (3) 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. F
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. F
552 Family in Contemporary Social Thought (3) Alternative conceptualizations of family in current social thought. Variations of family construction by race, gender, and social class. Sp
556 Martial Dyad (3) Communication, power, sexuality, marital stability. Prereq: 510 or equivalent or consent of instructor. F
560 Doctoral Research and Dissertation (3-15) P/NP only. E
570 Research Methods in Child and Family Studies (3) Empirical means of studying human behavior, evaluating and conducting empirical research. Prereq: 6 graduate hrs in major, or consent of instructor. May be repeated with different topics. Maximum 9 hrs. E
571 Research Seminar (1) Presentation and critique of research projects. Prereq: Departmental major or consent of instructor. May be repeated. S/N Conly. E
574 Analysis of Teaching for Professional Development (2) (Same as Education 574.)
575 Professional Internship in Teaching (1-4) (Same as Education 575.)
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, sibling 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: 6 graduate hrs or consent of instructor. May be repeated with different topics. Maximum 6 hrs. E
585 Development of Interpersonal and Supervision Skills (2) Refinement of interpersonal skills needed to work with families and other professionals: Supervisory training in others' skill development, active listening, self-disclosure, relationship building and negotiation.
590 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
592 Clinical Studies (4) (Same as Education 591.)
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 9 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 9 hrs. E
630 Advanced Developmental Processes (3) Socioemotional, cognitive/language development during infancy and childhood. Normative and nonnormative development. Prereq: 510 or equivalent or consent of instructor. May be repeated with different topics. Maximum 6 hrs. F,A
631 Adolescent Development in Families (3) Normative and nonnormative adolescent development: physical, cognitive, moral, social, familial, sexual, and family. Prereq: 510 or equivalent of consent of instructor. F,A

632 Advanced Study in Family Interaction (3) Human communication and conflict management within family context. Theoretical perspectives for familial processes, decision making, and coping. Prereq: 550 or equivalent or consent of instructor. Sp,A
633 Survey Design and Analysis (3) (Same as Sociology 630.)
691 Assessment of Family Behavior (3) Analysis of methods and measurement in family research. Prereq: 550, 571. 3 hrs graduate statistics, or consent of instructor. SNC only. Sp,A

Civil and Environmental Engineering
(College of Engineering)

MAJORS DEGREES
Civil Engineering .................... M.S., Ph.D.
Environmental Engineering .......... M.S.
(Ph.D. through Civil Engineering)

Gregory D. Reed, Head

Professors:
Burdette, E. G. (Fred N. Peebles Prof.), Ph.D. ........ Illinois
Chatterjee, A., Ph.D. .................. NC State
Davis, W., T., Ph.D. .................. Tennessee
Ghosh, M. (Goodrich Chair of Excellence), Ph.D. ....... Illinois
Goodpasture, D. W., Ph.D. ........... Illinois
Greeko, W. L. (Emeritus), Ph.D. ...... Michigan State
Hastings, K. W. (Emeritus), Ph.D. .......... Northwestern
Humphreys, J. B. (Emeritus), Ph.D. ...... Texas A&M
Johnson, H. L. (Emeritus), M.S. ........ Tennessee
Miller, W. A. (Granger Prof.), Ph.D. ...... Georgia Tech
Reed, G. D. (Liaison), Ph.D. ........... Arkansas
Robinson, R. B. (Fisher Prof.), Ph.D. ...... Michigan State
Tschirhart, B. A. (Condra Prof.), Sc.D. ......... New Mexico State
Walker, C. R. (Emeritus), M.S. .......... MIT
Weigmann, F. J., Ph.D. ................. Northwestern

Associate Professors:
Alavian, V. (Adjunct), Ph.D. .......... Wisconsin
Bennett, R., Ph.D. ..................... Illinois
Chou, K. G., Ph.D. ..................... Northwestern
Dasterahage, J. H., Ph.D. ............. Tennessee
Drumm, E. C., Ph.D. .................. Arizona
Hansen, J. H. (UTSI), Ph.D. .......... Missouri
Hylanis, G. J. (Adjunct), Ph.D. ....... Vanderbilt
Miller, T. L., Ph.D. ................... Tennessee
Moore, A. B., M.S. .................... Tennessee
Nappo, C. J. (Adjunct), Ph.D. ......... Georgia Tech
Richards, S. H., Ph.D. ................. Tennessee
Smoot, J. L., Ph.D. ................... VPI
Tiry, R. F. (Emeritus), B.S. ........... Marquette

Assistant Professors:
Cox, C. D., Ph.D. ..................... Penn State
Han, L. D., Ph.D. ..................... Pennsylvania State
Mauldon, M., Ph.D. ................... California
Mauldon, M., Ph.D. ................... California
Robinson, K. G., Ph.D. ............... VPI

532 Advanced Study in Family Interaction (3) Human communication and conflict management within family context. Theoretical perspectives for familial processes, adjustment, decision making, and coping. Prereq: 550 or equivalent or consent of instructor. Sp,A
533 Survey Design and Analysis (3) (Same as Sociology 630.)
591 Assessment of Family Behavior (3) Analysis of methods and measurement in family research. Prereq: 550, 571. 3 hrs graduate statistics, or consent of instructor. SNC only. Sp,A

The Department of Civil and Environmental 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, mixed waste management, and waste management.

THE MASTER'S PROGRAM

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

Departmental requirements provide that for a major in Civil Engineering, the Bachelor's degree must be in civil engineering, or certain undergraduate prerequisite courses must be taken before admission to candidacy for the Master of Science in Civil Engineering.

Civil Engineering

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

Thesis Option: A minimum of 30 semester hours, including 6 hours of thesis, is required.
Non-Thesis Option: A minimum of 33 semester hours, including a 3-hour special problems course, is required. The special problem will culminate in a written report which must be approved by the student's major professor.

Environmental Engineering

For a Master of Science with a major in Environmental Engineering, normally a Bachelor's degree in a field of engineering is required. For a student who does not have an engineering background, the following minimum prerequisite courses will be required: Basic Engineering or Computer Science 101: Basic Engineering 121, 131; Engineering Science and Mechanics 231; Statistics 251; Civil Engineering 390, 395, 386; Mathematics 141, 142, 231, 241; Chemistry 120, 130. In general, these must be completed with a B average before courses for graduate credit can be taken.

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

Thesis Option: The student must present a minimum of 30 semester hours of approved graduate courses. The major shall include 6 semester hours of thesis and a minimum of 12 semester hours of approved environmental engineering coursework. A minor may be selected but is not necessarily required.
Non-Thesis Option: The student must present a minimum of 33 semester hours of approved graduate courses. The major shall include a minimum of 18 semester hours of approved environmental engineering coursework. A minor may be selected but is not necessarily required.

Either option must be approved by the student's major professor. A student's program must include a minimum of 9 semester hours of...
advanced engineering design courses selected from a list provided by the student's committee. Normally, the graduate program of study will be adjusted by the head of the department and the student's committee to suit the individual academic objectives.

THE DOCTORAL PROGRAM

A graduate program leading to the Doctor of Philosophy is offered in Civil Engineering. Specific departmental requirements for the Ph.D. degree include the following:

1. A minimum of 24 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 faculty committee.

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, the 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.

MINOR IN ENVIRONMENTAL POLICY

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Environmental Engineering (concentration in air quality or waste management) is available to residents of the state of Alabama. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

Civil Engineering

GRADUATE COURSES

406 Legal and Ethical Aspects of Engineering (2) Legal principles underlying engineering work; laws of contracts, torts, real property; problems of professional registration and ethics. Prereq: Senior standing.

421 Portland Cement and Asphalitic Concrete (3) Aggregate properties and tests, tests of portland cement concrete, mix design methods for concrete and asphalt, concrete admixtures, tests of asphalt and asphalt mixes, and nondestructive testing. Prereq: 321, 2 hrs and 1 lab.

451 Highway Engineering (3) Design, construction, operation, and maintenance of highway facilities; application of various engineering principles and techniques to process of planning, locating and design of highway facilities; both geometric and pavement design. Prereq: 210, 251, 332.

452 Traffic Engineering (3) Characteristics of driver, vehicle, and roadway and their interaction; traffic studies; basic considerations of traffic circulation and control, lighting, capacity analysis, roadway safety analysis and design. Prereq: 210, 251, 332.

461 Analysis of Framed Structures (3) Maximum stress due to moving loads; use of influence lines; lateral forces due to earthquake and wind; analysis of portals, building frames, and space frames; matrix methods; use of computer in structural analysis. Prereq: Structural Analysis II.

472 Steel Design (3) Design of plate girders and composite beams; consideration of members subjected to combined stresses; design of typical framed building, connections. Prereq: 471.

474 Reinforced Concrete Design (3) Reinforced concrete continuous beams and floor slabs, columns with combined axial loads and bending, footings and retaining walls. Prereq: 471.

485 Principles of Geohydrology (3) (Same as Geological Sciences 485.)

490 Water Resources Project Design (3) Cohesive development of multipurpose reservoir and dam project; data acquisition, spillway and outlet works design; earth and gravity dam stability analyses; drainage and filtration; maintenance and operation principles; and dam safety concepts. Prereq: 390, 395.

494 Urban Drainage Engineering (3) Design and management of stormwater conveyance and control structures. Application of hydraulic and hydrologic principles to design of drainage systems for urban, rural and highway development; design of inlet structures, catchments, culverts, and detention and retention basins; application of commonly used computer runoff models; evaluation of land-use on streamflow quantity and quality. Prereq: 390, 395.

495 Water Resources Development and Management (3) Principles of water resources project development, planning, and management. Institutional framework: water law, evaluation procedures for comparing and selecting among water resources development alternatives, multi-disciplinary planning principles of engineering economics, benefit-cost analysis, and cost allocation methods; environmental impact assessment procedures; development of agency-based and agency-independent methods; case studies. Prereq: Senior standing.

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 facilities before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

510 Urban Systems: Engineering and Management (3) Various urban systems usually under responsibility of city manager and city engineer: streets, lighting, water, sewerage, refuse collection, personnel management, finance, planning and public relations. Prereq: Graduate standing or consent of instructor.


530 Steel Strength and Earth Slope Stability (3) Steel strength of lined grained soil from perspective of idealized, simple clay. Drained and undrained shear strength and stress-strain behavior of real soils. Laboratory testing. Stability of natural and cut slopes and embankments. Prereq: 210, 251.

531 Soil Stabilization (3) Mechanical stabilization of soils by compaction, drainage, and blending; chemical stabilization of soils with admixtures, waterproofing and stabilizing soils and additives. Reinforced earth and stabilization with geosynthetics. Prereq: Introduction to Soil Behavior.


539 Geomechanics Seminar (1) Seminar topics in geomechanics. Graduate student research contributions and practical applications presented by practicing engineers from companies in Tennessee. Graduate standing and consent of advisor. May not apply toward degree. May be repeated. S/NC only.

540 Construction Management I (3) Management and organization of heavy and building construction projects. Prereq: Construction Methods and Equipment.

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

543 Construction Estimating (3) Project costs, estimating techniques, market cost conditions, and feasibility of design to cost. Prereq: Construction Methods and Equipment.

551 Traffic Engineering-Characteristics (3) Vehicle- roadway system; traffic flow modeling; elements of transportation. Prereq: Graduate standing. S/NC only.

552 Engineering-Operations (3) Signs, signals and marketing; short-term operations; controllers; signal timing and phasing; one-way reversible flow; system operations; identification and correction of high-accident locations and system deficiencies. Prereq: 552.

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 the design of roadways, interchanges and street intersections; and parking. Prereq: 451 or consent of instructor.

554 Urban Transportation Planning (3) Transportation systems in urban areas; systematic planning for identifying existing and future problems; travel surveys and demand models; evaluation of alternatives; implementation tools; special topics: urban goods movement, transportation system management. Prereq: 352 or graduate standing.

555 Public Transit Planning (3) Characteristics of transit modes: conventional and paratransit; operational design of transit system: route planning and scheduling; load analysis; mode choice and planning; 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 controlled and uncon- trolled roadways; roadway design and crash testing. Prereq: 452 or graduate standing.


559 Planning and Transportation (3) Preparation of transportation plans as elements of comprehensive development plans. Analysis of relationships between various transportation modes and between transportation and other community features. Use of planning process to
establish existing travel patterns, modeling of demand, proposing alternatives and evaluation. Prereq: Graduate standing. (Same as Planning 537.)

561 Matrix Formulation of Structural Problems (3) Review of methods of solution techniques; direct stiffness analysis of plane trusses, general members, and structures composed of general members. Prereq: 361.

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

565 Structural Dynamics (3) Analysis of free and forced vibrations, and transient response of structures having many degrees of freedom; elastic-plastic behavior considered for structural systems; earthquake design and response of structures. Prereq: 561.

566 Structural Reliability (3) Application of probability theory and statistics to evaluating reliability of structures; development of safety factors and probability based design codes. Prereq: Graduate standing or consent of instructor.

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

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

573 Prestressed Concrete (3) Properties of pre-stress materials; methods of pre-stressing and post-tensioning; analysis and design of simple and continuous beams and slabs. Prereq. 471.

574 Behavior of Reinforced Concrete Members (3) Moment-curvature, load-deflection relationships for reinforced concrete beams; combined bending and axial load; shear and torsion; relation between research results and specifications. Prereq. 471.

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

576 Measurement Science (3) (Same as Nuclear Engineering 558, Aviation Systems 559, Chemical Engineering 558, Engineering Science and Mechanics 566, Mechanical Engineering 588 and Aerospace Engineering 588.)

590 Special Problems in Civil Engineering (1-6) Enrollment limited to civil engineering students in non-thesis programs. 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. Prereq: Consent of instructor.

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

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

637 Numerical Models for Geologic Materials (3) Numerical models to represent the stress-strain-volume relationships for soils, rock, and concrete; nonlinear elastic models; classical plasticity models; critical state and copped plasticity models; multiple surface models; determination of parameters from laboratory tests; numerical implementation. Prereq: 530 and Engineering Science and Mechanics 620.

639 Soil Dynamics (3) Behavior of soils and soil-structure systems under time dependent loading, wave propagation in elastic media, principles of seismic refraction techniques; effects of earthquakes and vibrating machines on soils and foundations: dynamic and cyclic tests and determination of soil parameters. Prereq: 335 and 555 or Engineering Science and Mechanics 431.

651 Analysis Techniques for Transportation Systems I (3) Analysis of trip generation, trip distribution, modal split, freight and passenger traffic, employing mathematical, statistical, and computer science techniques. State of the art and new modeling techniques. Prereq: 554 or 555.

652 Analysis Techniques for Transportation Systems II (3) Advanced topics of application of mathematical, statistical and computer science techniques in modeling and analysis of transportation systems. Prereq: 551.

666 Advanced Structural Reliability (3) Monte Carlo methods; Weatherly system reliability; Review and analysis of processes; dynamic loads on structures. Prereq: 556.

671 Behavior of Steel Bridges and Buildings (3) Behavior, analysis, and design of plate girders, columns, and composite members subjected to static and dynamic loading. Prereq: 571.

674 Behavior of Reinforced Concrete Beams and Slabs (3) Strength and behavior of statically indeterminate reinforced concrete beams and frames; limit analysis; behavior, analysis, and design of reinforced concrete beams; continuity aspects of wall 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 of student during enrollment for use of facilities. Prereq: Consent of instructor. May be repeated.

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 gradually varied flow theory and applications; open channel design; unsteady flow theory and analysis; dynamic routing; spatially varied flow; non-linear alignment; microcomputer applications, featuring HEC-2 Model. Prereq: Civil Engineering 390.

522 Floodplain and Urban Flood Management (3) Review of national, regional, and local flood problems; state of the art flood damage reduction techniques; structural and non-structural: institutional responses: policies, programs, regulations, and legal aspects; floodplain hydrology and hydraulics; HEC-1, HEC-2: floodway encroachment, flood hazard zone and damage potential determinations; case 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 390.

525 Soil Erosion and Sediment Yield (3) Theory of soil erosion and sediment yield processes from disturbed land; methods and computer models for estimating sediment yield. Erosion and sediment control theory and management practices. Local and state regulations. Prereq: Civil Engineering 395. (Same as Agricultural Engineering 525.)

530 Stormwater Modeling (3) Systems approach to stormwater modeling. Hydrologic components, linear and non-linear systems integrated into mathematical models; review and analysis of commonly used deterministic and parametric computer models. Prereq: Civil Engineering 395.

533 Ground Water Hydrology (3) Dynamics of flow and contaminant transport in porous media: hydrodynamics, dispersion, anisotropy, layered soils, unsaturated flow and groundwater contaminant transport phenomena. Analytical and numerical solution of flow and transport equations. Prereq: Hydraulics and Hydrology or Civil Engineering 485 for geology majors. (Same as Geological Sciences 535.)

540 Remote Sensing for Transportation and Facilities Planning (3) Principles of remote sensing; sources of data and data acquisition systems; photo interpretation, analog and digital techniques for analysis of aerial and terrestrial data; radar and other remote sensing systems with applications to transportation and facilities planning, construction and operations. Prereq: Consent of instructor.

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

543 Instrumentation and Measurement (3) (Same as Agricultural Engineering 543.)

545 Monitoring Hydrologic Phenomena (3) (Same as Agricultural Engineering 545.)

551 Physicochemical Unit Processes (3) Theory and design application in water and wastewater treatment. Prereq: Civil Engineering 386, and Civil Engineering 360.

552 Biological Treatment Theory (3) Theory and design application of biological processes in wastewater treatment. Prereq: Civil Engineering 380, 2 hrs and 1 lab. (Same as Agricultural Engineering 552.)

553 Aquatic Chemistry (3) Theoretical, applied and analytical chemistry related to water and wastewater: design and treatment of environmental contaminants. Prereq: Chemistry 130, 2 hrs and 1 lab.

554 Environmental Engineering Chemistry (3) Application of chemical principles in analyzing physical, chemical, or biological interactions of chemical contaminants in various environmental compartments: atmosphere, hydrosphere, and lithosphere. Prereq: One year chemistry and consent of instructor.

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, industrial applications. Prereq: Graduate standing or consent of instructor.

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

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

572 Air Quality Dispersion Modeling (3) Dispersion in atmosphere; application of atmospheric dispersion models and evaluation of meteorological and air quality data. Prereq: 570.

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: 570.

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

590 Special Problems in Environmental Engineering (1-6) Enrollment limited to environmental engineering students in non-thesis programs. 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.

620 Advanced Surface Water Hydrology (3) Advanced topics in surface water hydrology; solutions in ST. Venant equations of unsteady flow for complex channel situations; dam breach modeling. Prereq: 520.
630 Advanced Stormwater Modeling
651 Industrial Waste Unit Operations and Processes
652 Advanced Physicochemical Treatment
653 Pollutant Fate Modeling and Risk Assessment
675 Microbial Systems Analysis
691 Special Topics in Environmental Engineering

Classics

(630) Advanced Stormwater Modeling
(651) Industrial Waste Unit Operations and Processes
(652) Advanced Physicochemical Treatment
(653) Pollutant Fate Modeling and Risk Assessment
(675) Microbial Systems Analysis
(691) Special Topics in Environmental Engineering

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.

414 Cicero and Techniques of Latin Prose Composition
(3) For advanced students in Latin, practice in prose composition, writingsof Cicero themodel. Prereq: 351-352 or consent of instructor. Maximum 9 hrs.

401 Greek Poetry

402 Greek Prose

405-08 Selected Readings from Greek Literature
(3.3) For advanced students in Greek, plays, historical writings, poetry of ancient Greece in original Greek. Prereq: 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 prose composition, writings of Cicero themodel. Prereq: 351-352 or consent of instructor. Maximum 9 hrs.

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

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

is required. The non-thesis option requires 34 hours.
1. Ten hours of core courses—Communications 510, 512, 540, and 550 or 560, the first three of which must be taken during the first two semesters of the student’s program, except with written approval of the Associate Dean for Graduate Studies for 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 of the thesis option and 9 hours for the non-thesis option of electives from a list provided by the department in an area of concentration.
4. Six hours of thesis work (Communications 500), including a thesis seminar, or a 3-hour project (Communications 590).

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 hour requirements for the 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 coursework and research for the thesis option, the student must pass an oral examination conducted by his/her graduate committee. The non-thesis option requires a written comprehensive examination and an oral defense of the project.

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 required for entry into the doctoral program. Students lacking academic or professional experience in communications will be required to take prerequisite courses. In general, however, the program may be completed within three academic years of full-time study beyond the Master’s degree.

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 in 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 all the members of the Ph.D. Admissions Committee are recommended and may be required. Professional experience in some field of communications is a highly desirable criterion for admission.

A minimum of 88 hours of approved graduate work is required for the Ph.D.

1. Twenty-eight hours of required 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 (analytical, advertising, journalism, public relations, or speech communications).
3. Twelve hours in a secondary concentration (outside the College of Communications).
4. Nine hours of electives*.
5. Twenty-four hours of dissertation.

*Specific courses to be taken require the approval/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.

Each doctoral student’s progress will be reviewed annually by the Doctoral Committee of the College of Communications. Results will be reported to the student by his/her program advisor, who will convey the committee’s recommendation concerning the student’s remaining in the program (non-binding) and suggestions for improvement in performance.

Candidates without prior teaching experience must register for Communications 521, Tutorial in Communications Teaching.

Planed course offerings in the College of Communications for a full calendar year are published the preceding November. This information is available from the Dean’s Office, 302 Communications Building, 974-3031. See also courses listed under Advertising, Broadcasting, and Journalism.

GRADUATE COURSES

400 Mass Communications Law and Ethics (3) Legal issues directly affecting the mass media: libel, privacy, free press—fair trial, judicial controls, governmental regulations. Ethical standards and practices of mass media in America. Prerequisite: Writing for Mass Communication or consent of instructor. E

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

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

510 Orientation to Mass Media (1) Degree and thesis requirements. Committee formation and program planning. Overview of research methods and information sources. Prerequisite: Consent of instructor or admission to program. S/NP only. F

512 Fundamentals of Mass Media Research (3) Applications of communications research techniques for management. Gathering and analysis of data for assessing media audiences and message effectiveness. Prerequisite: Consent of instructor or admission to program. Sp

521 Tutorial in Mass Communications Teaching (1) Experience as teacher under guidance of faculty member. Prerequisite: Consent of instructor. S/NP only. E

540 Theory for Media Management (3) Selected research hypotheses and theories in the literature of mass communications, managerial decision-making. Prerequisite: Consent of instructor or admission to program. F

550 Seminar in Media Economics and New Technology (3) Electronic and print media ownership, finance, and corporate structure. Roles of new technologies and marketing techniques in changing media content and function in future. Prerequisite: Consent of instructor or admission to program. Sp

551 Seminar in Science, Society, and the Mass Media (3) Investigation of the interplay between scientific community and mass media: how scientific information reaches public and impact of journalism on scientific practice. Prerequisite: Consent of instructor.

552 Seminar in Health Communications (3) Methods, problem analysis, and issues of communication in health education. Prerequisite: Consent of instructor.

553 Seminar in Risk Communications (3) Interaction of communication scientists, journalists, and public on scientific, technological, and medical issues; analysis of methods for enhancing public understanding. Prerequisite: Consent of instructor.

560 Seminar in Communications Management (3) Organizational structure and functions of communications corporations; development of objectives, strategies, and tactics. Analysis of financial statements and case studies. Computer-intensive.

590 Project (3) Capstone project under guidance of faculty. Application of principles from previous coursework. S/NP only. E

597 Independent Study (3) Reading, research, or projects on special topics in communication. On individual basis, under faculty direction, with consent. May be repeated. Maximum 6 hrs. E

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

610 Orientation to Doctoral Research (1) Degree and dissertation requirements. Committee formation and program planning. Overview of research methods and information sources. Prerequisite: Consent of instructor or admission to program. S/NP only. F

612 Fundamentals of Communications Research (3) Universals of research process: from defining ideas and problems to reporting results. Causal inference and relative strengths of various research designs, fundamental and specific approaches to research design, data gathering and measurement techniques in communications research: experimental, survey, content analysis, historical-qualitative. Prerequisite: Consent of instructor or admission to program. Sp

620 Seminar in Mass Communications Education (3) Role and scope of mass communications teaching unit, historical perspectives of curricular trends, Teaching methods and instructional objectives, classroom testing and measurement; design of professional curricula, research and extension; program evaluation; grants and contracts in research. Prerequisite: Consent of instructor or admission to program. Sp

622 Quantitative Research (3) Techniques for evaluation of research design and measurement. Survey, content analysis, and experimental techniques. Assessment of reliability and validity. Data analysis, hypothesis testing, and inference strategies. Prerequisite: 512. F

632 Mass Communication History and Historiography (3) Origins and development of mass media in America. Philosophies of History. Historical sources and their evaluation. Prerequisite: 502 or consent of instructor. S

640 Mass Communications Theory I (3) Selected research hypotheses, and theories in literature of mass communication theory. Prerequisite: Consent of instructor or admission to program. F

641 Mass Communications Theory II (3) Selected topics in theory. Critical evaluation of extant theories, derivation of hypotheses, and advanced theory construction. Prerequisite: 640. Sp
Comparative and Experimental Medicine

(Office of the Vice Chancellor for Academic Affairs)

MAJOR DEGREES

Comparative and Experimental Medicine M.S., Ph.D.
L. N. D. Potgieter, Director

Joint Graduate Coordinating Committee:

Fuhr, J. E., Ph.D., Medical Biology
Lawler, J. E., Ph.D., Psychology
Luzzio, C. M., M.D., Medical Biology
Potgieter, L. N. (Liaison), B.V.Sc., Ph.D., Veterinary Teaching Hospital
Slauson, D. O., D.V.M., Ph.D., Veterinary Teaching Hospital

The Comparative and Experimental Medicine degree program (M.S. and Ph.D.) is a jointly-administered graduate program intended to prepare students for teaching and/or research careers in the health sciences. This program emphasizes the comparative approach to the study of pathology, immunopathology, hematology, infectious diseases, aberrant metabolism, oncology, and genetic disorders. The Ph.D. program is open to approved graduate students. Students seeking training in this area and is especially useful for individuals with professional degrees. For the student with undergraduate biological science background, the Comparative and Experimental Medicine program provides an unusual opportunity to study disease processes common in humans and animals from a multidisciplinary perspective. The scope of this interdisciplinary program, which pools faculty resources from both veterinary and human medicine, is broadened by faculty members representing animal science and numerous areas of the life sciences. The interdisciplinary training environment includes such diverse support as facilities and personnel at the Veterinary Teaching Hospital, the Oak Ridge National Laboratory, Knoxville Zoological Park, Hemophilia Clinic, Developmental and Genetic Center, Pharmacokinetics Laboratory, Clinical Virology, Clinical Parasitology, Inflammation Research Laboratory, Hematology and Oncology services, and departments of life sciences.

For specific course listings, see Veterinary Medicine and Medical Biology under Fields of Instruction.

ADMISSION REQUIREMENTS

General Requirements

Applicants must have a baccalaureate degree with coursework in chemistry through organic, mathematics through calculus, physics, and basic biology. More advanced study in biology such as biochemistry, mammalian anatomy, histology, cell biology, or other appropriate biomedical courses from an accredited university is recommended.

Applicants for admission to the Master of Science degree program must have at least a 3.0 grade point average in the underlying science courses. The M.S. degree is expected to meet the following requirements:

1. 612 or consent of instructor.
2. 622, 632, 642 or 652 or consent of instructor.

Requirements for Admission to the Doctor of Philosophy Program

Applicants generally will be expected to have a Master's degree in one of the biological sciences and a Graduate Record Examination score of 700 or higher in the quantitative and verbal sections, or a professional degree in one of the medical sciences, (e.g., M.D., D.D.S., D.V.M.).

An individual having a baccalaureate degree with strong background in the physical and biological sciences may be admitted upon presenting evidence of exemplary performance on the Graduate Record Examination.

Exceptional veterinary students at UT Knoxville may be enrolled in the Comparative and Experimental Medicine graduate program but will be listed officially as veterinary students. Such students may take advantage of enrolling in graduate courses during summers and as elective courses in the veterinary program.

For additional information, write to the Office of Research and Graduate Programs, P.O. Box 1071, Knoxville, TN 37901-1071.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. and Ph.D. programs in Comparative and Experimental Medicine are available to residents of the state of Kentucky. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

Computer Science

(College of Liberal Arts)

MAJOR DEGREES

Computer Science M.S., Ph.D.

Professors:

Dongarra, J., Ph.D. ..... New Mexico
Langston, Michael A., Ph.D. ..... Texas A&M
Poore, J. H., Ph.D. ..... Georgia Tech
Sherman, Gordon R., (Emeritus), Ph.D. ..... Purdue
Thomason, Michael G., Ph.D. ..... Duke

Associate Professor:

MacLennan, Bruce J., Ph.D. ..... Purdue

Assistant Professors:

Beck, Michael, Ph.D. ..... Cornell
Berry, Michael W., Ph.D. ..... Illinois
Gregor, Jens, Ph.D. ..... Aalborg (Denmark)
Jones, Mark, Ph.D. ..... Duke
Plank, James S., Ph.D. ..... Texas
Straight, David W., Ph.D. ..... Texas
Vander Zanden, Bradley, Ph.D. ..... Cornell

Instructor:

Mayo, J. Wallace (Liaison), M.S. ..... Tennessee

THE MASTER'S PROGRAM

Two semesters of calculus plus two additional semesters of college mathematics (e.g., linear algebra, differential equations, probability) and a course in Discrete Structures and in Systems Programming are required for admission. For the Master's degree, 30 semester hours of graduate credit are required, 24 of which must be 500 level or above.

The student must complete at least 24 credits in Computer Science courses beyond the baccalaureate degree. In addition, an individual having a baccalaureate degree must have a baccalaureate degree with coursework in chemistry through organic, mathematics through calculus, physics, and basic biology. More advanced study in biology such as biochemistry, mammalian anatomy, histology, cell biology, or other appropriate biomedical courses from an accredited university is recommended.

Requirements for Admission to the Doctor of Philosophy Program

Applicants generally will be expected to have a Master's degree in one of the biological sciences and a Graduate Record Examination score of 700 or higher in the quantitative and verbal sections, or a professional degree in one of the medical sciences, (e.g., M.D., D.D.S., D.V.M.).

An individual having a baccalaureate degree with strong background in the physical and biological sciences may be admitted upon presenting evidence of exemplary performance on the Graduate Record Examination.

Exceptional veterinary students at UT Knoxville may be enrolled in the Comparative and Experimental Medicine graduate program but will be listed officially as veterinary students. Such students may take advantage of enrolling in graduate courses during summers and as elective courses in the veterinary program.

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Computer Science

(College of Liberal Arts)

MAJOR DEGREES

Computer Science M.S., Ph.D.

Professors:

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Poore, J. H., Ph.D. ..... Georgia Tech
Sherman, Gordon R., (Emeritus), Ph.D. ..... Purdue
Thomason, Michael G., Ph.D. ..... Duke

Associate Professor:

MacLennan, Bruce J., Ph.D. ..... Purdue

Assistant Professors:

Beck, Michael, Ph.D. ..... Cornell
Berry, Michael W., Ph.D. ..... Illinois
Gregor, Jens, Ph.D. ..... Aalborg (Denmark)
Jones, Mark, Ph.D. ..... Duke
Plank, James S., Ph.D. ..... Texas
Straight, David W., Ph.D. ..... Texas
Vander Zanden, Bradley, Ph.D. ..... Cornell

Instructor:

Mayo, J. Wallace (Liaison), M.S. ..... Tennessee

THE MASTER'S PROGRAM

Two semesters of calculus plus two additional semesters of college mathematics (e.g., linear algebra, differential equations, probability) and a course in Discrete Structures and in Systems Programming are required for admission. For the Master's degree, 30 semester hours of graduate credit are required, 24 of which must be 500 level or above.

Computer Science 530, 560, 580 plus an additional 3 hours of graded computer science graduate-level courses at or above the 400 level.
worked after earning a Bachelor's degree). The department reserves the right to contact these individuals or other knowledgeable people if additional information is deemed necessary or desirable.

2. The student is expected to have taken the GRE verbal and quantitative general test within the past three years and to have these scores sent to The Graduate School.

3. The student should satisfy the same background requirements as for the Master's program. See the departmental brochure for details.

Original research reported in a dissertation of high quality is emphasized. The minimum hour requirements are 24 hours of course 600 Doctoral Research and Dissertation and 24 hours of graduate courses beyond the equivalent of a Master's degree (i.e., beyond 30 graduate credit hours) graded A-F. Computer Science 530, 560 and 580 are required for the degree. At least six hours of 600-level graded courses must be taken in computer science at UTK. The student's advisor and committee will establish the specific course requirements. The comprehensive examination consists of a departmental written examination and a subsequent oral examination conducted by the student's committee.

**GRADUATE COURSES**

420 Advanced Topics in Machine Intelligence (3) Search, learning, expert systems, neural networks, pattern recognition and natural language processing. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

430 Advanced Topics in Hardware Systems (3) Architecture, parallel processors, microprogramming, networks and communications. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

460 Advanced Topics in Software Systems (3) Operating systems, compilers, parallel computation, software engineering, database systems and programming languages. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

470 Advanced Topics in Scientific Computation (3) Numerical methods, supercomputers and computer modeling and simulation of physical systems. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

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

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

480 Advanced Topics in Theoretical Computer Science (3) Theory of computation, complexity theory, formal languages and graph theory and its applications. Faculty research. Prereq: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

494 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 (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. SNC only. E

521 Artificial Intelligence (3) Heuristic search, automatic theorem proving, symbolic methods, semantic information processing, representation theory. Prereq: Discrete Structures. Problem Solving.

522 Cybernetics (3) Various functions in living systems and their actual or potential realization in computers. Prereq: Discrete Structures.

523 Machine Learning (3) Algorithms whereby computer exhibits aspects of learning or inference about its environment. Supervised and unsupervised methods, data-driven pattern analysis; explicit and implicit structure. Prereq: 521.

525 Software Engineering (3) Survey of key ideas in software engineering: formal methods, tools, testing, reliability, structured design and development, metrics, management and history of the field.


532 Boolean Algebra, Logic Design and Microprocessors (3) Boolean algebra, Combinational and sequential logic design, Microprocessors, Hardware lab. Prereq: One or more of following: mathematics beyond algebra and trigonometry.

536 Theoretical Aspects of Computer-Aided Design (3) Algorithms for CAD of VLSI systems, Placement and routing algorithms; programmable logic arrays. Prereq: Discrete structures and analysis of algorithms.

538 Computer Networks (3) Design and operation of networks. Hardware and software systems; communications subsystems. Prereq: System Programming and 532.


551 Pattern Analysis (3) Decision-theoretic and structural pattern analysis. Deterministic and statistical decision rules, feature extraction and representation; syntactic and semantic methods, relational models. Prereq: Digital design and probability or statistics.

552 Image Analysis (3) Techniques of computer image processing and understanding. Prereq: 551.


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.)

576 Sparse Matrix Computations (3) Solution of large sparse systems: graph models, reordering techniques, symbolic factorization, data structures, numerical algorithms, complexity analyses, parallel algorithms. Prereq: Discrete Structures.

580 Foundations (3) Finite automata and regular sets, push-down automata and context-free languages, Turing Machines, recursively enumerable sets, undecidability, Cook's theorem and NP-completeness. Prereq: Discrete Structures.

581 Design and Analysis of Algorithms (3) Analysis of algorithms and relevance of analysis to design of efficient computer algorithms. Sorting, searching, graph algorithms, pattern matching, dynamic programming, efficient approximation algorithms.


593 Independent Study (1-15) May be repeated.

594 Special Topics in Computer Science (1-3) May be repeated.

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

620 Advanced Topics in Intelligent Systems (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

630 Advanced Topics in Computer Systems (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

640 Advanced Topics in Databases/Information Retrieval (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

650 Advanced Topics in Pattern/Image Analysis (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

660 Advanced Topics in Software Systems (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

670 Advanced Topics in Numerical Mathematics (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

680 Advanced Topics in Theory and Foundations (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

690 Advanced Topics in Computer Science (1-6) Prereq: Consent of instructor. May be repeated with consent of department.

**Curriculum and Instruction** (College of Education)

**MAJOR DEGREES**

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

J. Estill Alexander, Head

Professors:

- Alexander, J. Estill, (Liaison), Ed.D. ..... Kentucky
- Allison, C. B., Ph.D. (........................................ Oklahoma
- Bellon, Jerry J., Ed.D. (........................................ California
- Blank, Kermitt J., Ph.D. (........................................ Ohio State
- Butefield, William L., Ed.D. (........................................ Texas Tech
- Christensen, Mark A., Ph.D. (........................................ Kansas
- Davis, A. R., Ph.D. (........................................ Ohio State
- Desart, Donald J., Ph.D. (........................................ Maryland
- Doek, E. Dale, Ed.D. (........................................ Colorado
- Frandsen, Henry, Ph.D. (........................................ Illinois
- French, R. L., Ph.D. (........................................ Ohio State
- Hippel, Theodore W., Ph.D. (........................................ Illinois
- Howard, Robert (Emeritus), Ph.D. (........................................ Ohio State
- Huff, P., Ph.D. (........................................ Ohio State
- Hull, H. N., Ed.S. (........................................ Peabody
- Jost, Karl J., Ed.D. (........................................ Oklahoma
- Knight, Lester N., Ph.D. (........................................ Texas
- Malik, Anand, Ed.D. (........................................ Columbia
- Mays, N., Ph.D. (........................................ Southern Illinois
- McIntryre, Lonnie D., Ed.D. (........................................ Florida
- Myer, M. E., Ph.D. (........................................ Pennsylvania
- Ray, John R., Ed.D. (........................................ Tennessee
- Rosens, C. E., Ph.D. (........................................ Virginia
- Rowell, C. Glennon, Ed.D. (........................................ Penn State
- Ray, John R., Ed.D. (........................................ Tennessee
- Slawson, Wilber S. (Emeritus), Ed.D. (........................................ Virginia
- Turner, T. N., Ed.D. (........................................ Wayne State
THE MASTER'S PROGRAM

The department offers two tracks for the Master's degree. Track 1 is for students who are already certified to teach in a curriculum and instruction discipline or those who are seeking a Master's degree without certification. Track 2 is for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

Track 1 - Concentrations are available in art education, curriculum, elementary education, English education, foreign language education, instructional media and technology, mathematics education, reading education, science education, social foundations, and social education. The non-thesis option requires the completion of 33 hours of coursework. The thesis option requires the completion of 30 hours, including 5 hours of Thesis 500.

Specific requirements for the concentration in art education are:

- The thesis option, Art Education 510, 520, and 593; 3 hours of 500-level elective courses in art history; 3 hours of 400- or 500-level elective courses in studio art; C & I 517, 520; 3 hours selected from C & I 511, 526, 542, 543, 544, 535, 558, 569, or 588 and 6 hours of Art Education 500. The non-thesis option requires Art Education 510, 520, and 593; 3 hours of 500-level elective courses in art history; 6 hours of 400- or 500-level elective courses in studio art; C & I 517, 580; 3 hours selected from C & I 511, 526, 542, 543, or 544 and 3 hours selected from 535, 558, 559, or 588.

- The non-thesis option culminates in an exhibition of original works of art produced under the direction of an art and art education faculty, accompanied by a written analytical and critical essay. This essay must include a philosophical statement, an explanation of process and media for each work presented, and a compositional analysis of each work.

Track 2 - Concentrations are available in art education, classroom teaching and in secondary teaching. For art education, the non-thesis requirements are Art Education 510, 520, 530, and 540; Education 547, 542, 591; C & I 517 and 3 hours selected from C & I 511, 526, 542, 543, 558, 559, or 588 for a total of 36 semester hours. For elementary or secondary teaching, the non-thesis requirements are Education 574 and 591, 6 hours; internship, 12 hours; studio methods, 6 hours; and 12 hours of electives as approved by the student's committee, for a total of 36 hours.

The thesis option for all concentrations requires 8 additional hours of Thesis 500 for a total of 42 hours.

For both tracks, a comprehensive written examination is required. An oral exam is given over the thesis.

THE SPECIALIST PROGRAM

The Educational Specialist degree program with a major in Curriculum and Instruction encompasses concentrations in the following areas: curriculum, elementary education, English education, foreign language education, instructional media and technology, mathematics education, reading education, science education, social science education, and teaching and learning.

THE DOCTORAL PROGRAM

The Ed.D. program in Curriculum and Instruction may include concentration upon the following fields: curriculum, elementary education, educational research, elementary education, English education, foreign language education, mathematics education, reading education, science education, social science education.

The Doctor of Philosophy with a major in Education includes concentrations and specializations as listed under Education.

For further information, write the Department of Curriculum and Instruction.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis.

THE DOCTORAL PROGRAM

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>404</td>
<td>Problems in Improvement of Instruction (1-3)</td>
<td>Special conferences, workshops or service programs. May be repeated. Maximum 6 hrs. S/N only. E</td>
</tr>
<tr>
<td>421</td>
<td>Elementary and Middle School Science and Social Studies Instruction (3)</td>
<td>Methods and materials for teaching science and social studies. Development of functional relationships and entities of two fields. Not open to students with recent course or background in teaching science and/or social studies. Prereq: Admission to teacher education. F</td>
</tr>
<tr>
<td>422</td>
<td>Elementary and Middle School Teaching Methods (1)</td>
<td>Methods and materials (knowledge base) for teaching reading, language arts, mathematics, science and social studies, content and curricula overview. Unit planning, daily planning, evaluation, etc., and language and concept development.</td>
</tr>
<tr>
<td>429</td>
<td>Language Arts/Reading Instruction in Elementary and Middle Schools (3)</td>
<td>Language and language development as applied to teaching of oral (listening-speaking) and aspects of literacy (reading process/readying and writing). Not open to students with recent course in language arts methods. Prereq: Admission to teacher education. F, Sp</td>
</tr>
<tr>
<td>430</td>
<td>Elementary and Middle School Developmental Reading Instruction (3)</td>
<td>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</td>
</tr>
<tr>
<td>433</td>
<td>Elementary and Middle School Mathematics Instruction (3)</td>
<td>Procedures for helping children learn mathematics. Unit planning, daily planning, group methods, factors related to classroom management. Not open to students with recent course in teaching of elementary school mathematics. Class requirements apply toward 3rd-6th degree. Prereq: Admission to teacher education. F, Sp</td>
</tr>
<tr>
<td>434</td>
<td>Early Childhood Education: Program Development and Teaching in Kindergarten (3)</td>
<td>Curriculum planning, classroom organization and management practices for teaching young children; relationship of kindergarten to total elementary school. Prereq: Admission to teacher education. E</td>
</tr>
<tr>
<td>451</td>
<td>Cultural Perspective (3)</td>
<td>Contributions of anthropological concepts (primarily concepts of culture) to understanding of educational processes, problems, and thought in our society and others.</td>
</tr>
<tr>
<td>454</td>
<td>Teaching Strategies and Issues in Social Studies Education (3)</td>
<td>Goals, objectives, techniques, materials, and evaluation; observational instruction in the classroom; preparation of teaching plans and materials; simulated teaching experiences. Prereq: Admission to Teacher Education Program.</td>
</tr>
<tr>
<td>455</td>
<td>Teaching of Foreign Languages, Grades 7-12 (3)</td>
<td>Instructional methods, lesson planning, peer teaching, materials for teaching foreign language and culture; evaluation techniques. Required for certification in modern foreign languages and Latin. Prereq: Completion of foreign language hours for certification and Admission to Teacher Education Program.</td>
</tr>
<tr>
<td>459</td>
<td>Teaching English as a Second Language (3)</td>
<td>Techniques of teaching, methodology, language, and literature. Prereq: Admission to Teacher Education Program.</td>
</tr>
<tr>
<td>460</td>
<td>Teaching Reading and Literature in the Secondary School (3)</td>
<td>Approaches for teaching basic reading skills and ways of teaching literature. Sp</td>
</tr>
</tbody>
</table>

The Master's Program

GRADUATE COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>Thesis (1-15) P/NP only.</td>
<td>E</td>
</tr>
<tr>
<td>502</td>
<td>Registration for Use of Facilities (3-15)</td>
<td>Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. E</td>
</tr>
<tr>
<td>510</td>
<td>History and Philosophy of Art Education (3)</td>
<td>United States from 1860's to present. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>520</td>
<td>Studies in Art Education (3)</td>
<td>Current practices and procedures in art education: planning, classroom organization and teaching methods. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>530</td>
<td>Production and Critical Analysis of Art (3)</td>
<td>Relationship of production and critical analysis of works of art to discipline-based art education.</td>
</tr>
<tr>
<td>540</td>
<td>Instructional Materials and Production Related to the Teaching of Art (3)</td>
<td>Development and use of instructional aids concerned with all aspects of teaching art: videotapes, audiotapes, slides, charts, and learning aids.</td>
</tr>
</tbody>
</table>

Calendar and Instruction

GRADUATE PROGRAMS

404 Problems in Improvement of Instruction (1-3) Special conferences, workshops or service programs. May be repeated. Maximum 6 hrs. S/N only. E

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

422 Elementary and Middle School Teaching Methods (1) Methods and materials (knowledge base) for teaching reading, language arts, mathematics, science and social studies, content and curricula overview. Unit planning, daily planning, evaluation, etc., and language and concept development.

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

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

433 Elementary and Middle School Mathematics Instruction (3) Procedures for helping children learn mathematics. Unit planning, daily planning, group methods, factors related to classroom management. Not open to students with recent course in teaching of elementary school mathematics. Class requirements apply toward 3rd-6th degree. Prereq: Admission to teacher education. F, Sp

434 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) Contributions of anthropological concepts (primarily concepts of culture) to understanding of educational processes, problems, and thought in our society and others.

454 Teaching Strategies and Issues in Social Studies Education (3) Goals, objectives, techniques, materials, and evaluation; observation in schools, preparation of teaching plans and materials, simulated teaching experiences. Prereq: Admission to Teacher Education Program.

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

459 Teaching English as a Second Language (3) Techniques of teaching, methodology, language, and literature. Prereq: Admission to Teacher Education Program.

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

Graduate programs are designed to improve scholarship and educational competence in a number of areas leading to the Master of Science degree, the Specialist in Education, the Doctor of Education, and the Doctor of Philosophy with a major in Education.

Assistant Professors:

Cagle, Lynn C., Ed.D. Georgia
Chance, Charles A., Ph.D. Ohio State
deMarrais, Kathleen, Ed.D. Cincinnati
Grant, A., Ph.D. Wisconsin
Hatch, J. Amos, Ph.D. Florida
Hodge, R. L., Ph.D. Texas
Ryan, Thomas K., Ed.D. Ball State
Watkins, J. Paul, M.S. Tennessee

Graduate programs are designed to improve scholarship and educational competence in a number of areas leading to the Master of Science, the Specialist in Education, the Doctor of Education, and the Doctor of Philosophy with a major in Education.
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 improvement of instruction through use of media. (Same as Library and Information Science 475). E

485 Teaching Mathematics, Grades 7-12 (3) Preparation of teaching plans, evaluation, materials for teaching mathematics; teaching methods and directed observation in schools. Prereq: Admission to Teacher Education Program.

486 Introduction to Instructional Computing (3) Classroom uses of computers, applications for teachers, overview of software and hardware for teachers of all grades. F,Sp.


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

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


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.

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

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 curriculums, development and generalization of 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,Sp.

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. F,Sp.


525 Strategies, Programs and Materials for Teaching Elementary Social Studies (3) Analysis of new and innovative social studies materials and methods in teaching elementary social studies. Prereq: Previous course in teaching of social studies or consent of instructor. Sp.


527 Elementary School Curriculum (3) Examination, evaluation and application of curriculum designs in elementary school. Trends and issues which affect elementary education. Prereq: Consent of instructor. F,Sp.

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

529 Practicum in Diagnosis and Remediation of Difficulties in Learning Mathematics (2) Assessment and practical experience with children having difficulties in learning 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 assessment procedures for teaching reading at elementary school level. Prereq: Course in teaching of reading or consent of instructor. F,Sp.

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

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

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

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

535 Curriculum Evaluation and Program Improvement (3) Historical background and importance of educational evaluation in relation to curriculum development. Understanding systematic curriculum evaluation approach and application 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 child’s overall intellectual development. Affective and cultural factors. Prereq: 500-level course in reading education or consent of instructor. Sp.

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

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 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 conferences, workshops, and inservice programs. May be repeated. Maximum 6 hrs. S/NC only. E

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


543 Foundations of Educational Policy (3) Relationship between theory, policy, and practice; educational policies that arise from philosophical and practical considerations relative to human nature, to educational purposes, to content of curriculum and to methods and techniques for conducting educational enterprise. F,Sp.

544 Survey in Contemporary Philosophies of Education (3) Historical, existentialism, phenomenology, philosophical analysis, Marxism, 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,Sp.

549 Topics in International Education (3) Historical, philosophical, and sociological explorations of local, regional, and national influences. 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. Sp.

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 schools. Characteristics of students, curricula, and instructional organization and structure of junior high and middle schools. Sp,Sp.

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

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

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

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,Sp.

564 Curriculum for Early Childhood Education (K-3) (3) Theoretical foundations and current research in content and skill areas of curriculum for kindergarten-grade

582 Teaching Enrichment Mathematics in Middle and Junior High Schools (3) Topics to enrich middle and junior high mathematics. Geometric, laboratory, and problem solving activities. Special attention to metric system. Opportunities for individual projects. Prereq: 581. 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.

587 Teaching Foreign Languages in Secondary Schools (3) Advanced instructional techniques and evaluation procedures: materials analysis and presentation; trends, issues, and research in modern foreign languages and Latin. Prereq: Consent of instructor.

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

590 Field Experience (1-3) Application of curricular and instructional principles, methods, and materials in schools. Prereq: Program approval and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E.


592 Linguistics and the Teaching of English (3) Grammar, usage, semantics, dialectology, history of language, and lexicography. Su.

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

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

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

596 Curricular Trends and Issues in Science Education (3) Analysis of elementary and secondary curricular projects for biological, physical, and environmental sciences. Impact of current learning theories on future curriculum development projects. Prereq: 496, 422, or equivalent. Prereq or consen: 595 or consent of instructor.


598 Developing Speaking and Listening Skills, Grades 7-12 (3) Teaching approaches to nonverbal communication, interpersonal and group communication, public address and listening. Review of tests and materials. Sp.

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

600 Doctoral Research and Dissertation (1-15) Prereq: Consent of instructor. E.

601 Studies in English Education (3) Issues and research in teaching of English. Su.

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. S/NC only. E.

605 Organizing and Administering Reading Programs (3) Analyzing and synthesizing instructional, learning, and materials components into classroom, school, and system programs. Prereq: 2 500-level courses in reading education or consent of instructor. Su.

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

607 Advanced Seminar in the Social Foundations of Education (4) Interdisciplinary team-taught seminar. Readings selected by faculty and participants from classic and current periodical literature in anthropology, sociology, and philosophy of education. Required of Ph.D. students in Education. Prereq: Doctoral student in Education.

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.

609 Advanced Seminar in Curriculum and Learning (4) Team-taught interdisciplinary seminar; trends, themes, and issues in curriculum and learning. Reading and discussions based on significant research and scholarly publications. (Same as Educational & Counseling Psychology 609.)

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

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

620 Seminar in Social Studies Research and Theory (2) Status of research and theory, current and related research in the field of social studies. Prereq: Recent course in teaching of social studies and consent of instructor. May be repeated. Maximum 4 hrs. E.


626 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.


633 Teacher Education in America (3) For students preparing to enter teacher education. Brief historical development, program analysis and evaluation, current issues, and future directions. F.


650 Advanced Studies in Early Childhood Education (3) Prereq: 2 graduate courses in early childhood education and consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E.

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

652 Advanced Studies in Educational Anthropology and/or Sociology (3) Ethnographic methods applied to formal and non-formal educational settings. Analysis of selected research in field. Prereq: 451, 2 courses in cultural anthropology, or consent of instructor. Sp.


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


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.

683 Advanced Studies in Elementary School Mathematics (2) Research in elementary school mathematics. Prereq: Graduate course in mathematics education or consent of instructor. Sp.

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

(College of Liberal Arts)

MAJOR DEGREES

Ecology ................................................ M.S., Ph.D.

Dewey L. Bunting, Director
J. Larry Wilson, Associate Director
Paul A. Delcourt, Associate Director

Shared Faculty:
Adams, Marshall, Ph.D., ORNL
Amundsen, C. C., Ph.D., Botany
Blaylock, B. G., Ph.D., ORNL
Boake, Christine R. B., Ph.D., Zoology
Blaylock, B. G., Ph.D., ORNL
Amundsen, C. C., Ph.D., Botany
Adams, Marshall, Ph.D., ORNL

Shared Faculty:

ADMISSION REQUIREMENTS

The requirements for this degree are in general the same as those of The Graduate School. The doctoral program must include Ecology 573, 574, and 610 as designated, 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 remainder of a student's course program is determined 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, 574, and 610 as designated, or an approved equivalent and one course from an approved list of quantitative methods offerings. The 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 Ecology faculty from other departments.

MINOR IN ENVIRONMENTAL POLICY

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

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

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
Economics

(College of Business Administration)

MAJORS

Economics ........................................ M.A., Ph.D.
Business Administration ......................... MBA

William F. Fox, Head

Professors:
Bohm, Robert A. (Liaison), Ph.D. ....... Washington (St. Louis)
Borang, Roger L., Ph.D. ......................... Texas
Carroll, Sidney L., Ph.D. ....................... Harvard
Chang, Hsi, Ph.D. ................... Vanderbilt
Clark, Don F., Ph.D. ......................... Michigan State
Cole, William E., Ph.D. ....................... Texas
Davidson, Paul (J. Fred Holly Chair) Ph.D. , ... Pennsylvania
Feltw, George R. (Emeritus), Ph.D. ....... Ohio State
Garrison, Charles B., Ph.D. ................... Kentucky
Herzog, Henry W., Ph.D. ................. Maryland
Jensen, Hans E. (Emeritus), Ph.D. .......... Texas
Lee, Fong-Yao, Ph.D. ....................... Michigan State
Mayhew, Anne, Ph.D. ....................... Texas
Moore, John R. (Distinguished Prof.) (Emeritus), Ph.D. .......... Cornell
Neale, Walter C. (Emeritus), Ph.D. ....... London

The Department of Economics offers graduate programs leading to the M.A. and Ph.D. The M.A. may be completed by either a thesis or non-thesis option, while the Ph.D. requires successful completion of a dissertation. Applicants to these programs should contact the Director of Graduate Studies, Department of Economics, for further information. The Department also offers an area of concentration for the MBA degree. Students interested in the MBA program should contact the Director of Graduate Business Programs, College of Business Administration.

ACADEMIC STANDARDS

A graduate student 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 established by the program. Students interested in the MBA program should contact the Director of Graduate Business Programs, College of Business Administration.

STUDENT'S RIGHT TO PETITION

Graduate students in good academic standing have the right to petition the department for modification of departmental degree requirements and redress of grievances. Petitions must be in writing and addressed to the Director of Graduate Studies.

THE MASTER'S PROGRAM

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

The non-thesis option requires a maximum of 48 hours of coursework of the 500 level or above, 6 of which may be thesis hours. Of the remaining 18 hours, a maximum of 6 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 a minimum of 42 graduate hours of coursework of the 500 level or above, 24 of which must be beyond the Master's degree, at least 24 hours of 600 Doctoral Research and Dissertation, and successful completion of the following:

1. Students are required to complete the following core requirements:
   a. Economic Theory: Microeconomic theory and macroeconomic theory by a qualifying exam.
   b. History of Economics: Completion of 515 or 516 with a grade of B or better, or by qualifying examination.
   c. Quantitative Methods: Completion of 581, 582 and 585 and additional courses in quantitative methods approved by the department with grades of B or better, or by qualifying examination.

   Students failing a qualifying examination must retake the examination the next time offered. A qualifying examination may be taken a third time only with approval of the department. Failing a qualifying examination may result in a student's dismissal from the doctoral program.

   2. Students are required to demonstrate competence by comprehensive examination in at least two fields of specialization in economics. Students failing the comprehensive examination may retake the examinations the next time offered. A comprehensive examination in a specific field may be taken a third time only with approval of the department.

   3. Students are required to complete with a grade of B or better two elective courses in economics at the 500 level or above, outside the area of concentration.

   4. Students are required to complete a doctoral dissertation and to defend it successfully before the faculty.

MINOR IN ENVIRONMENTAL POLICY

The program is designed to give Master's degree students an opportunity to develop an interdisciplinary specialization in environmental policy. While administered through the Economics Department, the program is coordinated by a committee of representatives from participating departments: Agricultural Economics and Rural Sociology; Civil and Environmental Engineering; Ecology; Economics; Forestry and Fisheries; Geography; Management; Political Science; and Sociology.

Students may request admission to the minor following admission to the Master's program in one of the participating departments. Students in good standing in one of these programs may apply for admission to the minor in environmental policy. The coordinating
committee will consider the admission of interested students. Applicants should have a background in both natural and social sciences evidenced by prior coursework or experience. One course in environmental studies from the student’s Master’s discipline and one course in quantitative methods are required. These requirements must be fulfilled before or after admission to the minor. Students admitted to the minor will be required to register for at least three hours of Economics 579, Environmental Policy Research Workshop, and to complete successfully the following:

1. Ecology 520 or Plant and Soil Sciences 414 or Geography 433 or an equivalent course approved by the coordinating committee.
2. Six hours of coursework outside the Master’s discipline approved by the coordinating committee.

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. May be repeated.

413 Macroeconomic Fluctuations (3) Analysis of historical data, methods of analyzing macro-economic fluctuations, theoretical explanations of cycles, and role of monetary and fiscal policies in aggregate economy. Major writing requirement. Prereq: Intermediate Macroeconomics or consent of instructor.

415 History of Economics (3) Methods of study of historical origin, development, and evolution of major doctrines: classical and neoclassical economics, economics of Keynes and his followers, principal developments of second half of 20th century. Major writing requirement. Prereq: 201 or equivalent and consent of instructor.

424 Political Economy of World Development (3) Topics vary: Latin America, Asia, Soviet Union and Eastern Europe. Analysis of major economic strategies, policies, and institutions. May be repeated. This course includes a major writing requirement. May be repeated when topic varies. Maximum 9 hrs.


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.


472 Public Finance: Taxation and Intergovernmental Relations (3) Analysis of individual taxes and of tax systems, non-taxes sources of revenue, fiscal federalism. Major writing requirement. Prereq: 201.

482 Introduction to Mathematical Economics (3) Application of basic mathematical tools: calculus, matrix algebra, etc. to major topics of economic theory. Prereq: Intermediate Microeconomics with B or better and Calculus.

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

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

510 Fundamentals of Microeconomics (3) Theory of consumer behavior and demand, theory of production and cost, behavior of the firm in perfectly competitive and monopolistic environments. For non-economics majors. Not available for students with credit for 511. Prereq: 311 or equivalent.

511-12 Microeconomic Theory (3,3) Theory of consumer choice and demand, theory of revealed preferences, attributes of goods and implicit prices, market demand and supply, individual behavior under uncertainty, theory of firm, theory of production and cost, market structures, derived demand and factor pricing, introduction to welfare economics, market failure and theory of second best, pure exchange.

513-14 Macroeconomic Theory (3,3) Determination of national income, prices, and employment. Results using Keynesian, non-market-clearing, monetarist, and rational expectations paradigms.


525 Economic History of Europe (3) Nature and functioning of economic systems and policies in history of Western civilization; major issues of method and interpretation. Prereq: Graduate standing in economics or consent of instructor.

526 Economic History of the U.S. (3) Interpretation of American economic structure and policies from colonial times. Prereq: Graduate standing in economics or consent of instructor.

537 Managing in a Regulated Economy (3) Economic effects of utility and public utility, and environmental regulation on business. Development of decision-making skills in area of governmental-business relations.

560 Labor Relations and Collective Bargaining (3) Same as Management 522.

577 Environmental Economics and Policy Management (3) Interdisciplinary perspective on goals of sustainable economic development and environmental quality. Development of decision-making tools and conflict resolution.


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: 512 or equivalent.


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

624 Economic Development: Western Impact on Asia and Africa (3) Study of consequences of contact between developed world and developing countries of Asia and Africa. Prereq: 21 hrs of upper division undergraduate social science or consent of instructor.


642 Labor History and Legislation (3) Development of labor: labor as an important factor of economic and political force in U.S., from Colonial times to present. Evolution of legal status of labor unions and of individual workers vis-a-vis their employers.

651 Monetary Theory (3) Study of money, credit, and approaches to simultaneous equation models with applications to current economic research. Prereq: 513.

652 Topics in Monetary Theory (3) Advanced monetary models, issues in monetary theory and policy, student participation. Prereq: 513.

661 Regional and Urban Location and Development Theory (3) Theory of industrial and agricultural location and human migration. Economic basis for land-use patterns, central places, and urban form. Spatial inequalities and urban problems. National policies for regional and urban assistance.

662 Methods of Regional and Urban Analysis (3) Theory of regional economic structure and growth. Regional income and product accounts, shift and share analyses, economic base studies, and regional-urban input-output models. Theory and problem solution.


672 Public Finance: Taxation and Intergovernmental Relations (3) Theory of taxation, tax incidence and tax efficiency, policy analysis of U.S. tax structure at federal, state, and local levels. Theory of fiscal federalism and intergovernmental relations.

677 Environmental and Natural Resource Economies (3) Alternative paradigms for allocating and valuing environmental resources. Exploration of issues related to market failure and differences between renewable and nonrenewable resources.

678 Economics of Environmental Policy (3) Topics in environmental policy analysis. Consideration of alternative policy instruments, defining policy objectives and role of risk in decision-making process.

681-82 Econometric Methods (3,3) Theory and techniques of statistical testing of economic hypotheses and construction and estimation of econometric models. Review of classical least squares regression model, and approaches to simultaneous equation models with application to current economic research. Prereq: 582 or equivalent.

690 Workshop (3) Advanced topics in economics. Student participation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Education (College of Education)

MAJOR DEGREE

Curriculum and Instruction ......................... M.S.

Education ........................................ Ph.D.

Human Performance and Sport Studies .......... M.S.

Special Education ................................ M.S.

Technological and Adult Education ............. M.S.
The College of Education offers an extended teacher preparation program which features a professional year internship with accompanying coursework and an intercollegiate doctoral program.

TEACHER LICENSURE AND THE MASTER'S PROGRAM

For teacher licensure and a Master's degree in one of the available majors offered in the College, a student must complete the 24 hours associated with the professional year and 12 more credits for the total of 36 semester hours. Course requirements for an M.S. program include:

**Fall Semester**
- Internship: 4 hrs
- Specialty Studies: 6 hrs
- Analysis of Teaching for Professional Development: 2 hrs

**Spring Semester**
- Internship: 8 hrs
- Clinical Studies: 4 hrs

**Post Internship**
- Major Area: 12 hrs
- TOTAL: 36 hrs

Prior to the first semester of internship, a student must be admitted to The Graduate School and register as a graduate student to receive graduate credit. Prior to the completion of the first semester of internship, a student must be admitted to a Master's program within the College of Education in which the degree is to be pursued. See the individual program descriptions for complete details.

THE DOCTORAL PROGRAM

The Ph.D. program with a major in Education provides six concentrations. The departments participating in the Ph.D. program are Curriculum and Instruction; Educational Leadership; Educational and Counseling Psychology; Health, Leisure, and Safety; Human Performance and Sport Studies; Special Services Education; and Technological and Adult Education.

The program requirements, concentrations and specializations are:

**Requirements**

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Minimum Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign or Computer Language</td>
<td>14</td>
</tr>
<tr>
<td>(demonstrate proficiency)</td>
<td></td>
</tr>
</tbody>
</table>

**General Core Requirements**

- History and philosophy of education, (both areas must be represented) 4
- Learning theory and curriculum (both areas must be represented) 4
- Administrative theory 2
- Trans-college seminar: three consecutive semesters (including summer) 3

**Alternative Core Requirements**

- Courses in philosophy of science 3
- Trans-college Seminar: three consecutive semesters (including summer) 3
- Seminar in area of specialization 3
- Courses in learning theory/group or independent study 3

**Concentration Requirements**

- Primary Concentration: A minimum of 16 hours normally selected from one or two specializations within the primary concentration 16
- Supporting Specialization: A minimum of 9 hours selected from a specialization in concentration other than the primary concentration 9

**Cognate**

- A minimum of 6 hours selected from outside the college in addition to the designated research courses 6

**Dissertation**

24

**CONCENTRATIONS**

**Administrative Theory and Practice**

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

**Theories of Curriculum Development and Foundations of Education**

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

**Instructional Theory and Practice**

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

**Theories and Practice of Educational and Personal Adjustment**

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

**Foundations of Human Movement**

Specializations:
1. Exercise Science: Adapted Physical Education
   - Exercise Physiology/fitness
2. Motor Behavior: Motor Control
   - Motor Learning
   - Psychology of Sport
3. Socio-Cultural Foundations of Sport: History
   - Philosophy
   - Sociology

**Health Education**

Specializations:
1. Public health
2. Safety

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Education is available to residents of the states of Arkansas (concentration in administrative theory and practice only), South Carolina (concentration in theories and practice of educational and personal adjustment only) and Virginia (concentration in health education only). Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

See College of Education for additional departmental listings.

**GRADUATE COURSES**

574 Analysis of Teaching for Professional Development
(Same as Child and Family Studies 574.)

575 Professional Internship in Teaching
(Same as Child and Family Studies 575.)

591 Clinical Studies (4) Group and individual seminar activities during full-time internship. Application and evaluation of professional core competencies. Completion and presentation of portfolio and analysis of teaching project. Coreq: 575. (Same as Child and Family Studies 592.)

601 Trans-College Seminar (1) Introduction to Ph.D. program in Education; research requirements, meaning of scholarship in academic issues/problems in education. Minimum of two consecutive semesters preceded or followed by an interterm 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.

**Educational and Counseling Psychology**

**MAJORS**

**GUIDE DEGREES**

Guidance ............................................. M.S.
Educational Psychology .......................... M.S., Ed.D.
Educational Psychology and Guidance ...... Ed.S.
Education ............................................. Ph.D.

R. Steve McCallum, 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. (Emeritus), Ed.D. ........ Arizona State
Hector, M. A., Ph.D. ...................... Michigan State
Huck, Schuyler W., Ph.D. ............. Northwestern
McClain, R. S. (Liaison), Ph.D. .......... Georgia
McClain, Ed W. (Emeritus), Ph.D. .... Texas
supervised practicum and internship experiences working with clients. A final examination is required of all Master's degree students.

THE EDUCATIONAL SPECIALIST PROGRAM

Admission requirements include up-to-date scores from the GRE, the departmental recommendations, 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.D. programs in educational psychology or school counseling, it is assumed that they have completed a Master's degree equivalent to the one offered at UT Knoxville. In this case, the minimum hours beyond the Master's required to complete the Ed.S. are: educational psychology, 24; school counseling, 22. The specialization in counseling psychology requires a minimum of 60 hours. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

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 the 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 recommendation, and a writing sample. The following minimum number of hours is required in each program concentration/specialization: counseling psychology - 96; counselor education, Ph.D. - 96, Ed.D. - 79; educational psychology, Ph.D. - 87. Residency for the Ed.D. programs is three consecutive semesters 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 year-long practicum sequence and the equivalent of a year's full-time work as an intern in an appropriate counseling setting. The concentrations/specializations in educational psychology and counselor education also require supervised practical experience in classroom teaching. All doctoral students take written comprehensive examinations in the program concentration, supporting specialization and cognate areas. The guidelines for each program concentration may be consulted for further requirements.

MINOR IN GERONTOLOGY

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. and Ed.D. programs in Educational Psychology are available to residents of the state of South Carolina. Additional information may be obtained from the Admissions Specialist 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.N.C or letter grade. E

410 Sex Role Development: Implications for Educational and Counseling (3) Theories and research concerning development of person's sexual role and its relevance in educational and counseling settings. F.Su

431 Personality and Mental Health (3) Various perspectives of mental health with application to education and other social institutions. E

432 The Disadvantaged Student: Psychoeducational Perspectives (3) Theory and research regarding etiology, psychosocial behavior, and appropriate interventions. Sp

460 Self-Management in the Helping Professions (3) Applications of self-management strategies to career, social, emotional, and interpersonal domains for helping professionals and their clientele. Prereq: introductory course in psychology or consent of instructor. S.N.C or letter grade. E

493 Independent Study (1-15) May be repeated. Maximum 15 hrs. S.N.C or letter grade. E

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

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

503 Problems in Lieu of Thesis (1-3) May be repeated. Maximum 12 hrs. S.N.C or letter grade. E

504 Special Topics (1-3) Instructor-initiated course offered at convenience of department on topics of current interest. May be repeated. Maximum 15 hrs. S.N.C or letter grade. E

510 Psychological Theories of Human Development Applied to Education (3) Theories and research in cognitive, emotional, social, and intellectual development over the lifespan with applications to educational and therapeutic settings. F.Su

511 Cognitive Development: Implications for Education (3) Applications of theory and research related to higher mental problem-solving. Prereq: 510 or consent of instructor. E

515 Educational Applications of Behavioral Theories of Learning (3) Behaviorial theories and research concepts such as operant conditioning, observational learning, and the learning of complex skills. F.Su

516 Educational Applications of Cognitive Learning Theories (3) Cognitive theory and research, social learning...
559 Internship in Community Agency Counseling (1-6)
Supervised postpracticum employment at departmentally approved human service agency. Prereq: Admission to community agency program, 555 and consent of instructor. May be repeated. Maximum 12 hrs. S/N only. E

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

561 Development and Operation of School Counseling Programs (3)
Management of comprehensive school counseling programs to include needs assessment, program goals, resource identification, evaluations, and use of computer-based program management software. Prereq: 550, Sp, Su

565 Approaches to Family Intervention and Counseling (3)
(Same as Child and Family Studies 505).

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, Human Performance and Sport Studies 585, Public Health 585, Psychology 585, Social Work 585, and Sociology 585.)

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

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

602 Directed Research (1-3)
Instructor- or student-initiated group investigation of empirical and theoretical problems in educational and counseling psychology. May be repeated. Maximum 12 hrs. S/N only. E

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

606 Advanced Seminar in Curriculum and Learning (4)
(Same as Curriculum & Instruction 609). F

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

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

649 Advanced Internship in School Psychology (1-9)
Supervised experience as school psychologist in departmental approved internship site for doctoral level students. Prereq: Enrollment in doctoral level school psychology program and consent of instructor. May be repeated. Maximum 15 hrs. S/N only. E

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. S/N only. F

655 Practicum in Counselor Education (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. S/N only. E

659 Internship in Community Counseling (1-6)
Supervised employment in community agencies. Prereq: Admission to community agency program, 555 and consent of instructor. May be repeated. Maximum 18 hrs. S/N 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/N only. F

661 Education Implications of Neuropsychology (3)
Theory and assessment. Common syndromes and their behavioral and cognitive manifestations. Prereq: 516, 541 or equivalent individual assessment course; or consent of instructor. Sp

662 Applied Research Design (3)
Preparation of empirical investigations. Collection of data, and drawing of inference from evidence gathered. Prereq: Two-course sequence in statistics. F

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

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

669 Practicum in Instructional Planning (3)
Development and management of course of program in instructional 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/N only. E

670 Foundations of Counseling Psychology (3)
History, theory, research and practice of counseling psychology. Prereq: Admission to counseling psychology doctoral program. May be repeated. Maximum 6 hrs. F, Sp

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. A

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. A

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

674 Practicum in Counseling Psychology (3)
Supervised practice of individual counseling. Minimum 150 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: 665, or 674, or consent of instructor. S/N only. E

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/N only. E

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

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Educational Leadership (College of Education)

**MAJORS**

<table>
<thead>
<tr>
<th>DEGREES</th>
<th>MAJOR</th>
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<tbody>
<tr>
<td>College Student Personnel</td>
<td>M.S.</td>
</tr>
<tr>
<td>Educational Administration and Supervision</td>
<td>M.S., Ed.S., Ed.D.</td>
</tr>
<tr>
<td>Education</td>
<td>Ph.D.</td>
</tr>
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Mary Jane Connelly, Head

Professors:

- Coffield, William H. (Emeritus), Ph.D. ...
- Harris, G. W., Jr., Ph.D. ...
- Lovell, J. T. (Emeritus), Ed.D. ...
- McInnis, Malcolm C., Jr., Ph.D. ...
- Peccolo, C. M. (Emeritus), Ph.D. ...
- Roney, Robert K. (Emeritus), Ed.D. ...
- Tennessee
THE DEPARTMENT OF EDUCATIONAL LEADERSHIP OFFERS GRADUATE PROGRAMS LEADING TO THE MASTER OF SCIENCE WITH MAJORS IN EDUCATIONAL ADMINISTRATION AND SUPERVISION AND IN COLLEGE STUDENT PERSONNEL. THE PROGRAMS ARE DESIGNED TO PROVIDE STUDENTS WITH THE KNOWLEDGE AND SKILLS NEEDED TO BE EFFECTIVE LEADERS IN EDUCATIONAL ORGANIZATIONS. THE DEPARTMENT FOCUSES ON THE DEVELOPMENT OF LEADERSHIPS WHO ARE ABLE TO MANAGE AND SUPERVISE EFFECTIVELY.

ADMISSION REQUIREMENTS

General test of the Graduate Record Examination: writing sample if GRE verbal is below 50th percentile; leadership potential judged by activities in organizations; and rating forms or letters of recommendation. The Ed.D. applicant must also interview with all faculty members on campus or elsewhere. Application deadlines are March 15 and October 1.

THE MASTER'S PROGRAM IN COLLEGE STUDENT PERSONNEL

Thesis Option

A minimum of 60 hours beyond the baccalaureate degree including 6 hours of Educational Administration and Supervision 518 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as 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 518 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as an oral exam over the thesis.

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 unless the student has a Master's degree in a field outside the College of Education. Two consecutive semesters of 604 must be taken during residence. An internship is highly recommended but not required. A foreign language requirement is at the discretion of the committee. A written comprehensive examination is given as an oral exam over the dissertation.

The Department of Educational Leadership also has an Ed.D. program for practicing school administrators. Please contact the department for further information.

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

EDUCATIONAL ADMINISTRATION AND SUPERVISION

GRADUATE COURSES

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

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

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

513 Administrative and Organizational Theory in Education (3) Introduction to the theoretical administrative and organizational foundations of management and leadership. May be repeated. F, Su

515 Human Relations and Communication in Administration (3) Development of interpersonal communication skills and channels, group relations, supportive work climates, personnel motivation, and interpersonal management skills as applied to educational settings. F, Su

516 Research for School Administrators (3) Descriptive, experimental, and quasi-experimental designs to help students with qualitative background to design and write research. F, Su

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

529 Politics of Education and Educational Environments (3) Community and interorganizational relations in political context of modern, complex society. F, Su

535 Administrative Applications of Micro Computers (3) DOS, word processing, database management, spreadsheets, personal and professional applications. F, Su

544 School Finance and Business Management (3) For prospective building level administrators. Financial and human resource management, financial and logical management tasks and procedures in individual school setting. F, Su

547 Educational Facility Planning (3) Concepts and skills for developing, evaluating, designing, constructing, renovating, maintaining, and operating of quality educational environments and facilities. F, Su

548 Introductory Supervision and Personnel (3) Basic functions and tasks of educational administration, personnel, and related competencies. Building and maintaining professional relationships. F, Su

553 Strategies of Educational Planning (3) Processes for improving decision-making function through use of both quantitative and qualitative planning techniques. F, Su

554 School Law (3) Logical arrangement of case and statutory materials for school administrators and teachers, problems concerning law and public education. F, Su

580 Internship in Educational Administration (3) Field experience in preparation in administrative work directly with administrator. F, Su
614 Statistical Methods for School Administrators (3) Contemporary educational finance policies and their influence upon education, nation and citizens. Superintendence team concept, management of school logistical services. Prereq: 544 or consent of instructor. F, Su

562 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, prerequisite: 21 hrs. in educational administration and supervision or consent of instructor. F, Su

583 Educational Leadership—Principalship (3) Knowledge, skills and relationships for principals to be effective instructional leaders: simulation materials and field-based activities. Culminating course with internship and problems paper. At end of planned program of study. Prereq: 21 hrs. in educational administration and supervision or consent of instructor. F, Su

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

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

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

595 Elementary Principals Seminar (1-2) For in-service training of elementary school administrators. Developments, problems, programs, and trends of elementary schools and management skills of elementary school administrators. May be repeated. S/N or letter grade. F, Sp

596 Middle School Principals Seminar (1-3) For in-service training of middle school administrators. Developments, 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/N or letter grade. F, Sp

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

605 Advanced Seminar in Administrative Theory (2) Interdisciplinary seminar. Readings selected by faculty for research and scholarly value from early to current classical theoretical studies and current periodical literature in education administration. Required of Ph.D. students in Education. Prereq: Doctoral student in Education.

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/N only. E

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

615 Research Design (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; survey studies and school surveys. Conduct of survey. Prereq: Basic statistics and computer skills or 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. Field inquiry. Prereq: 525, 518 or equivalent or consent of instructor. F

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

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

655 State-Federal Relations in Education (3) Interorganizational, state, and local responsibilities and organization for education by analysis of traditional, legal, fiscal and functional aspects of educational partners. Funding partnerships; discussion of grant proposals and development processes. Prereq: 545 or consent of instructor. F

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

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

670 Values and Ethics in Educational Leadership (3) Examination of moral and ethical dimensions of work of educational administrators; assistance to current and prospective administrators to deal with dimensions in knowable, reflective and principled ways. (Same as Higher Education 670.)

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

690 Special Topics (1-3) 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 structures, theory and practice in management of American colleges and universities. Prereq: 543 or consent of instructor. Su

Higher Education

GRADUATE COURSES

455 Seminar in Student Leadership (1) Knowledge and skills in leadership roles for resident assistants, student government leaders, student activities, and other student organizations. Topics to be assigned. May be repeated. S/N or letter grade. E

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

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

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

699 Seminar in Higher Education (3) Analysis of administrative and organizational structures, theory and practice in management of American colleges and universities. Prereq: 543 or consent of instructor. Su

Electrical and Computer Engineering

(College of Engineering)

MAJOR

DEGREES

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

R. C. Gonzalez, Head

Professors:

Alexeff, Igor, Ph.D. ................... Wisconsin

Bailey, J. Milton, Ph.D. ............... Georgia Tech

Birdwell, J. Douglas, Ph.D. ............ MIT

Bishop, Asa O., Jr., Ph.D. .......... Clemson

Blalock, T. Vaughn, Ph.D. ............. Tennessee

Bodenheimer, Robert E., Ph.D. .... Northwestern

Bozic, Bimal (Conrad Chair of Excellence), Ph.D. ....... Calcutta

Boudlin, Donald W., Ph.D. .......... Vanderbilt

Gonzalez, R. C. (Distinguished Prof.), Ph.D. ........ Florida

Goode, Joseph M., Ph.D. .......... Georgia Tech

Green, Walter L., Ph.D. ............... Texas A&M

Hoffman, Graham W., Ph.D. ......... Harvard

Huang, James C. (Distinguished Prof.), Ph.D. ........ New York

Kennedy, Eldredge J., Ph.D. ......... Tennessee
Admissions Requirements

Students applying for admission to the Master of Science program and who hold a B.S. in Electrical Engineering are considered for admission on an individual basis. The minimum expectation is an undergraduate cumulative grade-point average of 3.0 out of 4.0 and a GPA of 3.0 for the senior year. A TOEFL score of 580 is required for international students.

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

Master's Degree Requirements

Specific degree requirements which must be met include:
1. Electrical and Computer Engineering 503 and 504.
2. Six semester hours of graduate credit in mathematics consisting of mathematics courses of 400 level or higher which have been approved by the E.C.E. Graduate Committee.
3. An additional 12 semester hours of 500-level work in electrical and computer engineering courses or 6 semester hours of 500-level work in one area of electrical and computer engineering courses and 6 semester hours of 500-level work in another area approved by the student's Master's Committee. The 500-level work in electrical and computer engineering courses must include at least 6 hours in the student's major area.
5. A final oral examination covering the thesis and related coursework.

The DOCTORAL PROGRAM

The Ph.D. with a major in Electrical Engineering may be pursued in the concentration areas of circuit theory, computers, electromagnetics, communication theory, system theory, power systems, and solid-state electronics. The written comprehensive exam is given when the student is ready to apply for admission to candidacy. The exam consists of both written and oral parts. The written part consists of at least two sections: a complete review of the literature in the student's dissertation topic, and a review of the major tools to be used in the dissertation work. The student's dissertation may require additional written sections. The student must demonstrate a mastery of the dissertation area, ability to think analytically and creatively, skill in using academic resources, and ability to complete the dissertation satisfactorily. The oral part consists primarily of a professional presentation of a proposal for dissertation work and its defense. The dissertation committee may cover additional topics in the oral part.

Note: 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 or 500-level course may be used toward a graduate degree in Electrical and Computer Engineering except when required by the program.

405 Digital Signal Processing and Filter Design (3) Discrete-time signals and systems, sampling, discrete Fourier transforms, analog filter characteristics, non-recursive and recursive filter design, and CAD tools for filter design. Includes laboratory experiments and projects.


412 Linear Control System Design (3) Classical and modern techniques for design and compensation of
linear feedback control systems. Prereq: Linear System Analysis.

413 Passive and Active Network Synthesis (3) Use of network analysis techniques, passive network driving point synthesis, transfer function synthesis, approximation theory, topics in active network synthesis. Prereq: 312.


422 Machines (4) Dynamic behavior of rotating machines; transfer functions for common modes of operation of d.c. machines; response to different waveforms in supply; design and control. Transformers for machines load; their numerical solutions. Includes laboratory experiments and projects. Prereq: Electric Energy System Components.

423 Power Electronics (4) Principles and characteristics of power semiconductor devices, single-phase and polyphase phase-controlled converters, converter control, ac phase controller, voltage-fed inverter and dc-dc converter principles, industry applications. Includes laboratory experiments and projects. Prereq: Electric Energy System Components.


431 Digital and Analog Integrated Electronics (4) Basic processing and fabrication of active and passive components, design and testing of analog circuits based on basic principles of bipolar, MOS and JFET transistors in typical digital and integrated circuit designs; 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. Includes laboratory experiments and projects. Prereq: Electric Energy System Components.

433 Analog Signal Processing Electronics (4) Transistor signal and interconnect characteristics; analog integrated circuits: operational, instrumentation, and isolation amplifiers, mos and logarithmic converters, multipliers, and dividers. Includes laboratory experiments and projects. Prereq: Electric Energy System Components.

434 Electronic Amplifiers (4) Feedback amplifier principles; wideband linear amplifier design; radio frequency and audio power amplifier design; linear regulated power supply design; oscillator principles. Includes laboratory experiments and projects. Prereq: Electric Circuits.

441 Communication Systems II (3) Probability, random variables, and random processes as applied to communication systems. Analog modulation in presence of noise. Digital communication concepts: binary and m-ary signaling, synchronization, multipath, and equalization. Digital communications in presence of noise and matched filtering, information and coding theory. Includes laboratory experiments and projects. Prereq: Communication System I.

442 Antennas and Propagation (3) Linear antennas, arrays, other simple antennas. Antenna gain, impedances, communication link parameters. Wave propagation in earth bound troposphere, ionosphere. Reflections from earth; effects on link reliability. Prereq: Fields.

443 Microwave Circuits and Electronics (3) Scattered wave theory, antennas, isolators and amplifiers, couplers and power dividers, circulators, phase shifters. Loading and interconnection of systems. Power generation and amplification by switching, filtering and multiplexing. Design parameters for microwave components. Includes laboratory experiments and projects. Prereq: Fields.


451 Microprocessors in Computer Engineering (4) Project-oriented course using microcomputer kit having monitor program and development system with cross-assemblers, file management, and emulation capability. Interfacing and hardware/software inside-inside in interrupt driven applications. Term grade dependent on satisfactory completion of projects completed, homework solutions, and engineering notebook. Includes laboratory experiments and projects. Prereq: Introduction to Logic Design of Digital Systems.


453 Data Acquisition Systems (4) Digital-to-analog conversion techniques; Quad and R-2R ladder networks; error analysis of A/D converters; sample hold circuits; analog-to-digital conversion techniques; open loop systems; direct and matrix converters; closed loop systems; dual slope and successive approximation; error analysis of accuracy, linearity, linearity, drift, dynamic range, frequency response, gain, bands and shielding; automated testing of A/D and D/A converters; device service routines; software analysis. Includes laboratory experiments and projects. Prereq: Introduction to Logic Design of Digital Systems.


461 Plasma Magnetohydrodynamics (3) MHD approximation; MHD waves; and instabilities: MHD in static and dynamic systems; MHD in pulsed and steady-state power generation. Applications to fusion energy, industry, and astrophysics. Prereq: 361.

462 Plasma Kinetic Theory Engineering (3) Kinetic theory of non-neutral plasmas; ion plasma transition from multiple beams to continuum; plasma and Landau theory; microwave generation in plasmas and traveling wave tubes; free electron masers in circular geometry; gyrotron and orbitron. Design of plasma devices. Prereq: 361; 461 or consent of instructor.

463 Introduction to Fusion Energy I (3) High temperature plasma physics relevant to fusion plasmas, principles of fusion reactors, and engineering and physics constraints on fusion reactors. Prereq: Introduction to Plasma Engineering for ECE majors, or consent of instructor. (Same as Nuclear Engineering 463.)

464 Introduction to Fusion Energy II (3) Continuation of 463. Principles and phenomenology of tokamak reactors. Development of tokamak concepts, advanced fusion fuels, fusion technology, plasma engineering, and fusion reactor design studies. Project which integrates material in 463 and 464. Prereq: 463 or consent of instructor. (Same as Nuclear Engineering 464.)

465 Plasma Laboratory (1) Experiments and design project illustrating material covered in 461 and 462.

469 Plasma Laboratory (1) Experiments and design project illustrating material covered in 461 and 462.


473 Introduction to Electrons and Optical Devices (4) Fourier optics; Diffraction lenses, coherent light, interferometry, holography. Light propagation in optical waveguides. Modulation by electro-optic devices. Includes laboratory experiments and projects. Prereq: Consent of instructor.


491 Special Topics in Electrical and Computer Engineering (1-3) Topics related to recent developments and current practice. Prereq: Consent of instructor. May be repeated.

494 Special Problems in Electrical Engineering I (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 weekly seminar. Prereq: Consent of instructor. May be repeated. Maximum 2 hrs. S/NC or grade letter.

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. Student must complete all required hours and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

503 Modern Transform Methods (3) Frequency-domain transform methods, relevant fundamentals of complex variable theory. Two-sided Laplace transform, its inversion with residues, and its relation to the Fourier transform and series. Sampling theory. Two-sided z-transform and its inversion, the discrete Fourier transform and fast Fourier transform.

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

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

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

507 Application of Numerical Linear Algebra in Systems and Control Engineering (3) Same as Chemical Engineering 507 and Mechanical Engineering 507.

511 Linear Systems Theory (3) State space models of linear dynamical systems, linear algebra, state transition matrices, exponential, controllability, observability, realization theory, and stability theory. Coreq: 503.

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

515 Adaptive Control and System Identification (3) Adaptive control of linear deterministic and stochastic systems, adaptive filtering and prediction, parameter estimation for deterministic and stochastic systems. Prereq: Coreq: 512.

516 Passive and Active Network Analysis and Synthesis I (3) Frequency and time domain techniques for network analysis, network reliability, synthesis algorithms.


519 Control Systems Design II (3) Control design, variable structure control, state-space design of SISO systems.
systems, use of estimators and observers, calibration of classical and state-space methods of control system design, considerations for a control system instrumentation. Prereq: 516.

521 Power Systems Analysis I (3) Matrix vector representation of power networks, sequential 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, averaged PWM techniques, current-fed inverters, drive system modeling, vector and scalar control of induction and synchronous motor drives, control principles of synchronous machines.


525 Advanced Electrical Machines I (3) Fundamental processes of electromechanical energy conversion; application in conventional devices. Differential equations for rotating machinery. Prereq: 422 or equivalent.

526 Advanced Electrical Machines II (3) Park's transformations, sensorless control of isolated and interconnected rotating machines. Prereq: 528.

531 Advanced Analog Electronics I (3) Physical operation of modern electronic devices; semiconductor devices: doping, bipolar transistors, J-FETs, and MOS-FETs. Small-signal equivalent circuits and noise models of active devices. Project laboratory. Prereq: 431, 432, 435, or consent of instructor.

532 Advanced Analog Electronics II (3) Design and analysis of linear and nonlinear feedback amplifiers and radio-frequency amplifiers using discrete, monolithic and hybrid devices; voltage and current regulators, switching regulators for linear and digital systems in analogous signal processors. Advanced topics from current literature. Project laboratory. Prereq: 531.


543 Information Systems I (3) Optimum design of digital communication systems. Statistical analysis of signals and systems. Baseband transmission in presence of noise, digital representation of analog signals, multi-rate systems, channel coding and decoding and signal processing in communication systems. Prereq: Consent of instructor. Prereq: 431, 432, 435, or consent of instructor.


545 Introductory Microwave Networks and Components (3) Scattering and transfer representation for multipoles, unilateral and bilateral microwave and millimeter wave devices. Complex impedance of a complex parameter measurement by modern two-port networks. 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.

561 Plasma Diagnostics I (3) Principles of active, passive, perturbing and nonperturbing diagnostic methods used in low temperature plasmas, and high temperature plasmas of interest in fusion research. Laboratory safety, data reduction and presentation, and diagnostic based data handling and analysis, and reduction of time series data. Prereq: 461, 463, or consent of instructor. (Same as Nuclear Engineering 561).

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

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

566 Industrial Plasma Engineering II (3) Continuation of 565 to industrial applications: ion implantation in solids, plasma deposition and etching, plasma propulsion systems, plasma etch and dry etch devices, in situ and ex situ diagnostic techniques. Prereq: 565 or consent of instructor.

571 Pattern Recognition (3) Decision-theoretic and structural approaches to pattern recognition. Determination and statistical decision rules, feature extraction and representation, syntactic and semantic methods. Prereq: 471 or consent of instructor.


573 Vision and Sensing for Robotics and Automation I (3) Acquisition, processing, integration, and interpretation of a wide range of vision and non-visual sensing modalities as applied to automated and tele-operated systems. Prereq: Consent of instructor.

574 Vision and Sensing for Robotics and Automation II (3) Aspects of color processing, analysis, and interpretation using various sensing modalities. Selected topics from current literature. Prereq: Consent of instructor.


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

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


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: 517.

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

624 Electrical Insulation (3) Principles, testing, and case studies. Basic principles of aging, losses, charging, conduction, and breakdown in vacuum, gas, liquid, solid, and composite insulation systems. Testing with low-noise instrumentation, pulse height analysis, optics, acoustics, and bridges; association of insulation and distributed parameter effects. Case studies drawn from active research, power systems, electronic circuits and devices, shielding, and stress grading. Prereq: 503, 504, and consent of instructor.

651 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: 551-52 and consent of instructor.


653 Advanced Topics in Information Science I (3) Detection, information coding theory, system identification, and signal processing. Signals with unknown parameters: optimal filter synthesis; adaptive systems: sequential detection. Prereq: 504 or consent of instructor.

663 Advanced Plasma Physics I (3) Basic concepts of high-temperature plasma physics. Magneto-hydrodynamics and kinetic descriptions of plasma, plasma transport, plasma waves, equilibrium, and stability. Prereq: Physics 541-2, 481-2 or 563-4, or consent of instructor. (Same as Physics 553).


665 Advanced Topics I (3) Advanced topics in Electrical Engineering. May be repeated. Maximum 9 hrs.

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

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

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

675 Advanced Quantum Electronics (3) Electronic and quantum-mechanical devices. Prereq: 531-32 and consent of instructor.
Engineering Science and Mechanics
(College of Engineering)

MAJOR
DEGREES
Engineering Science ...................... M.S., Ph.D.

T. G. Carley, Acting Head

Professors:
Anant, B. (UTSI), Ph.D. ......................... Texas Texas
Carley, T. G. (Liaison), PE, Ph.D. .............. Illinois Illinois
Forrester, J. H., PE, Ph.D. ...................... Iowa State Iowa State
Jendrucko, R. J., PE, Ph.D. ..................... Virginia Virginia
Keefe, D. R. (UTSI), Ph.D. ..................... Florida Florida
Kim, K. H., Ph.D. ................................ NC State NC State
Krieg, R. D., Ph.D. ............................... New Mexico New Mexico
Landes, J. D., PE, Ph.D. ......................... Lehigh Lehigh
Lee, C. W. (Emeritus), Ph.D. .................... Illinois IT Illinois IT
McCay, M. H. (UTSI), PE, Ph.D. ............... Florida Florida
McCay, T. D. (UTSI), PE, Ph.D. .................. Auburn Auburn
Pih, H. (Emeritus), PE, Ph.D. .................... Illinois IT Illinois IT
Remenyik, 0. J. (Emeritus), Ph.D. .............. Johns Hopkins Johns Hopkins
Scott, W. E., Ph.D. ............................... Johns Hopkins Johns Hopkins
Shahroki, F. (UTSI), Ph.D. ...................... Oklahoma Oklahoma
Shobe, L. R. (Emeritus), PE, M.S. .............. Kansas State Kansas State
Snyder, W. T., Ph.D. ............................. Northwestern Northwestern
Soliman, O., PE, Ph.D. .......................... Tennessee Tennessee
Stoneking, J. E., PE, Ph.D. ...................... Illinois Illinois
Wasserman, J., PE, Ph.D. ....................... Cincinnati Cincinnati
Wellsman, V. J., Ph.D. ............................ Rensselaer Rensselaer

Research Professors:
Fan, J., Ph.D. ..................................... Cincinnati Cincinnati
Monarty, T. F., PE, Ph.D. ...................... Illinois Illinois

Associate Professors:
Boulit, J. A. M., Ph.D. .......................... Stanford Stanford
Caruthers, J. E. (UTSI), Ph.D. ............... Georgia Tech Georgia Tech
Engels, R. C. (UTSI), Ph.D. ..................... VPI VPI
Madhukar, M. S., Ph.D. ....................... Drexel Drexel
Mathews, A., PE, Ph.D. ......................... Illinois Illinois
Steinhoff, J. S. (UTSI), Ph.D. .................. Chicago Chicago

Assistant Professors:
Cazeaux, J. L., Ph.D. ............................ Rensselaer Rensselaer
Iannelli, G. S., Ph.D. ............................ Tennessee Tennessee
Pionke, C. D., PE, Ph.D. ....................... Georgia Tech Georgia Tech
Yu, N., Ph.D. ...................................... California (San Diego) California (San Diego)

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program concentrations include solid mechanics, 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:

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<th>Hours</th>
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<tr>
<th>Mathematics</th>
<th>Array of options covering graduate coursework and the thesis.</th>
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<tr>
<td>Engineering courses* (Major concentration may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)</td>
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<tr>
<td>Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.)</td>
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<tr>
<td>Thesis</td>
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*Engineering courses under option II may include advanced laboratory work or special problem work; for example, Engineering Science and Mechanics 581 or analogous courses in other departments.

A final examination is required under both options covering graduate coursework and the thesis.

THE DOCTORAL PROGRAM

Specific departmental requirements for the Ph.D. include:

1. A minimum of 72 semester hours beyond the Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.
2. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with

at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group will be taken 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. Attendance and participation in graduate seminars and colloquia.

5. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering Science.

After being admitted as a potential candidate for the Ph.D., a qualifying examination must be taken at the first opportunity after the student has completed a Master's degree or any 24 hours of graduate credit.

The purposes of qualifying examinations are:

a. To determine the qualifications of the student to continue the Ph.D. program, and
b. To identify the student's areas of strengths and weaknesses to guide the student's graduate coursework and research.

The qualifying examination will be administered by the department's Graduate Studies Committee. The examination will be written and will cover at least four graduate level subject areas. One subject area will be mathematics, and the other will be designated by the student subject to the approval of the department's Graduate Studies Committee.

The comprehensive examination is to be taken by students within 6 credit hours of completion of graduate coursework required for the Ph.D. degree. This examination is to be administered by the student's advisory committee and shall consist of both a written and an oral portion.

6. After successfully passing the qualifying and comprehensive examinations, the student must present the Ph.D. dissertation research proposal to the student's advisory committee and receive committee approval of the proposal before being admitted to candidacy for the Ph.D. dissertation.

7. A final examination on the student's dissertation and related fields will be taken by the student after completion of the Ph.D. dissertation and course requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Engineering Science is available to residents of the state of Florida (concentration in biomedical engineering only). Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE CREDIT FOR 400-LEVEL COURSES

Four hundred-level courses in engineering may be used for graduate credit at the discretion of the advising committee. However, at least two-thirds of minimum required credit hours in a Master's degree program must be at or above the 500 level.

GRADUATE COURSES

421 Materials of Engineering (3) Mechanical properties of engineering materials: data collection and proc-
500 Thesis (1-5) 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 before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
523 Theory of Elasticity (3) Equations of equilibrium; strain-displacement relations compatibility; and constitutive relations in three-dimensional solid mechanics; beams, thick-walled tubes, plates with holes, stress concentrations. Air and complex potential stress function, plane stress and plane strain, stress boundary conditions, polar coordinates, Thermal stresses in beams, rings, plates, and shells; thermal buckling problems.
525 Theory of Plates (3) Classical bending theory of thin plates; thick plates; buckling and large deflection problems. Prereq: 523 or 535.
536 Advanced Engineering Acoustics (3) Introduction to theory and application of acoustic analysis; vibration of continuous systems, plane and spherical waves, transmission, reflection, absorption, transmission, filters, absorption mechanisms, microphones, ultrasonics, sonar transducers. Prereq: 431 or 435.
539 Continuum Mechanics (3) Cartesian tensors, transformation laws, basic continuum mechanics concepts; stress, strain, deformation, constitutive equations. Conservation laws for mass, momentum, energy. Applications in solid and fluid mechanics.
541 Fluid Dynamics (3) Kinematic, kinetic and thermodynamic properties of fluids. Development of fluid deformation relations; mass, momentum and energy conservation; relationships; non-dimensionalization. Applications of Euler and Navier-Stokes equations. Exact solutions, potential flow, frictional boundary layer approximations; coupled heat/mass transfer models. Coreq: 539.
542 Fluid Dynamics II (3) Development of basic concepts and governing equations for turbulence and turbulent field motion. Formulation for correlation function, energy equation, transport equations, transport processes, free turbulence, wall turbulence; use of engineering turbulence closure models; examination of modern numerical and experimental methods. Prereq: 541.
552 Computational Fluid-Thermal Analysis (3) Construction, analysis and application of various Navier-Stokes equations system: weak-statement theoretical framework; non-linear, convection, buoyancy, turbulence, Navier-Stokes incompressible Navier-Stokes equations; stresstransformation-vorticity and physical variables algorithms. SIMPLE, SIMPLE C, pseudo-compressibility and penalty gms in unified, theoretical concept of completeness, accuracy, convergence, energy and boundary conditions. Unsteady problems, free surface flow, flows with massive separation, thermally driven boundary layers, diffuser, efficient three-dimensional, turbulent convection. Modifications to reproduce finite difference, finite volume and finite element algorithms. Computer project. Prereq: 551. (Same as Mechanical Engineering 516.)
553 Computational Solid Mechanics (3) Finite element analysis techniques in structural and solid mechanics, plasticity and elasticity, nonlinearities. Two and three-dimensional formulations, isoparametric elements, numerical quadrature. Error estimating, stability, strain-energy norm, matrix iteration techniques. Applications in beams, plates and shells; use of representative computer programs in research, teaching and design environment; CAD, graphics, solid models, data base management. Prereq: 551. (Same as Mechanical Engineering 559.)
557 Computational Mechanics Seminar (1) Current developments in computational fluid/thermal structural mechanics. For departmental thesis candidates only. May be repeated.
559 Computational Mechanics Laboratory (5) Utilization of networked X-terminal/engineering work station environment for conducting mechanics of continuous media experiments. May be taken for credit with each of courses 551, 552, 553, and 557. Coreq: 551. (Same as Mechanical Engineering 559.)
562 Experimental Mechanics of Composite Materials (3) Stress-strain relationships for orthotropic and transversely isotropic materials; analysis of composite laminate and laminate stress and strain transformation; laminate plate theory; fiber, matrix, fiber-matrix interface, and composite mechanical properties. Tensile, flexure, compressive, shear; physical properties; notch-tip stress field, stress intensity factor; notch sensitivity; strain energy release rate; composite fracture toughness; failure criteria. Comparison of experimental and theoretical modes. Lab. Prereq: 521 or consent of instructor. (Same as Materials Science and Engineering 562.)
566 Optical Engineering I (4) Wave optics; scalar wave theory; introduction to Fourier optics; ray or geometric optics; lens, mirror, gratings; paraxial design methods; introduction to aberrations.
568 Optical Engineering II (4) Statistical optics; spontaneous and induced emission; black and gray body radiative transfer, quantum optical phenomena; Markovian optical radiation processes; mutural coherence function, detectors, radiometry. Prereq: 556.
572 Biomechanical Fluid Mechanics (3) Application of fluid mechanics theory to fluid flows in living systems. Solution of hemodynamics equations to describe fluid flow in arteries, veins, and the microcirculation. Measurement of flow properties of blood and other biological fluids. Analysis of pathological flows, blood flow through arterial
stences. Study of flow through artificial heart valves and in extracorporeal devices. Prereq: 541.

575 Applied Artificial Intelligence (3) (Same as Nuclear Engineering 575 and Mechanical Engineering 575.)

576 Expert Systems in Engineering (3) (Same as Nuclear Engineering 576 and Mechanical Engineering 576.)

577 Neural Networks in Engineering (3) (Same as Nuclear Engineering 577 and Mechanical Engineering 577.)

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, Aviation Systems 588, Chemical Engineering 588, Civil Engineering 588, Mechanical Engineering 588 and Aerospace Engineering 588.)

599 Measurement Science II (3) (Same as Nuclear Engineering 599 and Aviation Systems 599.)

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

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. Prereq: 523 and 529 or Polymer Engineering 541.

625 Computational Plasticity and Creep (3) Theory and numerical algorithms used to describe plastic and creep behavior in finite element structural models. Perfect plasticity, kinematic and isotropic hardening, Mroz, mechanical sublayer, and two-surface models; volumetric plasticity models; traditional creep models and unified creep plasticity models. Numerical algorithms, including error maps, and plane stress plasticity algorithms in parallel. Prereq: 539 or 523, and 553.


641 Advanced Topics in Fluid Mechanics and Convective Heat Transfer (3) Convective momentum, heat and mass transfer; boundary layer analysis; stability, transition, turbulence, closure models; Navier-Stokes equations, closure procedures: time- and 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; Kolmogorov's hypothesis; large and small eddy structure for turbulent flows; turbulent diffusion by continuous movement; applications to turbulent jets, wakes, pipe flow, and boundary layers. Prereq: 542. (Same as Aerospace Engineering 545.)

651-52 Advanced Topics in Computational Fluid Dynamics (3,3) Approximation theory; analysis of accuracy, convergence, and stability for smooth and non-smooth solutions; shocks, artificial dissipation; two- and three-dimensional, compressible viscous and inviscid 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: 552. (Same as Mechanical Engineering 651-52.)

653-54 Advanced Topics in Computational Solid Mechanics (3,3) Fracture mechanics; singularity solutions, non-linear constitutive problems, variable stiffness, initial strain and invariance methods, plasticity, creep; unified creep-plasticity theory; geometrically non-linear problems, large deflection, stability, shell structures, analysis of flat and curved adaptive grids. Prereq: 553. (Same as Mechanical Engineering 653-54.)

657 Computational Mechanics Seminar (1) Current developments in computational fluid/thermo/mechanical mechanics. For departmental thesis students only. May be repeated.

671 Advanced Topics in Applied Artificial Intelligence (3) (Same as Nuclear Engineering 671 and Mechanical Engineering 671.)

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

Degree Options

MAJOR

DEGREES

English ................................................... M.A., Ph.D.

D. Allen Carroll, Head

Professors:

Bratton, Edward W., Ph.D. ......................... Illinois
Carroll, D. Allen, Ph.D. .......................... North Carolina
Cox, Don R., Ph.D. ................................. Missouri
Drake, Robert V., Ph.D. ........................... North Carolina
Dykeman, William (Adjunct), B.A. .......................... Northwestern
Ensor, Allison R. (Liaison), Ph.D. ...................... Indiana
Finneran, Richard J. (Hodges Chair of Excellence), 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
Maland, Charles J., Ph.D. ............................. Michigan
Penner, A. Richard, Ph.D. ............................ Colorado
Reese, Jack E., Ph.D. ................................. Kentucky
Sanders, Norman J. (Lindsay Young Prof.), Ph.D. .......................... Colorado
Schor, Dorothy M., Ph.D. ............................ North Carolina
Shurr, William, Ph.D. .............................. North Carolina
Thomas, Joyce Carol, M.A. .......................... Stanford
Thriefen, Joseph B., Ph.D. ........................... Princeton
Wheeler, Thomas V., Ph.D. .......................... North Carolina
White, Jon M. (Lindsay Young Prof.), M.A. .......................... Cambridge

Associate Professors:

Bensel-Mysels, Linda D., Ph.D. ........................ Oregon
Dumas, Bethany K., Ph.D. .......................... Arkansas
Dunn, Allen, Ph.D. ................................. Washington
Gannon, Stanford B., Jr., Ph.D. ........................... Princeton

Gill, J. E., Ph.D. ........................................ North Carolina
Goslee, David F., Ph.D. ............................. Indiana
Hutchinson, George, Ph.D. .......................... Rutgers
Keene, Michael, Ph.D. ............................. Texas
Leki, Ilona, Ph.D. ................................. Illinois
Robinson, Frank K., Ph.D. ............................. Texas
Smith, Arthur, Ph.D. ............................... Houston
Stillman, Robert, Ph.D. ............................ Pennsylvania
Zornichuk, John, Ph.D. .............................. Columbia

Assistant Professors:

Atwill, Janet, Ph.D. ............................... Purdue
Barton, Ken, Ph.D. ................................. Texas Christian
Bhatt, Rakesh, Ph.D. ............................... Illinois
Hammond, Pat G., M.A. .............................. Tennessee
Hirst, Russel, Ph.D. ................................. Rensselaer
Howes, Laura L., Ph.D. ............................. Columbia
Hubbard, Dolan, Ph.D. ............................... Illinois
Jennings, La Vina, Ph.D. ............................ North Carolina
Papke, Mary E., Ph.D. .............................. McGill

The Department of English offers the Master of Arts and the Doctor of Philosophy degrees with a major in English. Thesis and non-thesis options are available for the M.A. as well as a special concentration in writing.

Detailed information about the Master's and doctoral programs, and about individual graduate courses, may be obtained by writing the Director of Graduate Studies in English, 306 McClung Tower. A prospective student must contact the department to receive the proper information and forms with which to apply.

The Department of English does not accept students in non-degree or provisional status. A student who wishes to enter the department must apply in degree-seeking status for his/her application to be considered for admission to any graduate program in English.

The Master's Program

Requirements

Coursework: A minimum of 24 semester hours in English beyond the B.A., to include 6 hours at the 600 level, 12 additional hours at the 500-600 level (Only 3 hours of 593 Independent Study may be applied toward the M.A.); and 6 hours for graduate credit at any level, including the 400 level. In this coursework, students must maintain at least a 3.0 GPA.

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

Non-Thesis Option: Six hours of additional courses at the 500-600 level, making a total of 30 hours of required coursework.

Language Requirement: Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:

1. Completion of the second year of a language at college level with a grade of C or better.

2. Completion of French 302 or German 332 at UT Knoxville with a grade of B or better.

3. Passing of the regular Ph.D. foreign language examination as currently administered at UT Knoxville.

4. Passing the Graduate Student Foreign Language Test (GSFLT) as currently administered through the English Department.

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

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

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

WRITING CONCENTRATION

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

Requirements

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

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

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

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

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

THE DOCTORAL PROGRAM

Requirements

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

Coursework: At least 51 semester hours beyond the B.A. to include at least 21 semester hours at the 600 level; at least 15 semester hours at the 500 level or above (only 3 hours of 593 Independent Study may be applied toward the M.A. and 3 after the M.A.); a special three-hour course in teaching composition; and 12 additional hours at any level, including the 400 level. Up to 6 of these additional hours may be taken in some cognate field or fields such as history, philosophy, French. These courses must be drawn from those approved for graduate credit. All other coursework must be in the English department. In this coursework, students must normally maintain a 3.5 GPA.

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

Language Requirement: A language requirement met in one of the following ways:
1. Two languages approved by the Director of Graduate Studies in English. The requirement for each language may be fulfilled by a) completion of French 302 or German 332 with a grade of B or better; b) completion at UT Knoxville of any two courses on the 300 level or above in the foreign language or literature with at least a grade of B in each course; c) passing of the regular Ph.D. foreign language examination as currently administered at UT Knoxville; or d) passing the Graduate Student Foreign Language Test (GSFLT) as currently administered through the English Department.
2. One modern language approved by the Director of Graduate Studies in English. This requirement must be fulfilled by a passing grade on the language examination given by UT Knoxville and completion of two courses given in the foreign language at the 400 level or above, at least one course to be at the 500 or 600 level. A minimum grade of B must be received in each course.
3. One modern language approved by the Director of Graduate Studies in English and intensive study of the English language. This requirement must be fulfilled by completion of (a), (b), or (c) in option 1, for one foreign language, and completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509. History of the English Language (offered in alternate years only). For the other 3 hours, the student may either complete the history of the language sequence or choose one other course in language taught in the Department of English at the 500 or 600 level and approved by the Director of Graduate Studies in English. These courses will not count toward the minimum number of courses for the Ph.D., and anyone electing this language option may not take the comprehensive examination in linguistics.

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

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

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

GRADUATE COURSES

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

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

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

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

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

406 Renaissance Drama (3) English theatre between 1550 and 1650 through reading of representative plays by Shakespeare's contemporaries: Marlowe, Webster, Jonson.

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

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

411 Literature of Restoration and Early Eighteenth Century: Dryden to Pope (3) Survey of English literature and culture from 1660 to 1750.

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

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

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

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

416 Victorian Poetry and Prose I (3) Tennyson, Pre-Raphaelites, Carlyle, Newman, and Mill.

419 Victorian Poetry and Prose II (3) Browning, Arnold, Hopkins, Hardy, Ruskin, Darwin, and Wilde.

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

421 Modern British Novel (3) Lawrence, Joyce, and Woolf.

422 Women Writers in Britain (3) Literary consciousness and works of women writers in Britain. (Same as Women's Studies 422.)

431 Colonial, Federal, and Early National American Literature (3) From Columbus to Washington Irving.

432 American Romanticism and Transcendentalism (3)

433 American Realism and Naturalism (3)

434 Modern American Literature (3) World War I to the present.
435 American Novel before 1900 (3) From earliest sentimental novels through Brown and Cooper, and major figures to 1900: Hawthorne, Melville, Stowe, Clemens, and James.


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

442 American Humor (3) Early nineteenth century into twentieth century: Mark Twain.

443 Topics in Black Literature (3) Contents vary: particular genres, authors, or theories from 1645 to present: Langston Hughes and Harlem Renaissance, Richard Wright and Gwendolyn Brooks, writing by Black women, international Black literature in English, and Black American autobiography.

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

452 Modern British and American Drama (3) O'Neil's works as precursors to modern dramatists: Williams, Miller, Albee, and representatives of Black theater, Buffins, and Baraka.

453 Continental Drama (3) Selection of plays by European writers from late Renaissance to present; twentieth-century achievement.

454 Twentieth-Century International Novel (3) Joyce, Camus, Kafka, Nabokov.

455 Persuasive Writing (3) Persuasive strategies in both student and professional writing. Practice in mastering effective logical and emotional appeals.

460 Technical Editing (3) Editing technical material for publication. Principles of style, format, graphics, layout, and production management. Prereq: 456 and 459, or consent of instructor.

461 Advanced Technical and Professional Writing (3) For students planning careers in industry, education, and government who need technical writing skills. Writing of definitions, process descriptions, sets of instructions, descriptions of mechanisms, recommendation reports, abstracts, proposals, and major reports. Prereq: Junior standing in student's major or consent of instructor.


463 Advanced Poetry Writing (3) Further development of skills acquired in basic writing poetry course. Prereq: 460 or consent of instructor.

464 Advanced Fiction Writing (3) Further development of skills acquired in basic fiction writing course. Prereq: 463 or consent of instructor.

471 Sociolinguistics (3) Study of language in relation to society. Empirical and theoretical focus. Large-scale units: tribes, nations, social groups. Prereq: 371 or 372 or Linguistics 290 or consent of instructor. (Same as Linguistics 471 and Sociology 471.)

472 American English (3) Phonological, morphological, and syntactic characteristics of major social and regional varieties of American English: origins, functions, and implications of socio-cultural variation. Prereq: 371 or 372 or Linguistics 290 or consent of instructor. (Same as Linguistics 472.)

474 Teaching English as a Second or Foreign Language (3) Grammatical structures of English; particular grammatical difficulties of non-native learners of English. Basic phonological structures of English. Teaching grammar and phonology to non-native speakers; comparative analysis of English with other languages. Prereq: Second year of a foreign language. (Same as Linguistics 474.)

475 Teaching English as a Second or Foreign Language II (3) Second language acquisition theory. Issues in teaching English as a second language to learners of English. Materials and methods of language teaching and testing: preparation of materials. Observation of and team teaching with experienced staff member. Prereq: English 474. (Same as Linguistics 475.)

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

480 British and American Ballad and Folktale (3) Popular ballads and folktales of English, Scottish, and Northern American tradition.

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

482 Major Authors (3) Content varies. Concentrated study of at least one of most influential writers in British or American literary history: e.g., Donne, Tennyson, Jane Austen, Whitman, Faulkner, Baldwin or Lawrence.

483 Special Topics in Literature (3) Topics vary. May be repeated. Maximum 6 hrs.

484 Special Topics in Writing (3) Original writing integrated with reading, usually taught by professional author. Topics vary. May be repeated. Maximum 6 hrs.

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

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

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

502 Registration for Use of Facilities (3-15) Required when student uses University facilities and/or office space before degree is completed. May not be used toward degree requirements. May be repeated: S/N/C only. E

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

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

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

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

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

513-14 Readings in Medieval Literature (3) Reading and analysis of selected masterpieces of Old and Middle English literature and their Continental sources in Modern English.

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

530-31 Readings in English Literature of the Restoration and Eighteenth Century (3.3) Topics vary: genre, poetry, prose, fiction, drama; or period: Restoration, earlier eighteenth century, later eighteenth century.

540-41 Readings in English Literature of the Nineteenth Century I and II (3) Content varies: genre, theme, literary movement, or other coherent emphasis.

550-51 Readings in American Literature from the Colonial Period to the Present (3.3) Content varies: genre, theme, literary movement, or other coherent emphasis.

552 Readings in Black American Literature (3) Content varies: genre, theme, literary movement, or other coherent emphasis.
Entomology and Plant Pathology

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREE

Entomology and Plant Pathology .................... M.S.

Carroll J. Southards, Head

Professors:

Bernard, Ernest C., Ph.D. ...................... Georgia

Gerhardt, Reid R., Ph.D. ........... NC State

Hilly, James W., Ph.D. ...................... Ohio State

Johnson, Leander F. (Emeritus), Ph.D. .......... Louisiana State

Lambdin, Paris L., Ph.D. ...................... VPI

Pless, Charles D., Ph.D. ............. Clemson

Southard, Carroll J., Ph.D. ........... NC State

Associate Professors:

Grant, Jerome F., Ph.D. ...................... Clemson

Gwinn, Kimberly D., Ph.D. ............. NC State

Redick, Bradford B., Ph.D. .......... Clemson

Windham, Mark T., Ph.D. .............. NC State

Assistant Professor:

Ownley, Bonnie H., 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, or insect pest management; students in plant pathology may specialize in foliar and stem disease studies, soilborne diseases, disease physiology, biocontrol, plant nematology, or virology. For specific information, contact the department head.

THE MASTER'S PROGRAM

Admission Requirements

For admission to the M.S. degree program, a student must meet all requirements of The University of Tennessee Graduate 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 goals and interest in entomology or plant pathology are required.

Degree Requirements

The program requires a written thesis based on original research and the completion of a minimum of 24 hours of coursework for graduate credit, approved by the student's advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be passed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include at least 6 hours and not more than 10 hours of graduate-level credit in the minor department. The student's committee shall include a member of the faculty from the minor department to assist in designating courses required for the minor.

GRADUATE COURSES

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

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

510 Plant Disease Fungi (4) Morphology, taxonomy, and genetics of pathogenic fungi. Prereq: Plant Pathology. 2 hrs and 1 lab. F,A

512 Soilborne Plant Pathogens (3) Causal agents; host-parasite-soil-environment interactions; epidemiology; and biological, cultural, and chemical control. Prereq: Plant Pathology. 2 hrs and 1 lab. F,A

514 Bacterial Plant Diseases (4) Morphology, taxonomy, ecology, physiology, and genetics of bacterial plant pathogens; infection and disease development; plant-pathogen interactions. Prereq: Plant Pathology. 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 plant pathology, or consent of instructor. F,A

520 Plant Parasitic Nematodes (4) Morphology, taxonomy, ecology, and management of plant parasitic nematodes. Prereq: Plant Parasitics or consent of instructor. 2 hrs and 2 labs. S,A

521 Plant Virology (3) Symptomatology, epidemiology, and management of virus infections; structure, morphology, replication, transmission, purification, characterization, and classification of plant viruses; virology and virological methods. Prereq: Plant Pathology or consent of instructor. 2 hrs and 1 lab. Sp,A

525 Agricultural and Veterinary Entomology (3) Morphology, taxonomy, biology, and control of arthropod pests and vectors of diseases of humans and animals. Ecology and behavior of vectors in relation to pathogen transmission and control. Prereq: Plant Pathology 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: Plant Pathology or consent of instructor. (Same as Plant and Soil Science 530.) F,A

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

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

533 Concentrated Study in Entomology (1-3) Selected subjects in entomology for advanced students, concentrated in time and subject matter. Prereq: Plant Pathology or consent of instructor. May be repeated. Maximum 6 hrs. F,S

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

Environmental Engineering

See Civil Engineering

Environmental Practice

(College of Veterinary Medicine)

MAJOR DEGREE

Veterinary Medicine ...................... D.V.M.

L. N. D. Potgieter, Head

Professors:

Farkas, W. R., Ph.D. ...................... Duke

Oliver, J. W., D.V.M., Ph.D. .......... Purdue

Patton-McCord, S., Ph.D. ....... Kentucky

Potgieter, L. N. D., B.V.Sc., Ph.D. .. Iowa State

Ray, D. B., V.M., Ph.D. ..... Iowa State

Schultz, T. W., Ph.D. .......... Tennessee

Associate Professors:

Frazier, D., D.V.M., Ph.D. ......... Iowa State

New, J. C., D.V.M. .......... Texas A&M

Orosz, S. E., D.V.M., Ph.D. ....... Ohio State

Reinemeyer, C., D.V.M., Ph.D. ... Ohio State

Rohrback, B. W., V.M. ...... Johns Hopkins

Schroeder, E. C., D.V.M. ........ Michigan State

Assistant Professors:

Hahn, K. A., D.V.M. ................. Purdue

Kania, S., Ph.D. .......... Florida

Ramsay, E. C., D.V.M. ....... California (Davis)

Instructor:

Kennedy, M. A., D.V.M., Ph.D. .... Tennessee

Clinical Associate:

Clyde, V. L., D.V.M. .......... NC State

Post-Doctoral Research Associate:

Alansari, H. M., Ph.D. ...... Kansas State

Kelch, W. J., D.V.M. .......... Michigan State

Lu, X., M.D. .......... China

Residents:

Jones, M. P., D.V.M. .......... Missouri
Finance

(College of Business Administration)

MAJOR

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

Harold A. Black, Head

Professors:
Black, Harold A. (James F. Smith, Jr., Prof.), Ph.D. ................. Ohio State
Dotterweich, William W. (Emeritus), Ph.D. ......................... Pennsylvania

Philippatos, G. C. (Distinguished Prof.), Ph.D. ...................... New York
Shrieve, Ronald E. (Wm. Voigt Scholar), Ph.D. ....................... UCLA
Wansley, James W. (Clayton Chair of Excellence), Ph.D. ........ South Carolina

Grades of Oregon State University, P.O. Box 752, Corvallis, OR 97339-0752

Associate Professors:
Auer, A. L., Ph.D. ......................... Iowa
Boehm, T. P., Ph.D. .................... Washington (St. Louis)
DeGennaro, R. P., Ph.D. ............... Ohio State
Erhard, M. C., Ph.D. ................. Georgia Tech
Wachowicz, J. M., Jr., CPA, Ph.D. .......... Illinois

Assistants Professors:
Collins, M. Cary, Ph.D. ............ Georgia
Daves, Phillip R., Ph.D. .............. North Carolina
Guntherope, Deborah L., Ph.D. ....... Florida
Stern, Mitchell B., Ph.D. ............. Virginia

BUSINESS ADMINISTRATION

CONCENTRATIONS

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

MBA Concentration: Finance.

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

Minimum course requirements are three courses: Finance 510 (6 hours); plus two from the following: 512, 513, 522, 531, 561.

Ph.D. Concentration: Finance.

Minimum course requirements are Finance seminars 641, 642, 651, 652.

GRADUATE COURSES

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

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

501 Special Topics in Environmental Medicine (1-3) Acrometamorphosis, pharmacokinetic studies, toxicokinetic studies, epidemiology and techniques in molecular biology; atomic absorption, gas chromatography, ultracentrifugation, extractive techniques and radioimmunoassay. 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 used toward degree requirements. May be repeated. S/NC only. E

503 Predictive Toxicology (3) Principles and techniques of predictive toxicity: structure-activity relationships, expert systems, neural nets and molecular similarity.

505 Laboratory Animal Care and Use (2) Review of basic laboratory animal care and use as prerequisite to conducting research using animal subjects. Compliance with USDA, NIH and other regulations. Prereq: Consent of instructor.

506 Experimental Animal Surgery (3) Competence in performing humane surgical modifications of experimental animals. Techniques of anesthesia, Drug administration and postoperative care. Prereq: Embryology, parasitology, physiology and/or consent of instructor. 1 hr and 2 labs. F

530 Wildlife Diseases (2) (Same as Wildlife and Fisheries Science 530.)

561 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamics of drugs; mode of action, pharmacologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncrasies and clinical applications. Prereq: Consent of instructor. F

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

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

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


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, economic information, and dividend policy.

651 Advanced Seminar in Finance I (3) Recent theoretical and empirical developments in micro-finance literature. Topics vary. May be repeated. Maximum 6 hrs.

652 Advanced Seminar in Finance II (3) Recent theoretical and empirical developments in macro-finance literature. Topics vary. May be repeated. Maximum 6 hrs.

Food Science and Technology

(College of Agricultural Sciences and Natural Resources)

MAJOR

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

Marjorie P. Penfield, Acting Head

Professors:
Collins, J. L., Ph.D. ................. Maryland
Draughon, F. A., Ph.D. ............. Georgia
Jaynes, H. O. (Emeritus), Ph.D. .... Illinois
Melton, S. L., Ph.D. ................. Tennessee
Miles, J. T., (Emeritus), Ph.D. .... Wisconsin
Overcast, W. W., (Emeritus), Ph.D. .... Iowa State
Penfield, M. P., Ph.D. ............. Pennsylvania

Associate Professors:
Christen, G. E., Ph.D. .............. Missouri
Lovely, D. H., Ph.D. .............. Kansas State
Mount, J. R., Ph.D. ................. Ohio State
THE DOCTORAL PROGRAM

1. Completion of a Master's degree in the field, or a closely related field, or passing a special qualifying examination 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 600 Doctoral Research and Dissertation.

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

5. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Science and Technology.

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

Each candidate must pass both written and oral comprehensive examinations prior to admission to candidacy. Major professors will advise candidates on competencies expected. A final oral examination is required that includes a defense of the dissertation and subject matter that the student's committee considers appropriate.

GRADUATE COURSES

410 Food Chemistry I (3) Reactions of proteins, enzymes, and additives in foods. Physicochemical interactions of food materials. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. F

411 Food Chemistry II (3) Reactions of inorganic compounds, carbohydrates, lipids and vitamins in foods. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. Sp

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


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

440 Preservation of Food (3) Prevention of deterioration and spoilage of foods. Methods of preservation. Prereq: Agricultural Engineering Technology 422. 2 hrs and 1 lab. Sp

451 Dairy Products II (3) Science and technology of processing dairy products. Chemical, physical, and microbiological changes that occur during manufacture. Prereq: Principles of Chemistry. Introduction to Organic and Biochemistry, General Microbiology. 2 hrs and 1 lab. F

460 Meat Products Technology (4) Processing methods for making cured, smoked, fresh, filled and frozen 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

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. Sp

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

FORESTRY, WILDLIFE AND FISHERIES

Majors

Forestry .................................................. M.S.
Wildlife and Fisheries Science ........................ M.S.

John C. Rennie, Acting Head
Graduate study leading to the Master of Science with majors in Forestry and in Wildlife and Fisheries Science is offered by the Department of Forestry, Wildlife and Fisheries. The Master of Business Administration, with a concentration in forest industries management, is available for qualified students. This degree program is offered by the College of Business Administration with participation by the Department of Forestry, Wildlife and Fisheries.

The Doctor of Philosophy with a specialization in forest biology, wildlife science, or fisheries science can be achieved through the University's intercollegiate graduate program in Ecology.

A joint program between the department and Knoxville College leading to a specialized B.S. in Biology prepares Knoxville College graduates for graduate programs in natural resources.

THE MASTER'S PROGRAMS

Both thesis and non-thesis options are available for the major in Forestry; a thesis is required in Wildlife and Fisheries Science. For admission, the student must have a bachelor's degree from an accredited institution in forestry, wildlife, fisheries, or other natural resource area. Applicants must also have taken the General Graduate Record Examination (GRE). Graduate school rating forms or letters of recommendation from three individuals familiar with the applicant's academic ability are required. The department also has an application that must be submitted at the time of application to the Graduate School.

Thesis Option

1. Prior to research for the thesis, the student is required to develop a detailed written research proposal. Registration for 6 hours of Thesis (Forestry 500 or Wildlife and Fisheries Science 500) is required.

   2. A graduate committee of no fewer than 3 graduate faculty members must be selected by the student during 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.

   3. The student's progress and background indicates the student's progress in the program.

Non-Thesis Option (Forestry only)

1. Thirty-five hours of graduate coursework of which at least 28 hours must be at the 500 level or above is required.

2. A graduate committee of no fewer than 3 faculty members will be selected. At least one member shall be from outside the department. The committee will meet and schedule the student's program during the first semester 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.

   A concentration in managing natural resource organizations is available under the non-thesis option with a major in Forestry. The minimum core requirements include: Forestry 511, 570, and six additional hours of Forestry courses to be selected in consultation with the student's committee; Political Science 564, Management 504, and Planning 550. Fourteen hours of elective coursework are selected with the faculty advisor.

MINOR IN ENVIRONMENTAL POLICY

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

Forestry

GRADUATE COURSES

422 Forest and Wildland Resource Policy (3) Policy formation; concepts of decision-making; forest and wildland law and regulation; theory of conflict resolution; formal and informal resolution. Prereq: Senior standing. F

423 Wildland Recreation Planning and Management (3) Planning processes and techniques, site design projects; management strategies, methods of visitor and recreation site management; case studies. Weekend field trips. Prereqs: 321, 323, Ornamental Horticulture and Landscape Design 285, or consent of instructor. 2 hrs and 1 lab. Sp

424 Forest Adhesives and Glued Wood Products (2) Theory and practice of adhesives bonding of wood; wood-substrate-adhesive interface for bonding; principles of adhesion; wood adhesives; gluing of solid wood and composite wood manufacturing processes; laboratory manufacture and testing of adhesives, adhesive bond strength and glued wood product performance; day field trips. Prereq: Wood Properties and Use and Wood Identification, consent of instructor. 2 hrs and 2 labs. F

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

435 Wood Drying and Preserving (2) Discussion of wood-drying moisture relations. Introduction to commercial wood drying equipment and practices; property, specification, and disposal of preservative treated wood. Day field trip. Prereq: Wood Properties and Use and Wood Identification, consent of instructor. 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 be repeated. Maximum 6 hrs. S/N/C only. E

511 Problem Analysis in Forest Resources (3) Problem identification, analysis and solution in forest resource management. Identify, analyze and prepare written report. Topical report, written report. At least one graduate committee. Available only to students in non-thesis option for M.S. in Forestry. E

512 Seminar (1) Current developments in forestry. Required of all graduate students in residence fall semester. 4 hrs. S/N/C only. E

520 Advanced Forest Tree Biology (3) Growth, reproduction, and physiology of trees; forest ecology; variety and taxonomy of forest trees. Prereqs: Graduation standing in forestry or biological science, or consent of instructor. F

530 Advanced Forest Resource Management (3) Analysis of forest resource 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, A

540 Genetics in Forestry (3) Genetic improvement of forest resources. Principles of forest genetics and related testing for genetic variability; tree breeding; development of seed orchards; hybridization; tree cytophytology and tissue culture. Prereqs: Genetics and Genetical Science 364, 465, or consent. F

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

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

580 Advanced Silviculture (3) Silvicultural characteristics, silvicultural practices and systems applied to commercially important hardwoods and softwoods. In-depth analysis of silvicultural principles involved in forest management; fire, forest, insect and disease management; computer modeling of stand dynamics; structure and growth/yield; Prereq: Undergraduate silviculture and forest management consent of instructor. 3 hrs and 2 labs. Sp

581 Phylogenetics (3) Chromosome structure and behavior during mitotic and meiotic divisions in relation to structural changes; genetic control, hybridization, specialization, and ploidy. Laboratory, normal and abnormal 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.A

585 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory, fixed and variable plot sampling, lidar sampling, regression estimators; multiscale and multiphase sampling. Growth and yield predictions for even-aged and uneven-aged forests. Prereq: Land Measurement Techniques and Forest Resource Inventory or consent of instructor. F, A

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

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

Forestry, Wildlife & Fisheries

GRADUATE COURSES

410 Wildlife Habitat Evaluation and Management (3) Ecological relationships between wildlife and habitat. Evaluation, modeling, and management of wildlife habitat. Effects of land-use practices on wildlife habitat. Prereq: Principles of Wildlife and Fisheries Management or General Ecology. Applicable to majors in Forestry and Wildlife Habitats Science. 2 hrs and 1 lab. F

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

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

535 Environmental Impacts to Natural Ecosystems (3) Current environmental problems impacting natural ecosystems: climatic change, acid deposition, air pollution, species declines, and introductions of exotic species. Management of these problems through monitoring, modeling, and other methodologies. Prereq: 416 or equivalent or consent of instructor. Applicable to majors in Forestry and in Wildlife and Fisheries Science. Sp

540 Seminar on Integrated Resources Management in Biotic Reserves (2) MAI program, UNESCO-sanctioned global conservation initiative. Analysis of integrated resource management practices that demonstrate the concept of sustainable development. Environmental policy, application of science to management practice. Applicable to majors in Forestry and in Wildlife and Fisheries Science. Sp

Wildlife and Fisheries Science

GRADUATE COURSES

440 Wildlife Techniques (2) Methods of wildlife damage control, wildlife habitat management, identification of wildlife field sign, wildlife trapping techniques and management plan preparation. Weekend field trips. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. 1 hr and 1 lab or field. F

442 Fisheries Techniques (2) Active and passive sampling techniques for fish and aquatic organisms; population estimation methods; fish handling and transport; food habits analysis; marking and tagging techniques; age determination and incremental growth analyses; stream assessment; equipment and instrumentation usage and maintenance; safety in sampling methods; weekend field trip. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. 1 hr and 1 lab or field. F

443 Fisheries Science (3) Quantification and management of freshwater fisheries: population estimation, age and growth, biological assessment, and stocking. Prereq: Principles of Wildlife and Fisheries Management or General Ecology, and 6 hrs of mathematics. 2 hrs and 1 lab. Sp

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


490 Ethics in Wildlife and Fisheries Management (1) Ethical bases for decision making and application of methodologies in practice of wildlife and fisheries management. Seminars by ethicists, wildlife and fisheries scientists and managers, and foresters to acquaint students with diverse perspectives of ethical behavior in practice of wildlife and fisheries management. Lectures, panel discussions, and case studies. Team taught. Prereq: Senior standing. 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 University facilities and/or faculty time before degree is complete. May be noted forward degree requirements. May be repeated. S/N only. E

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

520 Planning and Administration of Fisheries and Wildlife Programs (2) Factors influencing policy and program planning activities of fisheries and wildlife agencies. Decision-making policies, case histories. Sp,A

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

530 Wildlife Diseases (2) Necropsy of birds and mammals. Recognition of various diseases and methods of preparing pathological materials in field and lab. Investigative procedures concerning wildlife diseases. Prereq: 1 yr biology, 444 or 445, or consent of instructor. (Same as Environmental Practice 530.) F,A

540 Predatory Ecology (2) Dynamics of terrestrial vertebrate predator populations in human-altered and relatively unaltered environments. Prereq: 444 or 445 or consent of instructor. (Same as Environmental Practice 530.) F,A

545 Population and Habitat Analysis (2) Detail characteristics, assumptions, and current technologies for fish and wildlife population analysis. Technologies, methodology and goals of analysis. Use of computers. Prereq: Animal Science 571 or Statistics 538 or consent of instructor. A

550 Fish Physiology (3) Mechanism of circulation, excretion, ion regulation, and neural and hormonal control of fish systems in fishes. Practical applications of fish physiology in water pollution assessment, fish culture, and management. Prereq: Senior or graduate standing in biological sciences. F

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

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

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

French

See Romance Languages

Geography

(Course of Liberal Arts)

MAJOR

DEGREES

M.S., Ph.D.

Sidney R. Jumper, Head

Professors:

Aiken, Charles S., Ph.D..................................Georgia
Bell, Thomas L., Ph.D..................................Iowa
Forest, Ronald, Ph.D..................................Pennsylvania
Hammond, E. H. (Emeritus), Ph.D..................................California
Long, Robert G. (Emeritus), Ph.D..........................Tennessee
Minkell, C. W., Ph.D..................................Syracuse
Paludan, C. T. (UTSU), Ph.D..........................Southern Illinois
Ratson, Bruce, Ph.D..................................Northwestern
Schumme, Theodore H., Ph.D..........................Wisconsin
Wilbanks, T. J. (Adjunct), Ph.D..........................Syracuse

Associate Professors:

Blasing, T. J. (Adjunct), Ph.D..........................Wisconsin
Brintank, Leonard W., Jr., Ph.D..........................Wisconsin
Brown, Marilyn (Adjunct), Ph.D..........................Ohio State
Harden, Carol P., Ph.D..........................Colorado
Horn, Sally P., Ph.D..................................California
Rehder, John B., Ph.D..........................Louisiana State

Assistant Professors:

Liu, Cheng (Adjunct), Ph.D..........................Tennessee
McKeeon-Ice, Rosalyn (Adjunct), Ph.D..........................Oregon

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

THE MASTER’S PROGRAM

The department offers the thesis and non-thesis options for the Master of Science. Both options require a minimum of 30 semester hours beyond the completion of a sound undergradu-
ate major program. At least two-thirds of the total hours in the degree program must be at or above the 500 level and must include 501 (at each offering during residency), 504 and 3 semester hours at the 600 level. In the thesis option, 6 hours must be Thesis 500. A final examination is required in both programs.

THE DOCTORAL PROGRAM

The doctorate is a research degree and is granted only to those who demonstrate proficiency in conducting independent research. Students must have a broad foundation and understanding of the discipline, they should have been achieved in a comprehensive master's program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program must include 504, 515, 599, 9 hours of 600-level seminars, and (at each offering during residency) 501. A minimum of 12 hours must be earned in related fields outside the department. Competence in cartographic and quantitative techniques is required. Additional tools, including languages, will be required as appropriate to the student's areas of research specialization. Examinations required for admission to candidacy include a written comprehensive examination on two special fields. 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.

MINOR IN ENVIRONMENTAL POLICY

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in 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 Texas and Virginia. Additional information may be obtained from the Admissions Specialist 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 1-2 hr lab.
413 Remote Sensing: Types and Applications (3) Principles and techniques of remote sensing imagery. Prereq: 310 or consent of instructor.
415 Quantitative Methods in Geography (3) Geometric applications of statistical techniques, point pattern analysis, and analysis of areal units. Prereq: Mathematics 115 or two semesters of calculus or consent of instructor.
421 Geography of Folk Societies (3) Geographical study of folk culture, traditional material culture and rural settlement, examples from eastern North America and selected foreign areas. Prereq: 101-02 or 320 or consent of instructor.
425 Historical Geography of the United States (3) Survey of changing human geography of United States during four centuries of settlement and development. Changing population patterns, development of agricultural regions, and patterns of urban-industrial development. Prereq: 361 or consent of instructor.
433 The Land-Surface System (3) Characteristics of surface form, water, vegetation, and surface materials, and their regional interrelationships. People as evaluators and agents of change. Prereq: Geography of the Natural Environment or consent of instructor.
434 Climatology (3) General circulation system leading to world pattern of climate. Climatic change and modification, and interrelationships of climate and human activity. Prereq: Geography of the Natural Environment or Meteorology or consent of instructor.
435 Biogeography (3) Changing distribution patterns of plants and animals on a variety of spatial and temporal scales, their consequences for human behavior, change, and human activity on world biota. Prereq: Geography of the Natural Environment or consent of instructor.
436 Water Resources (3) Global water resources and hydraulic systems: availability, flooding, and water quality issues from physical and economic geographical perspectives. Prereq: Geography of the Natural Environment or consent of instructor.
443 Rural Geography (3) Geographical appraisal of rural areas. Problems of rural America. Prereq: 101-02 or 141 or 140 or consent of instructor.
444 Urban Geography (3) Concepts and theories concerning human communities and urban systems, problems of urban growth and change, and urban spatial behavior. Prereq: 441 or consent of instructor.
449 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/NP only. E
501 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration required of resident graduate students whenever offered. May be repeated. Maximum 4 hrs. May be applied toward graduate degree. S/NC only.
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when 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 Research Design (3) Geographical research from selection of topic and development of research design through field work and final report.
505 Directed Research (2-5) Research on problems as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC or letter grade.
506 Directed Readings (2-6) Readings on topics of interest as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC or letter grade.
509 Topics in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs. S/NC or letter grade.
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.
519 Graduate Practicum in Cartography/Remote Sensing (2-6) Prereq: Written consent of department before registration. May be repeated with consent of instructor. Maximum 6 hrs.
521 Topics in Cultural Geography (3) Examination of trends, problems, and methods in cultural geography. Prereq: 421 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
533 Topics in Physical Geography (3) Examination of trends, problems, and methods in geography of land surface systems or in modern climatology. Prereq: 433 or 434 and consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
535 Topics in Biogeography (3) Examination of trends, problems, and methods in biogeography. Prereq: 435 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
536 Plant Communities and Plant Geography (4) (Same as Botany 536.)
541 Topics in Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems, and urban spatial behavior. Prereq: 441 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
549 Topics in the Geography of Transportation (3) Examination of trends, problems, and methods in transportation geography and transportation networks. Prereq: 449 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
550 Regional Geomorphology (3) (Same as Geography 550.)
577 Biological Conservation (3) Analytical treatment of politics, policies, and forms of biological conservation as practiced in U.S. and abroad. Prereq: Consent of instructor.
591 Foreign Study (1-15) See College of Liberal Arts. Prereq: Written consent of department prior to registration. S/NC or letter grade.
592 Off-Campus Study (1-15) See College of Liberal Arts. Prereq: Written consent of department prior to registration. S/NC or letter grade.
593 Independent Study (1-15) See College of Liberal Arts. Prereq: Written consent of department prior to registration. S/NC or letter grade.
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/NP only. E
609 Seminar in Geography (2-3) Topics vary. Prereq: 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.

677 Seminar in Biological Conservation (3) Conduct of original research. Prereq: 577 or 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, including examinations, letters of recommendation, and a statement of purpose. The applicant must have completed a bachelor's degree with a minimum GPA of 3.0. Additional requirements may be waived in unusual circumstances.

To be considered for admission, a candidate must have completed a minimum of 30 semester hours of undergraduate work in geology and related sciences, including courses in physics, chemistry, and calculus. A minimum of 14 hours at the 500 or 600 level, including 12 hours of 600-level coursework, is required for the M.S. program. Graduation requires full-time enrollment for two or more years.

The prerequisite for the Ph.D. program, in addition to that for the M.S. program, is a master's degree in Geology or a Bachelor's degree plus completion of 9 hours of coursework from the list in #3. above, including one course from each group. These courses may be taken while completing other course requirements.

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

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

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

The student must demonstrate a reading knowledge of a foreign language in which there is a body of geological literature, as approved by the student's dissertation committee.

GRADUATE COURSES

401 Quantitative Methods in Geology (3) Applications of calculus and differential equations to problems in earth sciences. Examples of boundary conditions in structural geology and tectonics.


420 Paleontology (4) Principles of earth science as applied to fossils and fossil assemblages. Data collection and interpretation. Laboratory exercises will emphasize sample preparation and X-ray diffraction techniques of paleontologists. Prereq: 410 2 hrs and 1 lab.

421 Invertebrate Paleontology (4) Survey of invertebrate animal phyla: skeletal structures and preservation, functional morphology, ecology, and stratigraphic distribution. Writing emphasis course. Prereq: Paleontology or consent of instructor. 2 hrs and 2 1-hr labs

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


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

455 Basic Environmental Geology (3) Applications of geological sciences toward understanding of complex geological processes on earth's environment and implications of human activities on the earth's environment. Prereq: 12 hrs of geological courses. 2 hrs and 1-3 hr lab or field period.


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

475 Physical and Chemical Systems of the Earth (3) Development of geologic history from primary processes, composition and the principles of the hydrologic cycle. Crust, mantle, and core. Interdependence of structures and behavior of elements in earth's crust. Prereq: 460, 2 hrs and 1 discussion.

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

485 Principles of Geochemistry (3) Groundwater flow, groundwater pollution, and water management. Prereq: General Chemistry or equivalent or consent of instructor. Geochornistry or equivalent. Calculus and equivalent. (Same as Civil Engineering 485.)

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
first concentration; (2) at least 18 hours in the second concentration; and (3) at least 6 hours in a cognate field.

1. First Concentration: French, German, or Spanish. It consists of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:
   - A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.
   - A minimum of 21 hours at the 500 level (exclusive of thesis hours), including French 584 (3), German 560 (3), or Spanish 580 (3); French 512 (3), French 512 (3), or Spanish 512 (3); French 515-6 (2.2) or German 520 (3).
   - At least 12 hours at the 600 level (exclusive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It consists of at least 18 hours of courses beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.

3. Cognate Field: Six hours must be in graduate courses numbered 400 and above in a field outside 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.

The coursework for Track II must be distributed as follows: (1) at least 45 hours in the first concentration; (2) at least 12 hours in the second concentration; and (3) at least 6 hours in a cognate field.

1. First Concentration: French or Spanish. It consists of 45 semester hours beyond the bachelor's degree, distributed as follows:
   - A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.
   - A minimum of 27 hours at the 500 level (exclusive of thesis hours), including French 584 (3) or Spanish 550 (3); French 512 (3) or Spanish 512 (3); and French 516 (2) or the appropriate Spanish course.
   - At least 12 hours at the 600 level (exclusive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It consists of at least 12 hours, with a minimum of 3 hours at the 500 level. Students are encouraged to take classes that complement the primary area of expertise in the first concentration, so that this second concentration will be a useful research tool for the dissertation and future professional activities. (Because Track II students will have taken 12 graduate hours instead of 18 in the second concentration, they will normally not be eligible to teach that language at Institutions which follow SACs guidelines for college foreign language teaching.)

3. Cognate Field: Six hours must be in courses numbered 400 and above and in a field outside the candidate's 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 for both tracks: A student must demonstrate competence in the languages of both the 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 with translation into English administered by the department concerned) in a third language is required. If the student's first and second languages are Romance languages, the third language should be chosen from another language family.

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

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct at least two foreign languages, subject to staffing needs.

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

For additional courses, see 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 UT Knoxville on an in-state tuition basis. The Ph.D. program in Modern Foreign Languages is available to residents of the state of Alabama or Kentucky. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

**German**

**GRADUATE COURSES**

331-32 Elements of German for Upper-Division and Graduate Students (3,3) Elements of language, elementary and advanced readings, and a final 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 421 and 436. May be repeated once. Maximum 6 hrs. Undergraduate credit only.

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

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

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

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

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

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

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

426 Methods of Historical Linguistics (3) Phonetics, distinctive feature analysis, sound change types, nature of sources and change, principles of reconstruction, and fundamental assumptions about language change through time. Survey of non-phonological linguistic change, languages of all M.A. and Ph.D. students, and other proto languages. Prereq: 6 hrs of upper division foreign language courses (excluding courses in translation or graduate reading courses). (Same as Linguistics 463.)

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

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

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

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

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

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

512 Teaching a Foreign Language (3) Practical applications for teachers and students interested in teaching basic language skills and foreign language skills, and cultural knowledge through seminars, demonstrations, peer teaching, and observation of foreign language classes. Requirements of all M.A. and Ph.D. students except those whose previous training or experience warrants excuse by department.

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

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

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

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

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

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

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

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

555 Modern German Literature 1890-1945 (3) Content varies. May be repeated. Maximum 6 hrs.
Health, Leisure, and Safety
(Majors of Education)

MAJORS

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

Charles B. Hamilton, Head

Professors:
Gorski, June, Dr.P.H. ........... UCLA
Hamilton, Charles B., (Liaison), Dr.P.H. .......... Oklahoma

Hayes, Gene E. (Liaison), Ph.D. .......... North Texas State
Kirk, Robert H., Ph.D. ............ Indiana University
Neutens, James (Adjunct), Ph.D. .......... Illinois
Rockey, Ian R., Ph.D. ............... Brown
Wallace, Bill C. (Liaison), Ed.D. .......... Northern Colorado

Associate Professors:
Haughton, Betsy (Adjunct), Ed.D. .......... Columbia
Krick, Ken L., Re.D. ............... Indiana University
New, John C., Jr. (Adjunct), D.V.M. ........ Texas A&M
Purcell, R. Jack, Ph.D. .......... Iowa

Assistant Professors:
Aldrich, Tim E. (Adjunct), Ph.D. .......... Texas
Blackmon, James T., Ed.D. ............... Tennessee
Blanton, Mary Dale, Re.D. .......... Illinois
Ellison, Jack S. (Liaison), Ed.D. .......... Tennessee
Levin, Barbara (Adjunct), M.D. .......... California (San Francisco)
Pressey, Velma W., Ed.D. .......... Tennessee
Zemel, Paula C. (Adjunct), Ph.D. ........ Wayne State

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 Health Promotion and Health Education (thesis and non-thesis options) and to the Doctor of Education with a major in Health Education. The Master of Science, with thesis and non-thesis options, requires completion of 30 semester hours.

The Doctor of Philosophy with a major in Education offers a concentration in health education and choice of supporting specializations from public health or safety as listed under Education.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

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

406 Death, Dying and Bereavement (3) Aspects of dying, death and handling trauma of loss. Medical, financial, psychosocial, legal and social implications of death. F, Sp

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

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

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

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

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

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

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

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

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

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

560 Graduate Workshop (1-3) Specific health/wellness or health promotion issues. Special health problems in concentrated period of time. May be repeated. Maximum 12 hrs.

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

590 Research Methods in Health (3) Basic research techniques in variety of health settings. Development of research skills and problem identification for research topics. (Same as Public Health 590.) F

593 Directed Independent Studies (1-3) Individual identification and study of health/wellness or health promotion problem/issue. Specific proposal to instructor before registration. May be repeated. Maximum 12 hrs. B

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

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

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

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

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

655 Seminar in Nation's Health (3) Comprehensive study of definition, determinants, resources and health status of nation. (Same as Public Health 655.) F
650 International Health (3) Study of quality of health, health promotion and health services in countries throughout world. (Same as Public Health 560.) Sp


**Public Health**

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.).

Three professional preparation concentrations are available: community health education, health planning/administration, and occupational/environmental health and safety. The M.P.H. program is accredited by the Council on Education for Public Health. A minor in statistics is available to interested M.P.H. students due to public health affiliation with the Intercollege Graduate Statistics Programs.

**ADMISSION REQUIREMENTS**

A statement of the applicant's educational and career goals and three rating forms are required. Appropriate forms are available from the department's program in Public Health. Preference is given to those with a minimum undergraduate grade-point average of 2.6 and with at least one year of professional experience in a health-related occupation. No provisional students will be admitted. As a restricted program, non-degree admission requires departmental recommendation.

**THE MASTER'S PROGRAM**

The M.P.H. is a non-thesis program requiring completion of 38 semester hours of coursework including 9 weeks of field practice. Field practice provides a full-time experience with an affiliated health agency or organization offering one or more health programs. Of importance, field practice allows the student to apply academic theories, concepts, and skills in an actual work setting. Student must complete all assigned prerequisite coursework within 2 semester hours of the curriculum with a minimum overall GPA of 3.0 prior to placement in the field.

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

**MINOR IN GERONTOLOGY**

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

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an out-of-state tuition basis. The M.P.H. program in Public Health is available to residents of the states of Arkansas, Florida, Kentucky, Louisiana, or Virginia.

Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

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

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

480 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic. Maximum 6 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/N only.

505 Continuing Education in Public Health (1-3) Selected learning activities and experiences in specialized areas of public health utilizing workshop format. May be repeated. Maximum 6 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 to University. Prerequisite: Consent of instructor. Maximum 4 hrs. (Same as Nutrition 509, Nursing 509, Physical Education 509 and Social Work 509.) S/N only. F, Sp


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. Prerequisite: 2 yrs of chemistry and biology and consent of department.


513 Industrial Hygiene Instrumentation and Sampling (3) Instruments and methods for evaluating industrial environment for personal exposure to chemical and physical stresses affecting worker's health. Lecture, demonstration, and lab. Prerequisites: 511, MPH (OEHS) major, and consent of department.


520 Public Health Policy and Administration (3) Administrative considerations of community-based health care programs and public health practice. Health policy formulation, political environment and governmental involvement in health, legal responsibilities, and management concepts and techniques. F, Su

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

523 Management in Extended Care Settings (3) Managerial concepts and theoretical foundations essential to supervision and administration of domiciliary health services programs. Management and operation of health services programs for patients and clients in settings which provide activities of daily living and special psychosocial environmental needs. Programs for home health services, comprehensive medical rehabilitation, nursing homes, congregate living centers and similar type health programs. Prerequisite: 521 or consent of instructor.

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

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

540 Principles of Epidemiology (3) Distribution and determinants of health-related outcomes in specified populations, with application to control of health problems. Historical origins of discipline, hypothesis formulation, research design, data analysis and computer techniques. Prerequisites: 540 or consent of instructor.

542 Advanced Epidemiologic Methods (3) Nature, collection, analysis and interpretation of data pertaining to cohort and case-control studies. Surveillance and surveys. Analytic methods: multiple logistic regression and stratification, exposure and attributable risk, survival analysis. Opportunities to apply concepts and techniques. Prerequisites: 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 procedures, and introduction to community health analysis.

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

555 Health and Society (3) Understanding of social and behavioral factors which influence health status and care in America. Application to health-related organization. Social and psychological aspects of disease, sociological aspects of health care delivery systems, the economic basis of health and illness, impact of social movements on health, and social consequences of health legislation. Sp, Su

560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodologies; systems planning elements; of planning formulation and conceptualization of problem, planning evaluation and implementation. Health planning organizations, community health problems, population groups, appropriate diagnoses and programs for addressing needs. Sp

562 Group Processes in Health Planning (3) Application of group process techniques used in health planning. Techniques, group processes, and techniques to encourage innovation and creativity in health planning groups.
Recreation and Leisure Studies
Graduate study with a major in Recreation and Leisure Studies leads to the Master of Science. Professional preparation concentrations are available in therapeutic recreation, general recreation, and sport administration/management. The third concentration is an interdisciplinary program with the department of Human Performance and Sport Studies. The M.S., with thesis and non-thesis options, requires completion of 32 semester hours. The following retention policy applies to graduate students seeking the M.S. with a concentration in sport administration/management:

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

GRADUATE COURSES
410 Maintenance and Management of Recreation and Sports Related Facilities (3) Principles for operationalizing modern facility maintenance systems and management strategies. Cost tracking, inventory systems, specialized maintenance techniques, safety guidelines, personnel management systems and security. Prereq: 110, 310 or consent of instructor. F
430 Organization and Administration of Leisure Services (3) Principles of administration applied to provision of leisure services offered by public, private and/or commercial organizations. Organizational structures, personnel management, evaluation, legal authority, introduction to budgeting and fiscal procedures. Prereq: 310 or consent of instructor. F
440 Dimensions of Private and Commercial Recreation Business Organizations (3) Nature and function of recreation in private, commercial, and industrial settings. Survey of development and management of commercial goods and services offered in leisure market. Factors influencing participation, management considerations, and research in commercial recreation and tourism. 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/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 Perspectives and Trends in Leisure Studies and Services (3) Basic role of leisure delivery systems in today's society, scope of leisure services, determinants of leisure behavior, developmental features of leisure and recreation. Current trends, 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 relationships of leisure organizations and facilities to professional practice. Prereq: Consent of instructor. Sp
520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of therapeutic recreation. Basic overview of aspects of delivery systems. Prereq: Consent of instructor. F
521 Facilitation Techniques in Therapeutic Recreation (3) Role of facilitator in therapeutic recreation in clinical and non-clinical settings; application of style-life planning, self-awareness, values clarification and assertiveness training in therapeutic recreation, relationship of leisure education to therapeutic recreation. Prereq: 520 or consent of instructor. Su
522 Clinical Aspects in Therapeutic Recreation (3) Concept and techniques utilized by experienced and advanced therapeutic recreation specialist; clinical, issues, comprehensive program concerns, administrative funding and trends in practice of therapeutic recreation services. Prereq: 520, Sp
540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Finance, revenue generation, cash and inventory control, commercial/public cooperative ventures and microcomputer applications. Prereq: 430 or consent of instructor. Sp
541 Management and Operation of Recreation and Sport Related Facilities (3) Research for making program and management decision, process of cost analysis, and basic design and maintenance of recreation and sport related facilities. Prereq: Consent of instructor. Sp
590 Graduate Internship (1-6) Required of all graduate students. Minimum 100 clock hrs for each 2 hrs credit. Requires work experience, evaluation by agency and university, and written paper. E
591 Directed Study in Leisure & Recreation (1-6) Detailed study of theme, issue, or concern. Designed to meet needs of individual students. May be repeated. Maximum 6 hrs. E
592 Special Topics in Recreation & Leisure Studies (1-6) May be repeated. Maximum 6 hrs. E
593 Directed Independent Study (1-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
594 Seminar in Leisure Studies (3) Same as Human Ecology 594. S/NC only. E
595 Seminar in Leisure Studies (3) Same as Human Ecology 594. S/NC only. E
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599 Seminar in Leisure Studies (3) Same as Human Ecology 594. S/NC only. E
600 Seminar in Leisure Studies (3) Same as Human Ecology 594. S/NC only. E
601 Internship/Research in Safety and Health (3-6) Field experience. Significant problem identified, researched, and reported in acceptable form. May be repeated. Maximum 6 hrs. (Same as Health 601.) E

Safety
Graduate programs are available leading to the Master of Science with a major in Safety Education and Service (thesis or non-thesis options) and to the Specialist in Education with a major in Safety Education and Service.

The M.S. with thesis and non-thesis options, requires completion of 30 semester hours.

The Specialist in Education (Ed.S.) requires 30 semester hours beyond the M.S. An internship and research of a significant safety problem are included as professional development activities.

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

GRADUATE COURSES
441 Driver and Traffic Safety Education (4) Preparation of traffic safety instructors for school, college, and community agencies. Students required to teach at least two non-drivers to drive. Vado driver’s license required. 3 hrs and 2 labs.
442 Advanced Driver & Traffic Safety Education (3) Development of competence in teaching driver education theories of seat belt use, multimedia, and multiple car driving range. Teaching skills and supervision. 2 hrs and 2 labs.
443 Sports & Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interrelationships in sports injury and control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs and 2 labs. Sp
452 General Safety (3) Principles, practices, and procedures of general safety. Safety problems in school, traffic, recreation, industry, home and other public areas. F
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
532 Behavioral Problems in Safety Education & Accidents Prevention (3) Teaching strategies to prevent accidents; causes of accidents, and application of principles of psychology in development of safe behavior in all segments of environment. F
533 Problems and Research in Accident Prevention (3) Safety problems found in wide variety of accidents that occur in community; findings of current research in behavioral sciences as related to variation incidence of accidents. F
534 Organization, Administration and Supervision of Safety Programs (3) National, state and local level programs; administrative, instructional, and supervisory aspects. Implementation of relevant programs. Sp
535 Emergency Management (3) Civil and defense problems: tornadoes, floods, fires, mass civil disorders, and nuclear and personnel attack by alien countries. Sp
572 Graduate Workshop in Safety (3) Special safety education problems. For advanced graduate students, teachers, supervisors, and administrators. May be repeated. Maximum 12 hrs.
601 Internship/Research in Safety and Health (3-6) Field experience. Significant problem identified, researched, and reported in acceptable form. May be repeated. Maximum 6 hrs. (Same as Health 601.) E
History
(College of Liberal Arts)

MAJOR DEGREES

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

Russell Buhite, Head

Professors:
Bergeron, Paul H., Ph.D. ..................... Vanderbilt
Buhite, Russell P., Ph.D. ................... Michigan State
Chmielewski, Edward V., Ph.D. .......... Harvard
Cobb, James C., Ph.D. ...................... Georgia
Finger, John R., Ph.D. ...................... Washington
Graf, Leroy P. (Emeritus) (Distinguished Prof.), Ph.D. .......... Maryland
Haas, Arthur G., Ph.D. .................... Chicago
Hao, Yen-Ring, Ph.D. ...................... Harvard
Haskins, Ralph W. (Emeritus), Ph.D. . Columbia
Jackson, Charles O., Ph.D. .............. Emory
Klein, Milton M. (Emeritus) (Distinguished Prof.), Ph.D. . Michigan
McDonald, 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 E., Ph.D. ............... Duke
Johnson, Charles W., Ph.D. ............. Michigan
Mudówny, John, Ph.D. ..................... Yale
Pinckney, Paul J., Ph.D. ................. Vanderbilt
Utley, Jonathan Q., Ph.D. ............... Illinois

Assistant Professors:
Brummett, Palomra R. (Liaison), Ph.D. , Chicago
Burman, Thomas E., Ph.D. ............... Toronto
Diaco, Todd A., Ph.D. ...................... Wisconsin
Gavitt, Philip R., Ph.D. ................... Michigan
Plummer, Betty L., Ph.D. ................. Maryland
Wakeman, Rosemary, Ph.D. .............. California (Davis)

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. program includes a thesis and non-thesis option. The doctoral program has concentrations in American and European History with special focuses in the areas identified under Group II doctoral fields.

Detailed information may be obtained from the Director of Graduate Studies in History who also advises all incoming students.

THE MASTER’S PROGRAM

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

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

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

NON-THESIS OPTION
A total of 30 hours of coursework is required. At least 6 hours must be completed in each of two M.A. fields. The primary field is examined by a two-hour written thesis submitted within one week by a single oral examination with the single grade of pass/fail, given at the conclusion of the oral examination. No examination is given on the secondary field.

M.A. Fields
- United States (colonial to present)
- Premodern Europe
- Modern Europe
- Asia
- Latin America

Retention and Termination
A 3.0 overall grade-point average is required to remain in good standing.

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

Group II:
- To be defined by the student’s doctoral committee from within one of the following fields:
  - Political (U.S.)
  - Socio-Economic
  - Military/International Relations
  - Regional/Local (U.S.)
  - National/Regional (Non-U.S.)

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

GRADUATE COURSES

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

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

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

(Major of Human Ecology)

**MAJOR DEGREE**

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

**ADMISSION REQUIREMENTS**

A completed file for review includes the Graduate School admission file, College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section or Miller's Analog Test (MAT) score, and three Graduate School Rating Forms completed by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology. The M.S. in Home Economics requires an undergraduate degree in the field of home economics or human ecology.

**THE MASTER'S PROGRAM**

The M.S. in Home Economics is designed to meet graduate study needs of professionals who work in programs encompassing all areas of home economics. Thesis (33 hours) and non-thesis (36 hours) options are offered. The program includes 6 hours in statistics and research methodology, 9 hours in program planning, implementation, and evaluation (may be selected from agriculture, home economics education, or other courses approved by the committee), 3 hours in the integrative nature of home economics (HE 510), and 9 (thesis option) or 12 (non-thesis option) hours in the College of Human Ecology. At least one course is to be from each department in the college. The thesis option requires 6 hours of Thesis 500, and the non-thesis option requires a creative project (3 hours) and 3 hours of approved electives. 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 courses. There is no agreement with the University of Tennessee, Knoxville, 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 Admissions Specialist in the Office of Graduate Admissions and Records.
ADMISSION REQUIREMENTS
A completed file for review includes the Graduate School application file, College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section, and three Graduate School Rating Forms completed by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean’s Office, College of Human Ecology.

THE DOCTORAL PROGRAM
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), including College Professional Seminar in Human Ecology 610, minimum of 9 semester hours of 600-level coursework (not including dissertation), and 24 semester hours of dissertation;
3. Successful completion of written/oral comprehensive examinations as provided by each department’s procedures and the student’s doctoral committee;
4. Original research project, which culminates in a dissertation;
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.

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

Requirements are a minimum of 90 hours including:
1. HEED 530.
2. HE 610.
3. HRA 532, ID 570 and RCS 550.
4. HRA 537 or RCS 590 or ID 590 (2 hours).
5. Minimum 9 hours of statistics and research methods.
7. Twenty-four hours of dissertation.
8. Electives for 34 hours approved by the committee. (Students must take at least 18 hours in one of three specialty areas: foodservice and lodging administration, retail and consumer sciences or interior design; including a minimum of 9 hours required at the 600 level.)

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

Core courses and a practicum are offered by the College of Social Work and selected departments within the colleges of Human Ecology, Education, and Liberal Arts. A cross-listed seminar between contributing programs is designed to integrate experiences from different sources and to demonstrate the multi-faceted nature of working within an aging society.

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

Core Experience
Students must complete a core experience of 12 semester hours taken from at least three different departments including nine hours taken from outside the department. Coursework needs to comply with the following framework:
1. Coursework: 9 hours required. A variety of coursework may be taken toward satisfaction of this requirement. Courses which are offered on a regular basis include: Health 405, 465, Health/ Public Health 650, Interior Design 575, Nutrition 518, Public Health 523, Social Work 566, Sociology 415, Technological & Adult Education 522, 513.
2. Practicum. 2 hours required. Students should register under practicum experiences in the “home” department of the supervising faculty.
4. Successful completion of a written comprehensive examination covering subject matter of the minor.

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

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

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

GRADUATE COURSES
500 Thesis (3-15) F/P/NP only. E
501 Microcomputer Research Applications in Human Ecology (3) Advanced microcomputer concepts and applications for research. Overview of statistical analysis software, computer graphics, computer-assisted design and national data base searches.

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

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

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

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

530 College Teaching in Human Ecology (3) Instructional effectiveness, techniques, organization, and evaluation. 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, Human Performance and Sport Studies 585, Public Health 585, Psychology 585, Social Work 585, and Sociology 585.) S/N only.

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

Human Performance and Sport Studies
(undergraduate unit)

MAJORS

Human Performance and Sport Studies.................................M.S., Ed.D.
Education..........................................Ph.D.
Joan Paul, Head

Professors:
Capen, Edward K. (Emeritus), Ph.D. ......................... Iowa
Howley, Edward T., Ph.D. ............................ Wisconsin
Kozar, Andrew J. (University Prof.), Ph.D. .......................... Michigan
Lay, Nancy E., Ph.D. .................................. Florida State
Liemohn, W. P., Ph.D. .................................... Iowa
Mead, B. J., Ph.D. ..................................... Purdue
Morgan, W. J., Ph.D. .................................... Minnesota
Paul, Joan (Liaison), Ed.D. .................................. Alabama
Phillips, Madge M. (Emeritus), Ph.D. ......................... Iowa
Watson, Helen B. (Emeritus), Ph.D. ......................... Michigan
Wurtsb, C. A., Ph.D. .................................... Michigan

Associate Professors:
Bassett, David R., Jr., Ph.D. ............................... Wisconsin
Beitel, Patricia A., Ed.D. ................................. North Carolina (Greensboro)
DuSensi, J. T., Ed.D. ................................. North Carolina (Greensboro)
Jones, Ralph E., Ph.D. .................................... Toledo
Kelley, D. R., Ed.D. ................................. Georgia State
Namey, Thomas, M.D. ................................. Washington (St. Louis)

DEGREES

Human Performance and Sport Studies.................................M.S., Ed.D.
Education..........................................Ph.D.

Joan Paul, Head

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

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

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

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

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

530 College Teaching in Human Ecology (3) Instructional effectiveness, techniques, organization, and evaluation. 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, Human Performance and Sport Studies 585, Public Health 585, Psychology 585, Social Work 585, and Sociology 585.) S/N only.

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

Borovik, Patricia C., M.S. .................. Tennessee
Lewis, L. R., Ed.D. .................. Tennessee
McCUTCHEON, M. R., Ed.D. ................. North Carolina (Greensboro)

Adjunct Faculty:

Buckles, Tina M., Ph.D. .................. Tennessee
Hastings, Donald, Ph.D. .................. Massachusetts
Schlesman, Earl, Ph.D. .................. Tennessee
Stein, Julian, Ed.D. .................. George Peabody
Steinberg, John, M.A. .................. Michigan State

THE MASTER’S PROGRAM

The Department offers two tracks for the Master’s degree. Track 1 is for students who are already certified to teach or those who are seeking a Master’s degree without certification. Track 2 is for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

Track 1 - Concentrations are available in exercise science (adapted physical education, exercise physiology/fitness), motor behavior, pedagogy in physical education, sociocultural foundations (history, philosophy, sociology), and sport administration/management (an interdisciplinary concentration with health, leisure and Safety). The thesis option requires a minimum of 30 hours. The non-thesis option requires 32 hours, including a project. All students must complete a course in research design or statistics and register for two credits of Human Performance and Sport Studies 601.

Track 2 - Requirements include Education 574, 2 hours; Education 575, 12 hours; Education 571, 4 hours; and specialty methods, 6 hours. Specialty methods courses must be approved by the student’s committee and include: one research or statistics course selected from 532, Educational & Counseling Psychology 520 or 521; and one pedagogy course selected from 511, 512, 514, 531, 533, 535, 541, 542, 543, 544, or 553. A Master’s degree may be earned by taking 12 additional committee-approved hours from the above listed specialty methods courses for a total of 36 hours. A maximum of 9 hours may be taken outside of Human Performance and Sport Studies with the committee’s approval. The thesis option requires 6 additional hours of Thesis 500 for a total of 42 hours.

THE DOCTORAL PROGRAM

The Doctor of Education with a major in Human Performance and Sport Studies is available with the following concentrations:

Exercise Science (adapted physical education, exercise physiology/fitness), Motor behavior (motor control, motor learning, psychology of sport), Sociocultural foundations of sport (history, philosophy, sociology), and the Doctor of Philosophy with a major in Education includes the concentrations and specializations listed under Education.

ADMISSION REQUIREMENTS

Applicants are required to complete the departmental application which will be sent to all persons upon their initial inquiry about the program. Specific questions about these programs should be directed to the head of the Department of Human Performance and Sport Studies.

The following retention policy applies to all graduate students seeking a degree in the Department of Human Performance and Sport Studies:

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

MINOR IN GERONTOLOGY

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

GRADUATE ASSISTANTSHIPS

A limited number of graduate assistantships are available for qualified women and men who are graduates of accredited colleges or universities. The assistantships are designed to support 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 Assistants Coordinator, Department of Human Performance and Sport Studies, The University of Tennessee, Knoxville, TN 37996-2700.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Master’s program in Human Performance and Sport Studies is available to residents of Georgia, Missouri, Tennessee, Virginia, and West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

Human Performance and Sport Studies

GRADUATE COURSES

405 Sociology of Sport (3) (Same as Sociology 405.)
411 Adapted Physical Education (3) Developmental disabilities, exceptional handlings and characteristics. Preparation for those with special education needs.
423 Readings in Physical Education (2) Review of current and classic literature in physical education.
480 Physiology of Exercise (3) Functions of body in muscular work, physiological aspects of fatigue, training and adaptation to environment. Prereq: Human Physiology or General physiology. 2 hrs and 1 lab. (Same as Zoology 480.)
500 Thesis (1-15) P/NP only. E
501 Special Project (3) Culminating experience for nonthesis major. Research study suitable for publication or practicum requiring special written work. Prereq: 532.
502 Registration for Use of Facilities (1) 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
509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nutrition 509, Nursing 509 and Social Work 509.)
511 Administrative/Supervisory Processes in Physical Education (3) Organizational concepts, management strategies, and office procedures 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 instructional situations for development of curricular and instructional programs.
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 515.)
528 Motor Behavior: A Theoretical Perspective (3) Motor behavior from an information processing perspective. Overview of current research that supports theoretical bases. Prereq: Undergraduate course in general psychology or consent of instructor.
531 Biomechanics of Human Performance (3) Human movement; teaching, coaching and sport medicine. Prereq: 422 or equivalent.
532 Seminar in Research Techniques in Physical Education (3) Evaluates, compares, and contrasts research techniques in physical education with consideration for and experiences in appropriate research design, analysis procedures, and proposal development.
533 Psychology of Sport (3) Social psychological factors influencing human behavior in sport context; discussion of contemporary research, theory, and methodology. Prereq: General psychology course or consent of instructor.
534 Motor Behavior and Skill Acquisition (3) Topical explanations and applications of principles of movement behavior to acquisition and performance of skills; discussion of current research and methodology.
535 Sport Administration (3) Development of knowledge and analytic skills desirable for middle and upper level managers/administrators in sport business/organization.
541 Special Topics (1-3) Advanced study in selected interdisciplinary or professional areas of physical education and sport. May be repeated.
542 Sociological Aspects of Sport and Physical Education (3) Social factors influencing sport and physical education. Pertinent issues and research applications. Prereq: Consent of instructor. (Same as Sociology 542.)
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 and teaching methodologies in physical education for children with special educational needs. Prereq: 411 or consent of instructor. Coreq: 554.
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 Educational Needs (3) Criterion and norm-referenced tests used in development of individualized education programs for children with special physical education/motor development needs. Testing protocols which permit the student to observe and practice just measure symptoms of dysfunction; efficacy of remediation therapies based on related to testing protocols; Evaluation of motor skill in exceptional children and
563 Laboratory Techniques in Exercise Physiology
(3) Laboratory course in experimental methodology and instrumentation: respiratory and metabolic measurements, blood chemistry, and gas analysis. Prerequisite: 480. S/NC or letter grade.

565 Advanced Physiology of Exercise (3) Quantitative approach to current and classical questions in exercise physiology. Prerequisite: 480 and 565.

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

568 Physical Activity and Positive Health (3) Review of clinical, epidemiological, and experimental evidence concerning relationship and effects of exercises on health-related components of fitness. Prerequisite: Elementary statistics, 480, and 414/415 or equivalents. Corequisite: 569. (Same as Public Health 568.)

569 Fitness Testing, Programming, and Leadership for Diverse Populations (2) Clinical experience in selecting, administering, and evaluating exercise programs for diverse populations. Practice in leading variety of activities aimed at improved fitness. Prerequisite: 480 and 414/415. Corequisite: 568. (Same as Public Health 569.)

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Educational and Counseling Psychology 585, Nursing 585, Psychology 585, Public Health 585, Social Work 585, and Sociology 585.)

593 Directed Independent Studies (1-3) May be repeated. Prerequisite: 532 or consent of instructor. S/NC only.

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) Prerequisite: Doctoral student or consent of instructor. May be repeated. S/NC or letter grade.

633 Advanced Motor Behavior (3) In-depth analysis, synthesis, and discussion of contemporary theory, motor development: motor control, learning, sport psychology, motor development. May be repeated. Maximum 9 hrs.

661 Seminar in Exercise and Applied Physiology (1) Selected topics in exercise and environmental physiolog. Prerequisite: 563 and 565. May be repeated with consent of instructor.

664 Research Participation in Applied Physiology (1-6) Participate in research projects of faculty members whose interests coincide with those of the student. S/NC only.

681 Practicum (1-3) Intern experience in areas of major interest. May be repeated. Maximum 16 hrs.

**Industrial and Organizational Psychology**

(College of Business Administration and College of Liberal Arts)

**MAJOR DEGREES**

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

Michael C. Rush (Liaison), Director

Committee:

Dobbins, Gregory H., Management
Fowler, Oscar S., Management
James, Lawrence R., Management
Johnson, Michael G., Psychology
Jones, Warren H., Psychology
Ladd, Robert T., Management
Larsen, John M., Jr. (Emeritus), Management
Lounsbery, John W., Psychology
Russell, Joyce E. A., Management
Schumann, David W., Marketing, Logistics & Transportation
Sundstrom, Eric, Psychology

(For complete Faculty Listing, see Departments of Management and Psychology.)

The Master's and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research: for university teaching; and for consulting relationships with industry. The program emphasizes a 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 Associate Vice Chancellor and Dean of the Graduate School on recommendations from the two department heads and the program director.

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

**ADMISSION REQUIREMENTS**

Applicants for admission should request information and application forms from both the Graduate School and the Director, Industrial and Organizational Psychology Program, 506 Stokely Management Center, University of Tennessee, Knoxville, TN 37996-0545.

Two separate applications must be completed: one application for admission to the Graduate School (apply for major in "Industrial and Organizational Psychology") and one application for admission to the Industrial and Organizational Psychology program. Deadline: New students are admitted in fall semester only; and applications must be received by the Graduate Admissions and Records Office by February 1.

**General Requirements**

At least one year of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade point average of 3.0 or above is required with no evidence of special weakness in mathematics and physical sciences.

Test scores on each section of the general portion (verbal and quantitative) of the Graduate Record Examination (GRE) are required. Customarily, those students admitted to the program have performed at or above the 69-79th percentile on the general tests. (This corresponds to a raw score of approximately 600 on each of the tests.)

**THE MASTER'S PROGRAM**

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

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their thesis may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 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
Admissions and Records available to residents of Arkansas or Kentucky. The Ph.D. program is also open to residents of other states to enroll in certain graduate programs. Legal sharing of graduate programs allows legal residents to continue in the Ph.D. program beyond the first year.

THE DOCTORAL PROGRAM

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

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

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

Management 567-68 or Psychology 517-18, Psychology 557, Statistics 537-38

A minimum of five doctoral seminars (15 hours) selected from: Management 610; Management/Psychology 625, 626, 627, 638; Psychology 620, 624. (Five doctoral seminars are viewed as the absolute minimum; more are recommended. Statistics 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 990.

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

Doctoral candidates must pass a final oral examination on their dissertation research. In addition to course requirements, a doctoral student must attain a score of 650 (90th percentile) on the Subject GRE (Psychology-81). 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 accredited undergraduate curriculums in engineering enable students to select an area of specialization from operations research, manufacturing systems, human factors engineering, information systems, quality engineering, or general industrial engineering. It is also possible for a student to select minors in engineering, mathematics, psychology, business, computer science, statistics, or economics.

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

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

Industrial Engineering

Graduate Courses


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

403 Production Facilities Design and Material Handling (3) Design of production facilities, plant layout, analysis and planning for overall moving, packaging and storage of materials. Office layout and service areas. Design of facilities for such diverse groups as hospitals, banking, industry. Prereq: 302, 401.

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


512 Production and Inventory Systems (3) Application of OR techniques to production and inventory systems. Deterministic and stochastic inventory models. Use of mathematical programming for production mix, process selection, blending and production planning problems. Application of simple and complex queuing models in manufacturing environment. Prereq: 402 or Engineering Management 537 or consent of instructor.


516 Advanced Engineering Economy (3) Application of engineering economic analysis in complex decision situations. Inflation and price changes; uncertainty evaluation using probabilistic techniques; capital financing and project allocation models involving new equipment, replacement, investor-owned utilities, and public works projects; probabilistic risk analysis including computer simulation and decision analysis; analysis of variance; single and multiple factor experimental design. Prereq: Probability and Statistics for Scientists and Engineers I and 405, or equivalent. (Same as Engineering Management 516.)


521 Human Factors Engineering Methodology (3) Background in methodology used by human factors engineering designer and systems analyst. Observation, interviewing, design and evaluation techniques, computerized methods, human reliability and human error prediction, training analysis, evaluation of human-machine interface, subjective and objective techniques, scaling techniques, questionnaire and survey design, critical incident technique, consensus techniques (Debrief), accident investigation, behavioral instrumentation, performance measurement, statistical techniques, experimental design, and expert systems. Prereq: 500.

522 Optimization Methods in Industrial Engineering (3) Classical optimization theory, computational and N-dimensional search techniques, Lagrangian relaxation, separable programming, linearization techniques, quadratic programming, and dynamic programming. Prereq: 500 or 501.

523 Optimization Methods in Industrial Engineering (3) Classical optimization theory, computational and N-dimensional search techniques, Lagrangian relaxation, separable programming, linearization techniques, quadratic programming, and dynamic programming. Prereq: 500 or 501.

524 Linear Programming and Extensions (3) Simplex and revised simplex algorithms, linear programming, and convergence properties. Post-optimality analysis, use of LP software integer programming, and dynamic programming. Prereq: 500 or 501.


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


603 Dynamic Programming (3) Solving multi-stage optimization problems as sequence of single-stage optimization problems. Computer-assisted and mathematical techniques for solving dynamic programming problems, decision making under certainty and risk. Prereq: 522.


611-92-93 Advanced Topics in Industrial Engineering (3,3,3) Forum to study individually or in groups. Prereq: Graduate standing and consent of instructor. May be repeated with consent of instructor.

Engineering Management

GRADUATE COURSES

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

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

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


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

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

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

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

539 Strategic Management in Technical Organizations (3) Strategic planning process and strategic management in practice; corporate vision and mission; product, market, organizational, and financial strategies; external factors; commercialization of new technologies; and competition and beyond. Prereq: 533 and Industrial Engineering 516 or consent of instructor.


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

Interdisciplinary Programs

(College of Liberal Arts)

The College of Liberal Arts offers a series of interdisciplinary undergraduate majors and minors through its Interdisciplinary Programs. These programs include African and African-American Studies, American Studies, Ancient Mediterranean Civilizations, Asian Studies, Cinema Studies, Comparative Literature, Latin American Studies, Linguistics, Medieval Studies, Russian and East European Studies, Urban Studies, and Women's Studies. Certain courses within these programs are available for graduate credit as listed below. See the Undergraduate Catalog for program descriptions and directors.

African and African-American Studies

GRADUATE COURSES


430 The Development of Historical Linguistics as a Science (3) Scientific understanding of language change. Emergence of Neogrammarian paradigm from 19th century intellectual trends. Impact of synchronic, diachronic, and transformational-generative linguistics on contemporary diachronic theory. Prereq: 6 hrs of courses required for linguistics concentration or consent of instructor.

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.)

Critical factors: Black feminism, violence, concepts of masculinity, family, white males, white females, homosexuality, nationalism, and athletics.

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

Cinema Studies

GRADUATE COURSES

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

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

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

Comparative Literature

GRADUATE COURSES

401-02 Special Topics in Comparative Literature (3,3) Content varies. May be repeated. Maximum 6 hrs.

Latin American Studies

GRADUATE COURSES

401 Cultural Plurality and Institutional Changes in Latin America (3) Value systems, behavioral patterns, political parties, role of military, church, educational institutions, dictatorship and nationalism.

402 Latin American Studies Seminar (3) Selected topics. May be repeated. Maximum 6 hrs.

Linguistics

GRADUATE COURSES

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

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

420 The Development of Historical Linguistics as a Science (3) Scientific understanding of language change. Emergence of Neogrammarian paradigm from 19th century intellectual trends. Impact of synchronic, diachronic, and transformational-generative linguistics on contemporary diachronic theory. Prereq: 6 hrs of courses required for linguistics concentration or consent of instructor.

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

426 Romance Linguistics (3) (Same as French 426, Spanish 426, and Spanish 426.)

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

430 Comparative Literature (3) (Same as French 429 and Spanish 429.)

431 The Development of Synchronic Linguistics as a Science (3) Development of first synchronic paradigm of linguistics. Impact of social sciences on American descriptive, Prague School, Transformational-generative theory. Prereq: 6 hrs of courses required for linguistics concentration or consent of instructor.

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 African 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.)

Urban Studies

GRADUATE COURSES

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

411 Urban Geography (3) (Same as Geography 411.)

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 Britain (3) (Same as English 422.)

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

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

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

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

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

Journalism

(College of Communications)

MAJOR

COMMUNICATIONS

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

James A. Crook, Director

Professors:

Adamson, June N. (Emeritus), M.S., Tennessee

Ashdown, Paul G., Ph.D., Bowling Green

Bowie, Dorothy, Ph.D., Wisconsin

Campbell, H. C. (Emeritus), Ph.D., Iowa

Comstock, James A., Ph.D., Iowa

Cummins, H. A., M.A., Minnesota

Dane, John L. (Emeritus), M.A., Kansas

Lehman, B. A. (Emeritus), M.S., Southern Illinois

Littman, Mark, Ph.D., Northwestern

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

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

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

Associate Professors:

Caudill, C. Edward, Ph.D., North Carolina

Heller, Robert B., M.A., Syracuse

Lucarelli, Susan M., Ph.D., Tennessee

Morrow, Jerry L., Ph.D., Toledo

Puett, Sammie Lynn, M.S., Tennessee
Assistant Professor:
Foley, Daniel, M.S. ...................................... Northwestern

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

GRADUATE COURSES

403 International Communications (3) Development and operations of 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 communications, techniques, and flow of news throughout world. Print and broadcasting systems in terms of relevant social, political, economic, and cultural factors. Relation of communications, techniques, and practice among print news media, especially newspapers, magazines, and newspapers. Extensive out-of-class work. Prereq: Public Relations Principles.

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. Prereq: Consent of instructor.

490 Advanced Photography (3) Advanced principles and techniques of still photography. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

520 Press-Government Relations (3) Development of adversary relationship between journalists and government officials. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

525 Public Opinion (3) Role of public opinion and influencing public consensus. Social theories of public opinion and analysis of mass media's role. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

535 Publications Management (3) Problems in management, production, and marketing of publications. Techniques of writing, editing, and presenting comprehensive projects. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

571 Seminar in Public Relations (3) Analysis and evaluation of public relations in business and industry. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

580 Seminar in Visual Communication (3) Behavioral aspects of communication with images. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

590 Communications and International Development (3) Role of mass communications in development of nations. Role of media in development of nations. Role of mass communications in international cooperation. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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.

Law

(College of Law)

MAJOR DEGREES

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

Richard S. Wirtz, Dean

Professors:
Best, Reba, M.L.S. ........................... Florida
Blaze, Douglas A., J.D. .................. Georgia
Cohen, Neil J., LL.M. ............. Harvard
Cook, Joseph G., LL.M. ............ Yale
Dessem, Lawrence, J.D. .......... Harvard
Gray, R. Macdonald (Emeritus), LL.M. .... George Washington
Hardin, Patrick, J.D. ............... Chicago
Hess, Amy M., J.D. .................... Virginia

Jones, Durward S. (Emeritus), J.D. ...................................................... North Carolina
King, Joseph H., J.D. .................. Pennsylvania
Lacey, Forrest W. (Emeritus), S.J.D. .................. Michigan
Le Couteur, Frederic S., LL.B. ........ Duke
Lloyd, Robert M., J.D. .............. Michigan
Miller, Charles H. (Emeritus), J.D. ........ Duke
Overton, Elvin E. (Emeritus), S.J.D. .......... Harvard
Phillips, Jerry J., J.D. ............... Yale
Piquet, Cheryn, M.S.L.S. .......... Tennessee
Rivkin, Dean H., J.D. ............... Vanderbilt
Sewell, Toxey H. (Emeritus), LL.M. ........ George Washington
Sobieski, John L., J.D. ............... Michigan
Wirtz, Richard S., J.D. .............. Stanford

Associate Professors:
Aarons, Dwight, J.D. .................. UCLA
Anderson, Gary L., LL.M. .............. Harvard
Anisley, Frances Lee, LL.M. .......... Harvard
Beinfield, William J., J.D. ........... Miami
Black, Jerry P., J.D. ..................... Vanderbilt
Bunker, Mary Garrett, J.D. .......... George Washington
Cornett, Judy M., J.D. ............... Tennessee
Davies, Thomas Y., J.D. .............. Northwestern
Gray, Grayford B., J.D. .......... Vanderbilt
Mudd, John A., J.D. ................... Georgetown
Park, Carol M., J.D. ................. Illinois
Pearce, Carl A., J.D. ................. Yale
Reynolds, Glenn H., J.D. .......... Yale
Stark, Barbara, J.D. .................. New York
Stein, Gregory M., J.D. ........... Columbia
Thompson, James E., J.D. .......... Florida
Wertheimer, Barry M., J.D. .......... Duke

Assistant Professor:
Thorpe, Steven R., J.D. .......... Mercer

Instructors:
Hoover, Mary Jo, J.D. .......... Brooklyn
Moore, Jean, M.A.L.S. .......... Michigan
Wimberly, Phyllis, J.D. .......... Alabama

The College of Law offers the Doctor of Jurisprudence degree program; a dual program with the College of Business Administration leading to the J.D. and Master of Business Administration degree; and a dual program with the College of Liberal Arts, leading to the J.D. and Master of Public 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 "Law School Bulletin."
several and also for the combined work of the grading periods in which the last 28 credit hours taken in residence were earned. Averages are computed on weighted grades. Grades are on a numerical basis from 0.0 to 4.0. A grade of 0.9 or below is a failure.

Students are encouraged to maximize the integrative facets of the dual program by taking courses in both colleges each year.

Awards of Grades

For grade recording purposes in the College of Law and the Department of Political Science, grades will not be included in the computation of the student's grade average or class standing in the college where such courses are taken.

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 basis for any appropriate purpose in the college offering the course. The official academic record of the student must be approved by the Registrar of the University. The student's actual grade assigned by the instructor without conversion. Grades earned in courses of either college may be used in the computation of the student's grade average or class standing in the college where such courses are taken.

Non-Law Elective Course Credit

Students enrolled in the J.D.-M.B.A. program may not receive credit toward the J.D. degree for courses taken in either department of the University except for those taken in conjunction with the dual program. Note: Students are advised to consult the Graduate School degree requirements as stated in the front section of this catalog as well as the requirements for this college.

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

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

Admissions

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

Curriculum

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

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

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

Except while completing the first year courses in the College of Law, students are encouraged to take courses in both colleges each year.

Awards of Grades

For grade recording purposes in the College of Law and for graduate business courses and 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 courses were taken.

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 basis for any appropriate purpose in the college offering the course. The official academic record of the student must be approved by the Registrar of the University. The student's actual grade assigned by the instructor without conversion. Grades earned in courses of either college may be used in the computation of the student's grade average or class standing in the college where such courses are taken.

Non-Law Elective Course Credit

Students enrolled in the J.D.-M.B.A. degree program may not receive credit toward the J.D. degree for courses taken in either departments of the University except for those taken in conjunction with the dual program. Note: Students are advised to consult the Graduate School degree requirements as stated in the front section of this catalog as well as the requirements for this college.

DUAL J.D.-M.P.A. PROGRAM

The College of Law and the Department of Political Science in the College of Liberal Arts offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and Master of Public Administration degrees. In this program, a student may earn the M.P.A. and J.D. degree within the last 28 hours required for the J.D. degree and will not be included in the computation of the student's grade average or class standing. The College of Law will award a grade of Satisfactory for an approved course in the College of Law course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for an approved course in the College of Business Administration course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

Policy for Graduate Students Taking Law Courses

Students pursuing a graduate degree in another college may, upon approval of the College of Law and the major chairperson, take up to 6 semester hours of approved law courses and receive credit toward the graduate degree. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a 2.0 or above is earned in a law course, an S will be recorded on the transcript. If a student earns a grade below 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. Law courses may be taken for credit only by students enrolled in a graduate degree program.

Different rules apply to the student enrolled in the Dual J.D.-M.B.A. or J.D.-M.P.A. Programs. Grades must be earned according to the
grading system of the respective college, e.g., numerical grades for law courses, letter grades for graduate courses. Refer to section on Grades for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, at which time both the graduate and the law courses will be shown on the permanent record.

PROFESSIONAL COURSES

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


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

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

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

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

807 Torts I (3) Intentional torts, including battery, assault, false imprisonment, infliction of emotional distress, conversion and trespass; products and non-tort defenses; intentional torts; negligence, including standard of care and proof of negligence; immunities and limitations on duties; cause in fact; and proximate cause.

808 Torts II (3) Defenses, including contributory negligence, assumption of risk, comparative negligence, and statutes of limitations; vicarious liability; strict liability; nuisance; products liability; settlement; problems of multiple defendants; joint tortfeasors; non-tort defenses for recovery for personal injury; law reform; defamation; invasion of privacy; wrongful death proceedings; misrepresentation, injurious falsehood, misappropriation of opportunities; fiduciary duty; conflicts of interest; and interference with contract; constitutional torts.

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

810 Property (4) Introductory course treating issues of ownership, possession, and title in the areas of landlord-tenant relations; estates in land and future interests; co-ownership and marital property; real estate sales agreements and conveyances; title assurance and recording statutes; servitudes; and selected aspects of nuisance law, eminent domain and zoning.

811 Constitutional Law I (3) Judicial review, limits on judicial power; national legislative power; regulation of commerce; supremacy of federal law; other sources of national power; separation of powers; state taxation and regulation of commerce; intergovernmental immunities.

812 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 (0) Introduction to major computerized legal data base retrieval systems. Lecture only. Offered on a rotating basis throughout year. May be taken beginning spring of first year after completion of first draft of appellate brief in Legal Process II. Must be completed satisfactorily prior to end of second year of law study. Prereq: Completion of first draft of appellate brief in 816. S/N Only.

818 Income Tax I (4) What is income; whose income is it; when is it income; how is it taxed (capital gains and losses, maximum and minimum tax); deductions and credits; rates (corporate, estate, and trust).

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

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

824 Local Government (3) Distribution of power between state and local governmental units; sources of authority for limitations on local government operations; creation of local boundaries; home rule; problems created by fragmentation of local government units; financing of local services under federal programs on local government finance and decision-making.

827 Business Associations (4) Legal problems associated with formation, operation, and dissolution of unincorporated and incorporated business firms; legal rights and duties of firm members (principals and agents); transfer of ownership (sales, assignments); corporate shareholders, directors and officers, and with others whom these members interact in connection with firm's business.

828 Advanced Business Associations (2) Selected topics from law of business associations. Prereq: 827. May be repeated.

830 Securities Regulation (3) Basic structure of federal securities laws. Legal problems associated with raising of capital by new and growing enterprises; sale and distribution of securities by promoters, officers, directors and other insiders; regulation of publicly-held companies; litigation under Rule 10b-5 and other antifraud provisions; and provision of legal and other professional services in connection with securities transactions.

832 Business Planning Seminar (2) Selected problems on corporate and tax aspects of business planning and transactions. Prereq: 818, 827, and 970.

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

835 Commercial Transaction Law I (3) Core principles of the law of commercial transactions, including formation, interpretation, and enforcement of contracts, and remedies for breach of contract. Emphasis on uniformity and predictability of results, and consistent application of principles to different transactions.

836 Commercial Transaction Law II (3) Advanced topics in the law of commercial transactions, including secured transactions, bankruptcy, and alternative dispute resolution. Prereq: 835 or consent of instructor.

837 Empirical Studies of Legal Institutions (3) Social, economic and organizational factors that affect behavior of courts, lawyers, judges, and other actors in legal institutions. Empirical studies of subjects: professional 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 sometimes cause "law in action" to operate differently than "law on the books."

838 Jurisprudence (3) Critical or comparative examination of legal theories, concepts, and problems; legal positivism; natural law theory; legal realism; idealism; historical jurisprudence; utilitarianism; Kantianism; socio-critical jurisprudence; policy science; and critical studies.

839 Law and Economics (3) Relationship between legal and economic thought, use of economics in legal decision making and legal criticism.

840 Law and Language (3) Intermediate level jurisprudence course. Law as the mind's attempt to defend, direct, and administer human activity; exploration, through methods of cognitive psychology, of ethical values underlying formal legal reasoning and legal concepts.

841 Law and Politics (3) Intermediate level jurisprudence course. Law as the mind's attempt to defend, direct, and administer human activity; exploration, through methods of cognitive psychology, of ethical values underlying formal legal reasoning and legal concepts.
898 Arbitration Seminar (2) Arbitration of labor agreements; judicial and legislative developments; nature of process; relationship to collective bargaining; selected arbitration problems; various forms of arbitration; and rules of lawyers and arbitrators. Prereq: 855.

906 Criminal Advocacy (6) Supervised fieldwork, requiring students to assume primary responsibility for representing defendants accused of crime in Knox County. Exploration of theory, practice and ethics of interviewing, counseling, planning, investigation and discovery, drafting, negotiation, litigation, and professional issues. Students will be required to provide competent representation for clients. Hearings in state and federal courts, or before state and federal administrative officers or judges. Prereq: 903 and third-year standing.

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

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

916 Remedies (4) Judicial remedies: damages, restitution, and equitable relief; availability, limitations and measurement of various remedies; comparison of contract, tort and property-related remedies.

920 Trial Practice (3) Litigation through simulation, trial problems and preparation: basic trial strategy; professional responsibility; fact investigation and witness preparation; discovery and presentation of evidence; selection and instruction of jurors; opening and closing arguments. Written work: pleadings, motions, interrogatories or memoranda. Prereq: 813.

921 Pre-Trial Litigation (3) Civil pre-trial process. Drafting of actual pleadings and discovery documents; compliance; motions for summary judgment, class certification; motions to dismiss and for summary judgment, and various discovery papers.

923 Complex Litigation (3) Advanced civil procedure course designed for students that are involved in litigation involving multiple claims and multiple parties; complex litigation; discovery; judicial control of complex litigation; res judicata and collateral estoppel problems.

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


929 Teaching Clients the Law (3) Communication of law as basic for decision by persons other than lawyers. Development of skills by teaching a practical law course to high school students and the writing of research papers that synthesize Tennessean or federal law in plain language.

935 Gratuitoius Transfers (4) Nature, creation, termination, and modification of trusts; fiduciary administration; inheritance, succession, and gifts; drafting of estate plans and implementing documents for hypothetical clients. Prereq: 973. Prereq or coreq: 913 and 935.

940 Land Finance Law (3) Financing devices: mortgages, deeds of trust and land contracts; creation of liens on real estate; mechanics' and materialmen's liens; condemnation; mechanics' lien laws; and mechanics' lien laws in temporary developments in areas such as condominiums, cooperatives, housing subdivisions, and shopping centers.

941 Land Acquisition and Development Seminar (2) Problems of estate planning; relationship to estate planning of law of landlord and tenant; federal and state laws governing the relationship to collective bargaining. Prereq: 965. Recommended prereq or coreq: 855.

943 Education Law (3) Compulsory attendance laws; immigration law; civil rights; state and federal constitutional law; due process and equal protection; education for the handicapped; reading, writing, and arithmetic; and personnel issues. Prereq: 973. Prereq or coreq: 913 and 935.

944 Independent Study (1-4) Independent study under direct supervision of faculty member. Prereq: 993. Prereq or coreq: 855. Maximum of once each semester during last two years of study. Prereq: Second-year standing.


953 Estate Planning Seminar (2) Problems of estate planning; fiduciary administration; probate procedure; life insurance, trusts, charitable and other gifts, and related topics. Prereq: 950. Maximum of once each semester during last two years of study. Prereq: Second-year standing.

958 Social Legislation (3) Systems other than traditional tort remedies for compensating disabled persons and victims of accidents. Weights, measures and standards; requirements for covered employer-employee relationships; injuries or occupational diseases arising out of and in the course of employment; disability; medical and death benefits; administrative remedies against employers and co-employees; Social Security disability benefits; implications of disability benefits for administrative process; rights to fair hearing; and counsel fees.

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


971 Income Taxation of Entities (2) Federal income taxation of partners and partnerships, Subchapter S corporations and shareholders, and related topics. Prereq: 818. Recommended prereq or coreq: 870.

973 Wealth Transfer Taxation (3) Transfer of wealth at death (estate tax) and during life (gift tax), and of generation-skiping transfers; fiduciary income taxation. Recommended prereq or coreq: 818 and 935.

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

983 Products Liability (3) Scope of doctrine and theories applicable to tort suits, product liability, and professional malpractice. Prereq: 958. Maximum of once each semester during last two years of study. Prereq: Second-year standing.

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

993 Directed Research (1-2) Independent study under direct supervision of faculty member. Prereq: 993. Prereq or coreq: 855. Maximum of once each semester during last two years of study. Prereq: Second-year standing.

994 Independent Study (1-4) Independent study under direct supervision of faculty member. Prereq: 993. Prereq or coreq: 855. Maximum of once each semester during last two years of study. Prereq: Second-year standing.


997 Moot Court (1) Participation as member of faculty moot court. Prereq: 993. Prereq or coreq: 855. Maximum of once each semester during last two years of study. Prereq: Second-year standing.

999 Library and Information Science (119)

Library Science

MAJOR

José-Marie Griffiths, Director
Glenn E. Estes, Assistant Director
The Graduate School of Library and Information Science provides a program leading to the preparation of librarians and information professionals for work in all types of libraries and information centers. The program of study includes a graduate curriculum leading to the Master of Science in Library Science. The program is accredited by the American Library Association.

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

A. To prepare students to understand the nature of information and the role of the library and other information agencies in the management of information resources, and the facilitation of information transfer. Students will demonstrate:
   1. Knowledge of the generation, production, management, dissemination and uses of information.
   2. Knowledge of the roles of various organizations/institutions in promoting the flow of information.
   3. An understanding of the role of the librarian/information professional as mediator between information resources and their users.
   4. An understanding of the roles of various tools and technologies in facilitating access to information.
   5. An understanding of the structure and content of information resources in various formats and subjects.
   6. Knowledge of theoretical and practical evolution of information sciences and technologies and their relationship with other disciplines.
   7. Competence in creating, managing and accessing information in a variety of formats.
B. To provide services to the state, region, and nation in association, consulting and continuing education activities which will promote the development and improvement of information systems and services such that the school's contributions reach beyond its immediate academic programs. The school will provide:
   1. Continuing education for information professionals and, on a selective basis, to persons outside the information field.
   2. Advising services to libraries and other types of organizations.
   3. Leadership for professional associations.
   4. To conduct basic and applied research which promotes the generation of new knowledge, services and technology. The school will encourage:
      1. Research which strengthens its instructional and public service programs.
      2. The use of a variety of research methods.
      3. Sharing the results of its research.

4. Increased research quality and productivity.

ADMISSION REQUIREMENTS

Applicants to the GSLIS program must have a minimum undergraduate grade-point average of 3.0 or a satisfactory graduate degree grade-point average for admission as a potential candidate for the MSLS degree.

The verbal and quantitative aptitude portions of the Graduate Record Examination (GRE) are required of all applicants unless a graduate degree has been completed prior to application for admission. Applicants should take the GRE at least one semester in advance of application for admission and are expected to score in the 50th percentile or above on the verbal portion of the GRE.

A personal data sheet and three recommendations (obtained from the Graduate School of Library and Information Science) should be submitted to the director of the school. Foreign applicants are required to take the Test of English as a Foreign Language.

MASTER OF SCIENCE IN LIBRARY SCIENCE

The program leading to the Master of Science in Library Science involves a total of 42 semester hours of graduate courses, 15 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis option is available, with 6 hours required for thesis credit. At least 36 hours must be taken in the Graduate School of Library and Information Science, allowing up to 6 hours outside the school with a maximum of 5 from outside the University. Upon completion of the program, all students are subject to a final examination. For students who elect the thesis option, the examination will be a defense of the thesis. Students who elect the non-thesis option will be given a written comprehensive examination.

Core Curriculum

The core curriculum is a 15 semester hour sequence of five courses required of all students: 490, 520, 530, 560, 580. These courses address the evolving information environment; foundations of information sciences and technologies; information resources selection, acquisition and evaluation; information content representation; information access and retrieval. The core curriculum includes a non-credit electronic information and communications laboratory experience required of students during the first semester: 504.

The 15 hour core is prerequisite to all elective courses for students enrolled in the MSLS degree program. Elective courses may begin in the final semester of core course work with permission of the advisor and the instructor of each elective course selected.

Concentrations

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

Youth Services in Public and School Libraries

The concentration includes two specializations: public library youth services and school library media services. Within the concentration, 21 hours (465, 571, 572, 573, 585, 599, one elective) are common and 6 hours are taken in the specialization (public library: 554, 592; school library: 475, 551).

4. Increased research quality and productivity.

ADMISSION REQUIREMENTS

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504 Electronic Information and Communications Laboratory (6) Methods for creating and managing information in electronic form. Communication of electronic information in networked environment. Location and use of electronic information resources. For GSLIS graduate students only; must be completed satisfactorily in first semester. S/N only.

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

521 Cataloging and Classification (3) Basic library-oriented cataloging and classification techniques, tools, and supporting operations. Descriptive cataloging, choice and form of non-subject entries, subject heading work, general classification, authority control, bibliographic utilities, online library catalogs.


523 Abstracting and Indexing (3) Philosophies, standards, and procedures for manual and automatic document retrieval, including key words, indexing, vocabulary control, thesaurus construction, and abstracting.

530 Information Access and Retrieval (3) Media for information storage, logical and physical information structures, query logic and languages, search strategies and habits, evaluation, retrieval system performance. Search techniques for various types of databases including multi-media, full-text, numeric, bibliographic.

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

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

533 Sources and Services for the Humanities (3) Information sources in philosophy, religion, fine arts, performing arts, literature and language, organization, and management of regional collections.

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

535 Advanced Information Retrieval (3) Bibliographic, non-bibliographic, full-text databases, e.g., non-bibliographic formula and structure databases, contents-page/full-text databases, patents; document delivery alternatives, evaluation, and testing. Prereq: 555.

536 Creation and Distribution of Information and Knowledge Resources (3) Historical, political, and societal dimensions of creation, dissemination, growth, and institutionalization of information and knowledge from Antiquity to the twentieth century.

537 Information Industry (3) Issues and trends concerning information industry: products and services. Standards, enabling technologies, choice of distribution media, entrepreneurship, marketing, management, and public policy concerns.

538 Economics of Information (3) Costing and pricing of information; value of information and value added services; cost benefit analysis and valuation; policies related to economic aspects of information exchange and transfer.

539 National Information Policy (3) Role of government in creation and exchange of information; review of key policy areas relevant to information creation, production, and diffusion.

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

550 Management of Information Agencies and Services (3) Management and organizational theories, strategies, techniques applicable to libraries, archives, records management programs, and other information delivery systems. Prereq: 585.

551 School Library Media Centers (3) Planning, implementing, and evaluating school library programs. Curricular involvement, role of technology, relationships with district and state services.

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

553 Specialized Information Agencies (3) Development and present status, scope and functions of special libraries, including law and specialty libraries. Prereq: 537.

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

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

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

560 Information Resources Selection, Acquisition, and Evaluation (3) Principles of development and management of collections in information agencies; community analysis; users and use; policies and procedures; evaluation of items and collections; selecting items to meet particular needs.

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

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

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

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


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

569 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 569.)


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

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

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

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

582 Library Automation (3) Computer-based applications and systems for libraries including MARC, bibliographic utilities, retrospective conversion, circulation systems, online catalogs, computer-based reference services, acquisitions and serials control, systems planning and implementation. Prereq: 585.

583 Information Systems (3) Systems concept, defining system, analysis and design of information systems. Selecting and using information systems to support various activities. User involvement in the development process. Prereq: 585.

584 Database Management Systems (3) Defining data needs, data structures, role of operating systems in data management, file organization, database management systems, logical data models, internal data models, database administration and evaluation. Design and implementation of application using database management system. Prereq: 585.


587 Information Retrieval Systems (3) Historical perspective on information retrieval research; statistical and probabilistic retrieval techniques; cognitive user modeling; expert intermediary systems; associations, relations and hyper-text. Prereq: 585.

588 Database Management Systems (3) Survey of human-computer interaction and introduction to psychological and other behavioral science knowledge and techniques useful in design of computing systems for human use. Basic psychological phenomena of human cognition, memory, problem solving, and language and how these processes relate to and condition interaction between humans and interactive computing systems. Prereq: 585.

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 (3-6) Prereq: Consent of instructor. May be repeated with consent of advisor. Maximum 6 hrs.

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

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

599 Practicum (3-6) Opportunity to translate theory into practice and to gain experience under guidance of qualified information professionals. Prereq: Completion of core and pertinent advanced courses relevant to student's practicum design. Minimum 3.0 cumulative GPA. Written consent of advisor and approval of practicum coordinator. May be repeated. Maximum 6 hours.
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; 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 course deficiencies may be corrected during the first year.

DEGREE REQUIREMENTS

The Master's degree requires a minimum of 30 semester hours of study approved by the student's committee, a thesis, and an oral examination. Within the biotechnology program only, a non-thesis M.S. option is available. Students choosing this option are expected to complete: (1) two summers' co-op experience in an appropriate industry. An evaluation by supervisor and a written report are required (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. Individual programs may have additional requirements.

CONCENTRATIONS

Biotechnology

The biotechnology program will prepare students to participate in the wide variety of opportunities presented by the use of living cells 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, bioprocess engineering, bioproducts and biotransformations, liposomes, microscopy and image processing, monoclonal antibodies and hybridoma technology, plant tissue culture, recombinant DNA technology and risk assessment, and modeling. The production of a research thesis or an industrial co-op experience plus an area of specialization will also be an important part of the training experience.

Required courses are Life Sciences 509, 511, 512, 531, 532; Biochemistry 511; Microbiology 410; 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 616.

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 450, 455; 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 the 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; Human Anatomy, Comparative Vertebrate Biology, 420; Biochemistry 410; four 600-level semesters; and a statistics sequence.

Plant Physiology and Genetics

This program provides the opportunity for intensive training and research experience in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions of problems concerning the interactions of physiology and genetics in applied and fundamental aspects of plant science.

Required courses are Life Sciences 510; Botany 521, 522; Biochemistry 511, 512; Plant and Soil Science 471 or Zoology 560; Plant and Soil Science 551; Microbiology 410.

GRADUATE COURSES

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

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/U only. E

509 Biotechnology Seminar (1-2) Topics of importance to biotechnology, May be repeated. Maximum 6 hrs.

510 Special Topics in Life Sciences (1-3) Specializations in biotechnology, cellular, molecular, and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.

511 Advanced Cellular Biology (3) Cells 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.)

529 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.

531 Biotechnology Laboratory (3) Growth of microorganisms, analysis of extracellular and intracellular components.

532 Biotechnology Laboratory (3) Pilot scale yeast cultivation, enzyme isolation, purification and characterization. Application of purified enzymes to food product fermentations and fermentation process control.

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

610 Advanced Topics in Life Sciences (1-3) Topics vary. May be repeated. Maximum 6 hrs.

Logistics

See Marketing, Logistics and Transportation

Management

(College of Business Administration)

MAJOR

DEGREES

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

Oscar Fowler, Head

Professors:

Boling, Ronald W. (Emeritus), Ph.D. .... Stanford
Dewhurst, H. Dudley, Ph.D. .................... Texas
Dobbins, Gregory H., Ph.D. ................. VPI
James, Lawrence R., Ph.D. .................... Utah
Keally, A. H., (Emeritus), Ph.D. .... Pennslyvania
Larsen, John M., Jr. (Emeritus), Ph.D. .... Purdue
Neal, C. Warren, Ph.D. ....................... Alabama
Reese, Don (Emeritus), Ph.D. ............... Iowa
Rush, Michael C., Ph.D. ...................... Akron
Zalex, William C., Ph.D. ..................... University of Pennsylvania
Vanos, S. C. (Emeritus) (W.B. Stokely Prof.) Ph.D. ................. Pennsylvania
Courses from the following list: Ecology 520, Human Organization and Design, Motivation, Leadership, Human Integration of Individual and Group Differences. Organization theory and design, organization behavior, intergroup relations, organizational change and development.

521 Personnel Administration (3) Personnel functions and human resources management. Community relations, recruiting, selection, training, performance evaluation, and salary administration. Legal framework as it affects personnel policies. May be repeated. (Same as Psychology 592.)

522 Labor Relations and Collective Bargaining (3) American labor history, structure and philosophy of labor relations, dispute settlement, and contract administration. (Same as Economics 627.)

525-26 Industrial and Organizational Psychology (1-3, 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 strategy. Management of research and development function and coordination with other functions. Management of scientists and engineers. (Same as Economics 592.)

540 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 Proseminar in Industrial/Organizational Psychology (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 571-18.)

571 International Management (3) Analysis of environmental impact of international business firms and of internal and external factors on managerial decisions.

581 Environmental Management (3) Managerial frameworks for addressing environmental issues. Most pressing environmental challenges; options compatible with sustainability. Field projects, research papers.

593 Directed Independent Study (1-3) Topic of mutual interest. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

595 Selected Topics in Current Management Issues (1) In-depth consideration of current issues, major events, and patterns of change and impact of emerging topics. Prereq: Consent of instructor.

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

601 Research Methods (3) Seminar covering a broad range of topics. Research process as applied to study of strategic management. Literature review 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.

613 Seminar in Strategic Management III (3) Review and analysis of important books and monographs in strategic management. Understanding evolution of strategic thinking and the emergence of distinct paradigms.

625 Seminar in Organizational Behavior (3) Self-analysis of current theories, concepts, and issues associated with psychology of organizational leadership and work motivation. Prereq: 587, 598, consent of instructor. May be repeated. (Same as Psychology 625.)

626 Seminar in Industrial Psychology (3) In-depth analysis of current issues and problems in the area of industrial/organizational psychology. Prereq: 587, 598, consent of instructor. May be repeated. (Same as Psychology 627.)

627 Seminar in Applied Industrial Psychology (3) In-depth analysis of current issues and problems in the area of industrial/organizational psychology. Prereq: 587, 598, consent of instructor. May be repeated. (Same as Psychology 627.)

638 Current Topics in Industrial/Organizational Psychology (3) In-depth analysis of various topics: organizational change and development, psychology and problems of consumer behavior. Prereq: 587, 598, 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.

690 Field Work in Industrial and Organizational Psychology (1-12) Supervised field practice in industries and organizations. Prereq: 587, 598, consent of instructor. May be repeated. Maximum 12 hrs. (Same as Psychology 690.)

Management Science

(College of Business Administration and Intercollegiate Program)

MAJORS

DEGREES

Management Science ................................ M.S., Ph.D

Business Administration................................ MBA

Charles E. Noon, Chairperson

Associate Professors:

Gilbert, Kenneth C., Ph.D....................... Tennessee

Noon, Charles E., Ph.D......................... Michigan

Srinivasan, M. M., Ph.D....................... Northwestern

Assistant Professors:

Bowers, Melissa R., Ph.D. ...................... Clemson

Clarrson, Clelland, Jain J., Ph.D ............... Southern California

Dean, Thomas J., Ph.D........................... Colorado

Edirisinghe, Chanaka F., Ph.D. British Columbia

Greenwood, Thomas G., Ph.D.................. Tennessee

Judge, William Q., Ph.D....................... North Carolina

Additional Committee Members:

Bowers, Melissa R., Ph.D. ...................... Clemson

Edirisinghe, Chanaka F., Ph.D. British Columbia

Greenwood, Thomas G., Ph.D. ............... Tennessee

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 the student to both the theoretical and applied aspects 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 concentration 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 applicant recommendation forms and the GRE or GMAT. Applications are encouraged from all majors, but mathematics background equivalent of the completion of at least two years of college calculus and proficiency in a computer language is required. The program is designed to be completed in three semesters by full-time students. However, students may start the program in any semester and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements

<table>
<thead>
<tr>
<th>Course Requirements</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Core Requirements</td>
<td>14</td>
</tr>
<tr>
<td>Management Science</td>
<td>531, 532, 533, 534</td>
</tr>
<tr>
<td>Statistics 563</td>
<td></td>
</tr>
<tr>
<td>Applied specialization area</td>
<td>(approved by advisor)</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>9</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>

An 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 committee must approve a tentative overall program during the student's first semester and must approve all courses on a semester-by-semester basis.

Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics requirement. 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 the 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. The Ph.D. program is designed to provide sufficient advanced study in a supporting area to qualify the student for a joint faculty position in the supporting area and management science. The student must complete a minimum of 24 semester hours of coursework, a high degree of mathematical maturity to enhance a potential career in management, research, or teaching.

Admission Requirements
The doctoral program requires three applicant recommendation forms and the GRE or GMAT, in addition to The Graduate School's requirements.

Coursework
A minimum of 48 semester hours of coursework taken for graduate credit (exclusive of thesis or dissertation) is required. Some of this may be the coursework from a Master's program although a Master's is not a prerequisite for the doctorate. The candidate must complete a minimum of 24 semester hours at The University of Tennessee, Knoxville, at least 6 of which must be at the 600 level. Both of these requirements are also exclusive of thesis or dissertation credits. Entering students who have completed graduate studies in applicable fields will be granted course credits for work which is equivalent to required courses in the program.

The program includes approximately 16 to 20 semester hours of coursework in the applied area.

Qualifying Examinations
The student must demonstrate mastery of probability theory and statistical 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 Mathematics 453, and 571-572, and real analysis, Mathematics 445-446. Other options may be approved. In exceptional circumstances, the faculty will consider waiving the mathematics and/or statistics qualifying examinations. These requirements generally are completed by the end of the first year of the program.

There is no foreign language requirement.

Comprehensive Examination
Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation
The student must complete 24 semester hours of Management Science 600: Doctoral Research and Dissertation, through which he/
Marketing, Logistics, and Transportation
(College of Business Administration)

MAJOR

DEGREES

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

David W. Schumann, Head

Marketing

Professors:

Barnaby, D. J., Ph.D. ......................... Purdue
Cadotte, E. R., Ph.D. ......................... Ohio State
Mentzer, J. T., Ph.D. ......................... Michigan State
Woodruff, R. B., DBA ....................... Indiana

Associate Professors:

Gardial, S. F., Ph.D. ........................ Houston
Reizenstein, R. C., Ph.D. .................. Cornell
Rentz, J. O. (Liaison), Ph.D. ................. Georgia
Schumann, D. W., Ph.D. ............... Missouri

Assistant Professors:

Dabholkar, P. A., Ph.D. ....................... Georgia State
Johnston, T. C., Ph.D. ...................... California
Moon, M. A., Ph.D. ........................ North Carolina
Song, X. M., Ph.D. ......................... Virginia

BUSINESS ADMINISTRATION CONCENTRATIONS

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

MBA Concentration: Marketing

Minimum course requirements are 511 and 512.

Ph.D. Concentration: Marketing

Minimum course requirements are 12 hours from among the following courses: 601, 602, 603, 604, 605, 606.

GRADUATE COURSES

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May be repeated. S/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: Business Administration 504 and 505 or consent of instructor.

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

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

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

510 Principles of Marketing Management for Non-MBA Students (3) For students from other disciplines interested in obtaining knowledge of marketing discipline at graduate level.

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

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

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

593 Independent Study (3) Directed research and study. Prereq: MBA Core and consent of instructor. May be repeated. Maximum 6 hrs.

599 Special Topics Seminar (3) Topics vary: nonbusiness marketing applications, macroenvironmental issues, market segmentation, international marketing, services marketing, marketing organizations, 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 I (3) Research process: problem formulation, research and experimental design, measurement and implementation of results. Design: experimental design, survey research, and measurement.

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

604 Seminar in Buyer Behavior Research (3) Behavioral study of people in their roles as buyers and users of goods and services both individual and group processes.

605 Research Methods II (3) Analytical approach to marketing decision and role of quantitative methods. Models and model building in marketing: consideration of decision theory, linear programming, simulation, and other mathematical representations of marketing phenomena.

606 Special Topics (3) Topics vary: marketing strategy, advanced consumer behavior, influence and persuasion theory and strategy, pricing issues, international marketing issues, and nonorganization marketing issues.

Logistics and Transportation

Professors:

Davis, F. W., Jr. (Liaison), Ph.D. Michigan State
Dier, G. N., DBA ......................... Indiana
Frye, J. L. (Emeritus), Ph.D. ........... Florida
Hendrix, F. L. (Emeritus), Ph.D. ....... North Carolina
Langley, C. J., Ph.D. ................ Pennsylvania
Mundy, R. A., Ph.D. ..................... Pennsylvania
Petton, E. P., Ph.D. ...................... North Carolina

Associate Professor:

Foggan, J. H., DBA ..................... Indiana

Assistant Professor:

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

BUSINESS ADMINISTRATION CONCENTRATIONS

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

MBA Concentration: Logistics and Transportation

Minimum course requirements are 501, 508, and one course from the following: 504, 506, 507, 509, and 509.

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

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.

506 Logistics Systems Management (3) Development of strategy for management of logistics systems. Executive level integration of logistics operations with market-
Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering. Both the metallurgical and polymer programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs. Prospective students should consult materials science and engineering faculty concerning development of individual concentrations or special programs compatible with their backgrounds and goals.

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

**THE MASTER'S PROGRAM**

**Thesis Option**
A total of 30 semester hours is required for the M.S. degree in either Metallurgical Engineering or Polymer Engineering. Additional requirements include:

1. A major consisting of 12 to 18 semester hours of graduate courses in metallurgical engineering or polymer engineering. The polymer engineering major must include 540, 541, 543, 546, 549, 550, and 572 unless similar material has been covered in prior coursework.
2. Additional courses amounting to 6 to 12 hours total in any approved engineering, chemistry, mathematics, physics, or other related fields.
3. Master's thesis, totaling 6 to 12 hours. All resident students are required to register for and participate in the graduate seminar in metallurgical engineering or polymer engineering, as appropriate, during each semester in which it is offered. Credits for the seminar do not count towards satisfying the coursework requirements.

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

1. A total of at least 33 hours in graduate courses in metallurgical engineering, polymer engineering and related areas. The minimum requirements are 21 hours in the Department of Materials Science and Engineering and up to 12 hours in other engineering or science courses. The candidate's degree program must be approved by the faculty committee.
2. Satisfactory completion of a critical review of the literature in an area related to metallurgical, polymer or materials engineering.
3. Satisfactory performance in an oral examination to be conducted by the faculty committee and covering the review paper and other areas of metallurgical or polymer engineering.

**THE DOCTORAL PROGRAM**

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

Department requirements consist of the satisfactory completion of:

1. Graduate courses in materials science and engineering amounting to approximately 24 semester hours, at least 8 of which must be in 600 series courses.
2. Supporting courses in related scientific and engineering fields amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include chemistry, mathematics, physics, and engineering.
3. The comprehensive examination, usually given in two parts, and covering such topics as materials science and engineering, metallurgical or polymer engineering operations and processes, thermodynamics, technology, mathematics, physics, chemistry, and other related fields.
4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 503 or 504 every semester offered.

**ACADEMIC COMMON MARKET**
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Metallurgical Engineering 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 Admissions Specialist in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

401 Structural Characterization of Materials (4) X-ray diffraction and fluorescence; scanning and transmission electron microscopy; microanalytical techniques.
421 Mechanical Behavior of Materials II (3) Description of stress and strain; linear elastic constitutive equations; isotropic and anisotropic moduli in various materials; yield criteria; fatigue; fracture; plastic; strain; constitutive equations, forming operations and limit criteria. Prereq: Mechanical Behavior of Materials, Mechanics of Materials I, sophomore mathematics.
422 Chemical Process Metallurgy (3) Application of chemical thermodynamics to metallurgical processing. Ferrous and nonferrous pyrometallurgical refining; slag-metal equilibria; solidification, gas-metal processing. Prerequisite: 401.
426 Materials Joining (3) Processes for joining metals, polymers and ceramics: mechanical, adhesive, fusion, solidification/vitrification; surface characteristics necessary for joining and chemical bonding; thermal effects on structure and properties of joints; design of joints. Prerequisites: Introduction to Materials Science and Engineering.
443 Polymer Processing (3) Rheological measurements; flow through tubes and ssss, end effects and extrudate swell; selected application, screw extrusion.
504 Graduate Seminar in Polymer Engineering (1) Prereq: 503 or equivalent.

503 Graduate Seminar in Metallurgical Engineering (3) Prereq: Admission to graduate program. May be repeated. S/NC only.

502 Registration for Use of Facilities (3-15) Required for all students. May be used toward degree requirements. May be repeated. S/NC only.

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

474 Biomaterials (3) Prereq: 302 or equivalent. Recommended for chemical and biological engineering majors.

475 Fracture-Safe Design (3) MSA 324.

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

502 Registration for Use of Facilities (3-15) Required for all students. May be used toward degree requirements. May be repeated. S/NC only.

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

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

505 Engineering Analysis (3) MSA 324.

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 mechanics of single crystal plastic deformation; slip, twinning, and cleavage, work hardening, effect of temperature, loading rate effects, effect of ordering and solid solution hardening, phase transformation behavior in terms of single crystal deformation mechanisms; texture formation. Prereq: 301 or consent of instructor.

524 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems; refining, oxidation, corrosion, surface treatments, alloy systems. Prereq: 570 or equivalent.

525-26 Welding Metallurgy (3,3) Welding processes; physical metallurgy of welding; phase transformations; heat flow; residual stresses; theories of hot cracking, cold cracking, and porosity formation; applications to process utilization.

529 Diffusion in Solids (3) Phenomenology and atomic mechanisms of diffusion in solid state. Solution and application of diffusion equations; random walk problems; concentration and shape functions; mechanisms of diffusion; diffusion in dilute and concentrated alloys; Kirkendall effect; high diffusivity paths.

530 Phase Transformations in Metallic Materials (3) Thermodynamics of phase transformations; nucleation and precipitation; theory of transformation; applications of phase diagrams; metallurgy and kinetics of martensitic transformation.

531 Advanced Corrosion (3) Analyses of corrosion processes in terms of polarization measurements and Pourbaix diagram. Influence of environmental and mechanical factors on metal corrosion. Prereq: 470 or consent of instructor.


540 Basic Polymer Chemistry (3) Molecular properties and structure of polymers; physical chemistry of polymers; synthesis, reactions, and degradation of polymers. Prereq: 402 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. Prereq: 421 or consent of instructor. May be repeated. S/NC only.

542 Further Topics in Polymer Processing (3) Selection and analysis of selected polymer processing operations. Prereq: 541.

543 Basic Polymer Physics (3) Essential structure-property relations in materials; Physical structure of polymers; Mechanical, electrical and thermal properties. Prereq: 450 or equivalent.

544 Polymer Solution Thermodynamics and Characterization (3) Prereq: 543. May be repeated. S/NC only.

545 Mechanical Properties of Solid Polymers (3) Types of mechanical behavior. Prereq: 421 or equivalent. May be repeated. S/NC only.

549-50 Laboratory Methods in Polymer Engineering (1,1) Basic experimental techniques and instrumentation associated with characterization; x-ray and light scattering; calorimetry, rheometry, mechanical properties of solid polymer processing operations. Prereq: 540 or consent of instructor.

550 Principles of Ceramic Processing (3) Treatment of ceramic processing; raw materials preparation and characterization; powder consolidation; firing, sintering techniques, mechanisms and kinetics. Prereq: 570 or equivalent.

551 Inorganic Glass Forming Systems (3) Physical and chemical nature of inorganic glasses; structural theories of glass formation: major glass forming systems: silica, other oxide glasses, nitrate glasses, water glasses, and chalogenide glasses. Prereq: 360, Chemistry 371.

552 Experimental Methods of Composite Material (3) Prereq: 541 or consent of instructor.

553 Chemical Thermodynamics (3) Enthalpy and entropy of mixing; Gibbs function and chemical potential methods of measuring activity; solution theories; phase rule; heat capacity of gases, liquids and solids; determination of molecular structures. Prereq: 301 or equivalent.

557 Electron Microscopy (3) Operation of electron microscope; kinesmal and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: 570 or equivalent.

570 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to definition of structures; powder and single crystal x-ray techniques; introduction to crystal structure determination; characterization of orientation and diffraction in organic, metallic and polymer substances.

573 Biomaterials Analysis and Characterization (3) Prereq: 542. May be repeated. S/NC only.

574 Formation of Materials (3) Modeling and analysis of finite plastic strain with application to primary and secondary forming operations: crystalline and noncrystalline materials; flow localization; instability; predictive testing. Prereq: Consent of instructor.

576-77 Special Topics in Materials Science and Engineering (3,3) Topics of current interest and significance. Prereq: Consent of instructor. May be repeated.
The Mathematics Department has three graduate degrees: (1) the Master of Mathematics degree, intended primarily for teachers, (2) the Master of Science degree, designed to prepare students for professional employment and for teaching, and (3) the Doctor of Philosophy degree, designed to prepare students for research careers in mathematics.

A student offering mathematics as a minor for the Master's degree is required to obtain at least 6 hours of resident graduate credit in courses numbered above 400 and approved by both the major department and the Department of Mathematics.

THE MASTER OF MATHEMATICS PROGRAM

Before admission to the Master of Mathematics program, the applicant must have either (a) certification for teaching secondary mathematics in at least one state, or (b) three years of elementary school, secondary school, or community college teaching experience.

Applicants must have successfully completed one year of calculus (141-142 or equivalent) and a course in matrix algebra (251 or equivalent).

The following requirements must be met:
1. Complete 30 hours of coursework of which 21 must be at the 500 level. The coursework must include 504, 505, 506, 507, and 6 hours in 509. At most, 6 hours may be taken outside the Department of Mathematics (selected in consultation with the advisor).
2. Pass a final examination upon completion of all coursework.

In exceptional circumstances, part of admission requirement (b) might be satisfied concurrently with coursework. Normally, the Master of Mathematics degree students will start the program by taking 504 during the summer.

THE MASTER OF SCIENCE PROGRAM

The department offers two options for the Master of Science degree. The first option requires a thesis for which 8 hours must be earned along with 24 additional hours of work in acceptable courses numbered above 400. Of the additional hours, 6 may be in an area outside the department and 15 must be in courses in mathematics numbered above 500.

After one semester of graduate study, a student whose advisors committee gives its approval may choose the non-thesis option, for which 30 hours in courses numbered above 400 are required. Of these, 21 hours (at least 15 of which must be in mathematics) must be in courses numbered above 500. Of the 30 hours, at least 9 in courses approved by the advisory committee may be taken in fields other than mathematics. For this option it is required that a written final examination be passed and that credit be received for a reading course (598) in which a term paper or project is required.

THE DOCTORAL PROGRAM

For the Ph.D. in Mathematics, the student must meet the following requirements in addition to those of the Graduate School:
1. Satisfy either of the following: the standard program or the mathematical ecology concentration. A student intending to work in mathematics may complete either, but he/she is encouraged to complete the mathematical ecology concentration. A student may elect to switch from one to the other provided the constraints of the latter option have not been violated. A student's status after electing such a transfer is determined by the complete history of his/her earlier examinations from the standard program and part 1 of the mathematical ecology concentration. A description of both programs is below.
2. Demonstrate proficiency in a 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 exam.
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 by the department head and 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 551-552
- b. Complex Analysis 543-44
- c. Topology 561-62
- d. Real Analysis 541-42
- e. Applied Linear Analysis 547-48
- f. Partial Differential Equations 536-37
- 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 at least 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 examination 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 four exams, counting possible repetitions, will be permitted to take another round of exams.

Mathematical Ecology Concentration

Students must pass examinations in two areas.
1. At least one of the 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.
2. 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.
   c. 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.
   d. Ecology, covering material selected from nine hours of coursework outside of mathematics at the 500 level or above.
   e. The courses 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 courses 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) Development of major ideas in mathematics from ancient times, and influence of ideas in science, technology, philosophy, art, and other areas. Writing emphasis course; at least one in-class essay examination and 3000 words of writing outside classroom. Prereq: Calculus.

401 Mathematics and Microcomputers (3) Primarily for students seeking certification as mathematics teachers at secondary level. Use of microcomputers to study concepts in mathematics and to satisfy the major requirements for a B.S. or M.S. in mathematics. Prereq: Calculus I.

404 Applied Vector Calculus (3) Topics from multivariable and vector calculus, line and surface integrals, divergence theorem, and Green's theorem. Prereq: Calculus III.

405 Models in Biology (3) Difference and differential equation models of biological systems. May not be counted toward graduate degree. Prereq: Calculus II or equivalent.


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 I (3) Elementary probability, random variables, and therefore, expectation, and laws of large numbers. Prereq: Calculus III. Recommended prereq: 300-level probability.


425 Statistics (3) Development of major ideas in statistics from ancient times, and influence of ideas in science, technology, philosophy, art, and other areas. Writing emphasis course; at least one in-class essay examination and 3000 words of writing outside classroom. Prereq: Calculus.

447-48 Honors: Advanced Calculus I (3,3) Honors version of 445-46. Prereq: 341 or consent of instructor.

451 Topics in Algebra (3) Number theory and group theory of polynomial equations, such as quadratic reciprocity law and Sturm separation. Prereq: Algebra I or consent of instructor.

453 Matrix Algebra II (3) Matrix theory including Jordan canonical form. Prereq: Matrix Algebra I.

455-56 Abstract Algebra II (3,3) Algebraic structures: groups, rings, fields, vector spaces and linear transformations. Prereq: 351 or consent of instructor.

457-58 Honors: Abstract Algebra II (3,3) Honors version of 455-56. Prereq: 351 or consent of instructor.

460 Geometry (3) Axiomatic and historical development of Galois-Kepler-Newton-Euclidean geometry, including a proof technique and critical reasoning. Models of Non-Euclidean geometries. Prereq: Calculus II, and Discrete Mathematics I; or consent of instructor.

461 Topology (3) Topology of line and plane, separation properties, compactness, connectedness, continuous functions, homeomorphisms, compactness and topological invariants. Prereq: 341 or consent of instructor.

471 Numerical Analysis I (3) Computation, stabilities, and rounding. Interpolation and approximation by polynomials and piecewise polynomials. Quadrature and numerical solution of initial and boundary value problems of ordinary differential equations, stiff systems. Prereq: Numerical Algorithms I or consent of instructor. (Same as Computer Science 471.)

472 Numerical Analysis II (3) Direct and iterative methods for systems of linear equations. Solution of single nonlinear equation and nonlinear systems. Orthogonal decomposition, least squares and algebraic eigenvalue problems. Prereq: Numerical Algorithms I or consent of instructor. Recommended prereq: 453. (Same as Computer Science 472.)

490 Readings in Mathematics (1-3) (Open to students with consent of department head. Independent study with faculty guidance. Prereq: Consent of faculty mentor to supervise independent work. May be repeated. Maximum 9 hrs.

499 Seminar in Mathematics (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

500 Thesis (1-15) 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/C only.

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 in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus or equivalent.

505 Analysis for Teachers (3) Topics in analysis of functions of one or more variables. Basic limit theorems, point and interval estimation, Bayesian estimation, statistical hypotheses, Neyman-Pearson theorem, likelihood ratio and other parametric and non-parametric tests; sufficient statistics. Prereq: Probability I or consent of instructor.

451-52 Honors: Advanced Calculus II (3,3) Honors version of 445-46. Prereq: 341 or consent of instructor.

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.


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. Consent of instructor. May be repeated. Maximum 12 hrs.

510 Applied Mathematics Laboratory (1) Computer applications in applied mathematics: software packages for matrix analysis, symbolic algebra, and differential equations. Coreq: 511 or 512. May be repeated.

511-12 Methods in Applied Mathematics (3,3) Fundamentals and techniques associated with discrete and continuous models of physical, engineering and biological systems: difference equations, networks and graphs, optimization, finite difference analysis, queueing analysis, simulation techniques and analysis of differential and delay-differential equations, and other topics. Coreq: 510. Prereq or coreq: 445 or 447, and 453.


515-16 Analytical Applied Mathematics (3,3) Analysis of advanced techniques in modern context for applied problems: dimensional analysis and scaling, perturbation theory, variational approaches, transform theory, wave phenomena and conservation laws, stability and bifurcation theory, and asymptotic analysis. Prereq: 445 or 446, 448, and either 511-12 or both 431 and 435.

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

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

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

523-24 Probability I (3) Joint probability theory, definition of probability, measure, algebra of events, random variables, algebraic properties of random variables, expectations, functions of random variables. Prereq: Calculus I or equivalent.

525-26 Statistics (3,3) Joint probability theory, definition of probability, measure, algebra of events, random variables, algebraic properties of random variables, expectations, functions of random variables and laws of large numbers; general theory of distributions of random variables and their characterizations, random vectors, linear independence, weak convergence and weak compactness and Levy's continuity theorem in Euclidean spaces; infinitely divisible distributions and central limit problem; general concepts and properties of conditional expectation, martingales, Doob's martingale and optional stopping theorems. Prereq: 445-46. Recommended prereq: 423.

527 Stochastic Modeling (3) Models in probability applied to real world situations; queueing 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 Jacobi's conditions, conjugate points, Multiple integrals. Prereq: 431.

535-36 Partial Differential Equations I (3,3) First order equations, classification of equations and properties of elliptic, hyperbolic, and parabolic equations in several variables. Prereq: 445-46 and 251 or consent of instructor.

537 Mathematical Principles of Continuum Mechanics (3,3) Conservation principles, equations of equi-
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. Applications to ecology. Prereq: 431, 453, 445-46 or consent of instructor.

585 Optimal Control Theory (3) Deterministic optimal control problems. Examples including calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control. Prereq: 431, 445-46 or consent of instructor.

589 Seminar in Mathematical Ecology (1-3) May be repeated. Maximum 12 hrs.

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

598 Graduate Reading in Mathematics (1-3) Independent study with faculty guidance. Prereq: Graduate standing and consent of instructor. May be repeated. Maximum 6 hrs.

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


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

523-24 Advanced Probability (3,3) Selected topics in modern theory of probability and stochastic processes. It's calculus and stochastic differential equations. Integration theory, ergodic theory, probability on algebraic structures, limit theorems, geometry and probability in Banach spaces, probability methods in analysis. Prereq: 523-24 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

529 Seminar in Combinatorics (1-3) May be repeated with consent of department. Maximum 12 hrs.

631-32 Advanced Ordinary Differential Equations (3,3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature. Subject matter varies according to interests and preparations of students. Prereq: 531-32 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

635-36 Advanced Partial Differential Equations (3,3) Selected topics in classical and modern theoretical partial differential equations. Prereq: 541-42 or 547-48 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


643-44 Harmonic Analysis (3,3) Fourier series and transforms on Euclidean spaces or topological groups: convergence, summability, uniqueness, inversion, duality. Fourier transform, Hilbert transform, Hardy-Littlewood maximal function, interpolatory operators, and Fefferman-Stein duality. Prereq: 541-42 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

649 Seminar in Analysis (1-3) May be repeated with consent of department. Maximum 12 hrs.

651-52 Advanced Modern Algebra (3,3) Selected topics in modern algebra or number theory. Prereq: 551-52 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

659 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


663-64 Algebraic Topology (3,3) Homology, cohomology, homotopy theories; duality theories and Novick-Ulam isomorphism theory. Prereq: 561-62 and 1 yr of abstract algebra, 455-56 or 551-52. May be repeated with consent of department. Maximum 12 hrs.


669 Seminar in Topology (3) May be repeated with consent of department. Maximum 12 hrs.


679 Seminar in Numerical Mathematics (1-3) May be repeated with consent of department. Maximum 12 hrs.

681-82 Advanced Mathematical Ecology (3,3) Selected topics in theoretical and applied mathematical ecology: population, community, ecosystem ecology and applied topics such as demography, epidemiology, environment change, and resource management. Prereq: 581-82. May be repeated.

Mechanical and Aerospace Engineering

(Phase of Engineering)

MAJORS

Aerospace Engineering...............................M.S., Ph.D.
Mechanical Engineering...........................M.S., Ph.D.

A. J. Edmondson, Acting Head

Professors:

Arimilli, R. V., Ph.D................................VPI
Bailey, Joel F. (Emeritus), PE, Ph.D..............Lehigh
Braun, G. W. (Emeritus) (UTSI), Ph.D.........Göttingen
Collins, Frank G. (UTSI), PE, Ph.D.............University of California
Crawford, R. A. (UTSI), Ph.D................Tennessee
Edmondson, A. J., PE, Ph.D......................Texas A&M
Flandro, Gary A. (Boling Chair in Space
Propulsion) (UTSI), Ph.D....................Caltech
Holland, R. W. (Emeritus), PE......................Georgia Tech
Holland, R. W. (Emeritus), PE......................Georgia Tech
Johnson, W. S., PE, Ph.D.........................Clemson
Kane, R. J., Ph.D.................................Oklahoma
Liston, Hardy, Jr. (Emeritus), Ph.D..........George Washington
Lo, C. F. (UTSI), Ph.D.........................Cornell

Mechanical and Aerospace Engineering

College of Engineering

MEASURING THE MECHANICAL AND AEROSPACE ENGINERING DEGREE

Aerospace Engineering...............................M.S., Ph.D.
Mechanical Engineering...........................M.S., Ph.D.

A. J. Edmondson, Acting Head

Professors:

Arimilli, R. V., Ph.D................................VPI
Bailey, Joel F. (Emeritus), PE, Ph.D..............Lehigh
Braun, G. W. (Emeritus) (UTSI), Ph.D.........Göttingen
Collins, Frank G. (UTSI), PE, Ph.D.............University of California
Crawford, R. A. (UTSI), Ph.D................Tennessee
Edmondson, A. J., PE, Ph.D......................Texas A&M
Flandro, Gary A. (Boling Chair in Space
Propulsion) (UTSI), Ph.D....................Caltech
Holland, R. W. (Emeritus), PE......................Georgia Tech
Holland, R. W. (Emeritus), PE......................Georgia Tech
Johnson, W. S., PE, Ph.D.........................Clemson
Kane, R. J., Ph.D.................................Oklahoma
Liston, Hardy, Jr. (Emeritus), Ph.D..........George Washington
Lo, C. F. (UTSI), Ph.D.........................Cornell
coursework that includes at least 12 semester hours of graduate (500 level or above) courses, with at least 12 of these semester hours in the major. A minimum of 9 semester hours of courses is required at the 600 level. These are exclusive of thesis, problems, or dissertation credit. The students' advisory committees may approve a student's petition to replace one or more 500-level courses with 600-level course(s) that are more appropriate.

Course Option
This option is restricted to those students who have had the equivalent of a thesis experience or, at the time of completion of the degree requirements, have had at least three years of full-time engineering experience since receiving the Bachelor of Science degree. 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 18 semester hours of coursework that includes at least 12 semester hours of graduate (500 level or above) courses in the department with at least 12 semester hours in the major and normally 6 semester hours numbered 500 or above.
2. A minimum of 24 semester hours in the major.
3. Participation in the departmental seminar program.
4. Passing a comprehensive written and oral 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 the department with at least 6 semester hours in the major 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. A minimum of 6 semester hours in 690 Selected Engineering Problems. A written report must be presented for each problem investigated.
3. Participation in the departmental seminar program.
4. Passing a comprehensive written and oral 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.

1. Twenty-four semester hours in doctoral dissertation
2. A minimum of 12 semester hours of graden credit in mathematics in courses numbered 400 or above with a minimum of 6 semester hours numbered 500 or above.
3. A minimum of 24 semester hours in the department in courses numbered 500 or above with at least 12 of these semester hours in the major. A minimum of 9 semester hours of courses is required at the 600 level. These are exclusive of thesis, problems, or dissertation credit. The students' advisory committees may approve a student's petition to replace one or more 500-level course(s) that are more appropriate.
4. Participation in the departmental seminar program.
5. The passing of a written and oral comprehensive examination is required as well as a successful defense of the dissertation.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Aerospace Engineering is available to residents of the states of Kentucky, South Carolina. The M.S. in Aerospace Engineering is available to residents of Kentucky or South Carolina. Additional information may be obtained from the Admissions Specialist 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

NOTE: Not all the courses listed below are available at both the UT Knoxville and the UT I.S. campuses.

GRADUATE COURSES
422 Environmental Noise (3) Basic principles of acoustics: measurements and control of noise in industrial and community environments. Prereq: Senior standing in engineering or consent of instructor.
Aerospace Engineering

NOTE: Not all the courses listed below are available at both the UT Knoxville and the UTSI campuses.

GRADUATE COURSES

422 Aerodynamics (3) Theory and design of aero-dynamic 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: 422 or Heat Transfer or consent of instructor. Sp.


425 Propulsion (3) Principles of propulsion devices; turbojet, ram jet and rocket engines. Prereq: 351, F.

426 Introduction to Aerospace Design (2) Design process; synthesis, safety, reliability, patents, product liability, economic analysis, optimization, design standards, design studies. Individual design report. Prereq: 351, 370, 363. Coreq: Mechanical Engineering 344. F.


449 Aerospace Engineering Laboratory (3) Designing, conducting, and reporting results of experimental exercises. Test standards and specifications. Analysis of data and formation of conclusions. Prereq: 343, 351, 3 labs. F.

494-95 Selected Topics in Aerospace Science (1-4, 1-4) Current problems and topics in aerospace science. Prereq: Consent of instructor.

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

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

511 Inviscid Flow (3) Kinematics and dynamics of inviscid fluid potential flow about body, conformal mapping. Prereq: 422 or Mechanical Engineering 531, Mathematics 425 or equivalent.

512 Viscous Flow (3) Equations of viscous fluid flow; laminar and turbulent flow, transition, separation; boundary layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 531 or equivalent.

513 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments, representative experiments, hot wire anemometry and turbulence measurements, flow visualization, wind tunnel tests, water table experiments, superflow experiments, boundary layers, laser Doppler measurements. Prereq: 423 or Mechanical Engineering 531.

515-16 Air Vehicle Aerodynamics and Performance (3, 3) Application of aerodynamics principles to air vehicles; provide estimates of performance, stability, and control characteristics for subsonic to supersonic speed. Stability of airplane, rocket, and lift apparatus; propulsion systems, vehicle performance characteristics, and trajectory optimization. Prereq: 422; 515 for 516.

522-24 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, similar medium; Newtonian theory; blunt body flow; viscous interactions; freemolecule and rarefied gas flow. Prereq: 512.

527-28 Aerospace Ground Test Facilities (3, 3) Atmospheric models and similarity considerations; aerodynamic testing in hypersonic and interplanetary continua and wind tunnels; and ballistic ranges; propulsion test facilities or air breathing and rocket engines; space environment and space vehicle test facilities. Prereq: 512 and 521, Mechanical Engineering 513 and 522.

529 Rarefied Gasdynamics (3) Binary elastic collisions; kinetic theory; flow regimes; Boltzmann and model equations, transfer equation, gas-surface interactions; slip boundary conditions, free molecule, slip and transition flow; Monte Carlo simulation; experimental techniques; introduction to hypersonic real gas flows. Prereq: 522, Mechanical Engineering 522.

531 Magnetohydrodynamics (3) Electromagnetic field theory, chemical kinetics, thermodynamic and thermal 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, energy spectra, diffusion; application of turbulent jets and pipe flow. Prereq: 511-12.

533 Atmospheric Entry (3) Reentry trajectories; lift and drag during reentry; vehicle motion and stability during reentry, aerodynamic heating and heat protection systems. Prereq: 522, Recommended prereq: 512.

544 Transonic Flow (3) Nature of flow at transonic speeds; small disturbance theory; shock wave properties; shock-free flows; strong viscous interaction phenomena; solution techniques. Prereq: 522.

551 Aerospace Mechanics (3) Principles of mechanics applicable to aerospace vehicles; equations of motion, multibody problems and trajectory analysis. Prereq: Mathematics 471.

554-55 Aerospace Vehicle Stability and Control (3, 3) Static and dynamic longitudinal and lateral stability and control of coupled modes. Motion with free and fixed lift control surfaces. Automatic control systems. Prereq: 423, 551.

556 Vertical or Short Take Off and Landing Aircraft (3) Performance, stability, control of rotary wing, tilt wing, vectored lift and jet vertical rise type aircraft. Vertical and transition flight modes. High lift airplanes. Automatic control systems. Simulation facility type and flight testing. Prereq: 555.


558 Aeroelasticity (3) Dynamics of elastic structures unsteady motion with self-excited instability. Deriva-
tion of aeroelastic operators, forced response, static and dynamic Eigenvalues of simplified structures. Applica-
tions to typical systems. Prereq: 557.

561 Fundamentals of Aeroacoustics (3) Generation, propagation and absorption of sound in static and mov-
ing media. Prereq: Consent of instructor.

564 Spacecraft Attitude Dynamics and Control (3) Rotational attitude dynamics of space vehicles. Gyro-
scopic instruments; passive and active attitude control devices. Linear control theory and attitude stabilization. Prereq: 551, Mathematics 471.

574 Space Engineering: Satellite Technology (3) Satellites and orbits (rocket, launch vehicles and launch-
ing), spacecraft structure, power systems, attitude control systems, telemetry, tracking, command, and commu-
nication systems, spacecraft testing, reliability, and applica-
tion of satellites (communication, weather, Earth observa-

588 Measurement Science I (3) (Same as Nuclear Engineering 588, Aviation Systems 588, Chemical Engineering 588, Civil Engineering 588, Engineering Science and Mechanics 588, and Mechanical Engineering 588.)

590 Selected Engineering Problems (2-4) Enrichment limits of students in programs Prereq: Consent of advisor.

595 Seminar (1) All phases of aerospace engineering, reports on current research at UT. May be repeated. S/ NC only.

599 Special Topics in Aerospace Engineering (1-3) May be repeated. Maximum 6 hrs.

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

631 Magnetohydrodynamics I (3) Electromagnetic field equations, motions of single charged particle, physical description of plasma, Boltzmann equation, conduction and diffusion in ionized gases, continuum magnetohydro-
dynamics equations. Prereq or coreq: 512. Prereq: Mathematics 561 or equivalent.

632 Magnetohydrodynamics II (3) Alfven and shock waves, exact solution for magnetohydrodynamic channel flow, one-dimensional model of channel flow, engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 531 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-equilib-
rional vibrational and chemical flow, non-equilibrium ki-
etic theory, flow with transversal non-equilibrium. Prereq: 522, Mechanical Engineering 522.

645 Theory of Turbulence (3) (Same as Engineering Science and Mechanics 645.)

651-52 Advanced Aerodynamics (3, 3) Subsonic, tran-
sonic, supersonic, and hypersonic flows treated in gen-
eralized and unified manner with viscous/ inviscid effects. Relations among various regimes of fluid flows. Fundamental assumptions, limitations of approximations and consequences. Foundations of gas dynamics, applications to airplane, rocket, ground test-
ing and jet propulsion. Discussion of special topics according to interest of students. Prereq: 511, 522.

681 Advanced Viscous Flow Theory (3) Critical review of significance to governing equations. Nature of bound-
ary layer approximation as singular perturbation prob-

690 Advanced Topics in Aerospace Engineering (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
Medical Biology

(Graduate School of Medicine-Medical Center Knoxville)

Carmen B. Lozio, Acting Chair

Professors:
Carroll, R., Ph.D. .......... Cornell
Chen, J. P., Ph.D. .......... Penn State
Condgon, C. C. (Emeritus), M.D. .......... Michigan
Farkas, W., Ph.D. .......... Duke
Fuhr, J. E., Ph.D. .......... St. John's
Ichiki, A. T., Ph.D. .......... UCLA
Lange, R. D. (Emeritus), M.D. .......... Washington (St. Louis)
Lozio, Carmen B., M.D. .......... Buenos Aires
McDonald, T. R., Ph.D. .......... Tennessee
Wigler, P. W., Ph.D. .......... California
Wust, Carl J., Ph.D. .......... Indiana

Associate Professors:
Hanna, W. T., M.D. .......... Ain-Shams
Matson, K., Ph.D. .......... Wisconsin
Schroeder, E. C., D.V.M. .......... Michigan State
Wimalasena, J., Ph.D. .......... Colorado

Assistant Professors:
Karlstad, M. D., Ph.D. .......... Loyola
Potter, N. T., Ph.D. .......... Duke
Switzer, R. C. III, Ph.D. .......... Michigan State
Tyler, J., Ph.D. .......... SUNY Buffalo

The Department of Medical Biology at the University of Tennessee Graduate School of Medicine 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 a broad research education and service interests in cancer, blood diseases, metabolism, toxicology, neuroscience, birth defects, cytogenetics, and clinical genetics. Courses in these areas are offered to students at the graduate and undergraduate levels. Elective courses are also available to students in the College of Medicine.

The faculty with the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. in Comparative and Experimental Medicine. Other advanced degree students can do thesis research in the department by arrangement. Pre-requisite division and concept courses and written communication of the results of research to the scientific community, and to train effective teachers. Students may enter the program after receiving a B.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


541 Molecular Basis for Metabolic Disease (4) Disease at molecular level. Changes in molecular events in cells that lead to disease and occur as result of disease. Correlation with clinical and pathological states. Prereq: Biochemistry 410-419 or equivalent. F,Sp

543 Metabolism of Drugs (1) Drug mechanisms of action: membrane transport, enzyme reactions, ionization, stereoisomerism, and metabolic pathways. For students interested in biochemical pharmacology. Prereq: Biochemistry 310. Sp

545 Clinical Genetics (3) Human genetic diseases: new developments in cytogenetics, molecular genetics, clinical diagnosis and prevention. Prereq: Biology and genetics background or consent of instructor.

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

610 Medical Biology Seminar (1) Invited speakers. Topics posted in advance. May be repeated. S/N only. F,Sp

611 Advanced Topics in Medical Biology (1-3) New developments in biomedical research applicable to clinical medicine. Primarily for doctoral candidates in Comparative and Experimental Medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

652 Special Topics in Pathology (1-3) Pathologic anatomy, biochemical pathology, and related areas. Primarily for doctoral candidates in Comparative and Experimental Medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

Microbiology

The Department of Microbiology offers both the M.S. and Ph.D. Students have the option of selecting from a variety of research programs. For a departmental brochure, contact the department head.

ADMISSION REQUIREMENTS

Students are expected to have completed an undergraduate program with a 3.0 or better GPA on a 4.0 system. Included in the undergraduate course credits should be (1) a full year of general biological science, (2) one year of calculus, (3) two years of chemistry, including one year of organic, (4) one year of physics, and (5) an introductory course in microbiology. In some cases, deficiencies in requirements may be removed by taking appropriate courses during the first year of graduate study. The department also requires the general portion of the Graduate Record Examination. A satisfactory score on each part is 550 or higher with rare exceptions. Three letters of recommendation should be submitted by current or former faculty members. Each new graduate student meets with an advisory committee chaired by the departmental Director of Graduate Studies to plan a program of study for the first one or two semesters until a research advisor is selected. All first-year students participate in a laboratory rotation program during the first semester of study. This program allows the student to adjust smoothly to the research programs of the department, to develop a background of research procedures and concepts, and to facilitate the selection of a research professor. Usually the student selects a research professor toward the end of the laboratory rotation period. The major professor assists in the selection of and carrying out of a suitable research program and in the naming of a thesis or dissertation committee.

THE MASTER'S PROGRAM

The program leading to the M.S. is designed to provide the student with broad basic knowledge, to permit the acquisition of technical competence in the fundamentals of research, and to encourage creative and independent thinking. Two to three calendar years are usually needed for the course of study that has the following requirements: (1) 30 hours including 6 thesis credits; (2) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F system; (3) a 3.0 GPA in courses taken in the department; (4) a complete course sequence in biochemistry or molecular biology; (5) presentation of a research thesis and its oral defense.

THE DOCTORAL PROGRAM

The program leading to the Ph.D. is designed to develop the student's ability to pursue independent and original research in microbiology and allied fields, to teach both oral and written communication of the results of research to the scientific community, and to train effective teachers. Students may enter the program after receiving a Bachelor's or Master's degree. Students who enter with a Bachelor's degree usually receive the Ph.D. after four or five years; those with the Master's degree usually take three or four years to
complete the degree. Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one semester as a teaching assistant; (4) one semester of physical chemistry; (5) one course in statistics; (5) two semesters of biochemistry or molecular biology; (7) satisfactory performance in a comprehensive examination that must be passed before admission to candidacy; and (8) the presentation of a research dissertation and its oral defense.

**GRADUATE COURSES**

**410 Bacterial Physiology (3)** Modern concepts of structure and function of bacterial cell. Prereq: Introduction to Microbiology. F

**411 Bacterial Genetics (3)** Transmission and expression of genetic information by bacteria. Prereq: Introduction to Microbiology. Sp

**420 Medical Microbiology (3)** Disease-producing microorganisms, isolating bacteria, hibernating mycoplasma, and fungi. Prereq: Introduction to Microbiology. Sp

**429 Medical Microbiology Laboratory (2)** Laboratory exercises designed to accompany 420. Prereq: Introduction to Microbiology. Laboratory. Coreq: 420. Sp

**430 Immunology (3)** Principles of inflammation and immunity, immunoglobulin structure and theories of formation and action, hypersensitivity, cell cooperation and recognition in immune mechanisms; soluble factors. Prereq: Biology 220. (Same as Zoology 430). F

**439 Immunology Laboratory (2)** Laboratory exercises designed to accompany 430. Coreq: 430. (Same as Zoology 430). F


**449 Virology Laboratory (1)** Laboratory procedures for isolation, handling, and culturing of animal viruses. Prereq: 310. Coreq: 440. Sp

**470 Microbial Ecology (3)** Physiological diversity and taxonomy of microorganisms from natural environments. Functional role of microorganisms in natural and simulated ecosystems. Prereq: 310. F

**500 Thesis (1-5) P/NP only.**

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

**510 Microbial Physiology (3)** Topics in microbial physiology and metabolism. Prereq: 410. Biochemistry 410, or consent of instructor. May be repeated. Maximum 12 hours.

**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 hours.

**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 hours.

**540 Molecular Virology (3)** Topics in replication, assembly, and expression of viruses. Prereq: 440 or consent of instructor. May be repeated. Maximum 12 hours.

**550 Microbial and Molecular Genetics (3)** Topics in transmission and expression of genetic information at the molecular level. Prereq: 411. Biochemistry 410, or consent of instructor. May be repeated. Maximum 12 hours.

**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, Environmental Engineering 575, and Agricultural Engineering 575.)

**591 Foreign Study (1-15)** See College of Liberal Arts.

**592 Off-Campus Study (1-15)** See College of Liberal Arts.

**593 Independent Study (1-15)** See College of Liberal Arts.

**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.

**595 Seminar (1)** Lectures and seminars by invited speakers on advanced subjects. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs. S/NC only. E

**596 Laboratory Rotation (1)** Familiarization with research areas in department through series of rotations in laboratories of individual faculty members. May be repeated. Maximum 3 hrs. S/NC only.

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

**601 Journal Club in Microbial Physiology (1)** Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

**602 Journal Club in Microbial Pathogenesis (1)** Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

**603 Journal Club in Immunology (1)** Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

**604 Journal Club in Virology (1)** Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

**605 Current Topics in Biological Membrane Research (1)** (Same as Biochemistry 606.)

**610 Advanced Topics in Microbial Physiology (3)** Prereq: 510 or consent of instructor. May be repeated. Maximum 12 hours.

**620 Advanced Topics in Microbial Pathogenesis (3)** Prereq: 520, 530 or consent of instructor. May be repeated. Maximum 12 hours.

**630 Advanced Topics in Immunology (3)** Prereq: 530 or consent of instructor. May be repeated. Maximum 12 hours.

**640 Advanced Topics in Virology (3)** Prereq: 440, 440, or consent of instructor. Maximum 12 hours.

**650 Advanced Topics in Microbial and Molecular Genetics (3)** Prereq: 550 or consent of instructor. May be repeated. Maximum 12 hours.

**670 Advanced Topics in Environmental Microbiology (3)** Prereq: 570 or consent of instructor. May be repeated. Maximum 12 hours.

**Microbiology-Veterinary Medicine**

See Veterinary Medicine for program description.

**Music**

(College of Liberal Arts)

**MAJOR DEGREES**

Music ................................................. M.M.

Kenneth A. Keeling, Sr., Head

Professors:

- Ball, Charles H., Ph.D.          Peabody
- Bitzas, George C., M.M.         Converse
- Brock, John P., (Liaison), M.M.  Alabama
- Carter, W. J. (Emeritus), D.M.A. Eastman
- Coker, J., M.A.                 Sam Houston
- Combs, F. M., M.A.             Missouri
- DeVine, George F. (Emeritus).  Diploma
- Dorn, W. (Emeritus), M.A.      Columbia
- Fred, Herbert W. (Emeritus).    North Carolina
- Holford, A. G. (Emeritus), M.M. Northwestern
- Huber, Calvin R., Ph.D.        North Carolina
- Julian, W. J (Emeritus), Ph.D.  Northwestern
- Lennon, J. A., D.M.A.          Michigan
- Keeling, Kenneth A., Sr., D.M.A. Catholic
- McCieland, D. K., M.A.         Columbia
- Meacham, John J., M.M.        Northwestern
- Moore, M. C., Ph.D.            Michigan
- Northington, D. B., D.M.A.     Yale
- Pederson, D. M., Ph.D.        Iowa
- Starr, W. J. (Emeritus), M.M.  Eastman
- Stutzenberger, D. R., D.M.A.  Maryland
- Tipps, A. W., Ph.D.           Michigan
- VanVactor, D. (Emeritus), M.M.  Northwestern

Associate Professors:

- Adams, Fay, M.M.            Tennessee
- Boling, M. E., M.M.       Tennessee
- Bonmeeh, W. (Emeritus), M.M. Tulsa
- Carter, P. S., M.M.         Colorado
- Hendrysky, P. M., M.M.    Manhattan
- Hough, Don, M.M.            Tennessee
- Hough, Dolly C., M.M.     Tennessee
- Jacobs, K. A., D.M.A.      Texas
- Johnson, A. E., D.M.A.     Stanford
- Leach, C. F., M.M.        New Mexico
- MacMorran, W. S., M. M.     Wisconsin
- McDaniell, Walter H. (Emeritus), M.S.  Indiana
- Michailos, L. W., M.A.    Tennessee
- Mintz, J. O., Ed.D.        Columbia
- Root, Patricia, M.A.     Washington State
- Scarlett, William P., M. M. Louisiana State
- Searle, S. M., M.M.        Tennessee
- Sparks, J. R., M.S.       Tennessee
- Sperl, G. R., M.M.        Indiana
- Young, S. E., Ph.D.       North Carolina

Assistant Professors:

- Brown, Donald R.          Yale
- Dubberly, T. S., D.M.A.    Peabody
- Hawthorne, W., Ph.D.     Cincinnati

The Department of Music offers the Master of Music degree with concentrations in accompanying, choral conducting, composition, instrumental conducting, jazz, music education, musicology, performance (organ, piano, strings, voice, winds, and percussion), piano pedagogy and literature, sacred music, string pedagogy, and theory.

Applicants must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by UT Knoxville, appropriate to the applicant’s prospective area of concentration on the Master’s level.

Applicants who plan to pursue the concentration in performance or music education are required to audition before the appropriate area faculty committee. Applicants for admission to
the program in composition must submit scores and tape recordings of representative works. Applicants for the concentration in jazz must audition in jazz improvisation and jazz piano proficiency and interview with members of the faculty in this area. Other applicants are required to have an interview with members of the faculty of the prospective area of concentration.

All applicants are required to take the Diagnostic Examinations in music theory, ear-training, and music history/literature. These examinations are given by the Department of Music at the beginning of each semester.

THE MASTER'S 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.

The graduate recital is given in lieu of thesis by 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, musicology, and theory.

All concentrations require a written and oral final examination.

Concentration in Music Education

The concentration in music education is designed for persons who hold a Bachelor's degree in Music or Music Education and certification to teach music in the public schools. Students seeking initial certification should consult the requirements for the Master of Science degree in the College of Education.

The program requires 510 and 520; 9 hours of music education electives at the 500 level; 6 hours of Thesis 500; 6 hours of 500-level courses in music history or theory; 2 hours of applied music at either the 400 or 500 level; 2 hours of music ensemble at the 500 level; and 3 hours of electives at the 500 level.

A three credit research problem and three extra hours coursework in Music Education may be substituted for Thesis. If a larger thesis problem is desired, the thesis credit may be increased to 9 hours, and 3 hours of Music Education electives may be dropped.

Diagnostic tests in theory, ear training, and music history will be required.

Music Education

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.

550 Curriculum 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.

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

590 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 year of music theory or consent of instructor.

580 Seminar in Music Education (3) Participation in the consideration of pertinent topics and issues in music education. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

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

Music General

GRADUATE COURSES

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

501 Graduate Recital (2)

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

511 Lecture Recital (2)

521 Special Topics in Performance (1-3) Prereq: Consent of department head.

540 Secondary Applied Music (1) May be taken by music majors desiring applied study on a 2nd or 3rd instrument. May be repeated for a maximum of 6 hours credit on each instrument. Admission by audition. Requires payment of Applied Music fee.

561 Church Music Performance Project (1-2) May be repeated. Maximum 3 hrs.

Music History

GRADUATE COURSES

410 Music History Genre (3) Topics vary. May be repeated. Maximum 6 hrs.

420 History of Opera (3) Dramatic, vocal, and orchestral elements in opera of Italian, French, and German schools, 1600-present.

430 Symphony 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 of perception and emotions, music, and role of artist in society. Aesthetic viewpoints of individuals and historical eras through selected writings.

480 Music in Christian Worship (3) Hymnody, liturgies, and liturgical music.

490 Church Music Methods and Administration (3)

510 Music Bibliography (2) Bibliographic methodology in music.

520 Research (1) Principles of research methodology applied to writing of research proposal and project.

530 Music in the Middle Ages (3) Gregorian and medieval chant, secular monophony, and rise of polyphony.

540 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chansons, madrigal, and other vocal and instrumental forms and genres.

550 Music in the Baroque Period (3) From c.1600 to 1750: rise of opera and oratorio, sacred and secular cantatas, instrumental forms, performance practice.

560 Music in the Classic Period (3) Evolution of classical style from pre-classic music to music of Haydn, Mozart, and early Beethoven.

570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romanticists.

580 Music in the Twentieth Century (3) From 1890, Debussy, to present, Stockhausen and others.

590 World Music (3) Attitudes and techniques of ethnomusicology. Survey of world music cultures. Interview and transcription project.

593 Independent Study (1-15) See College of Liberal Arts. Prereq: Consent of department head.
Music Instrumental

GRADUATE COURSES

490 Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to conductor's art; musical analysis and practice in conducting. Prereq: Music Education 320 or equivalent.

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 6 hrs.

580 Band Literature (3) Band literature and origins of band; 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 band music. S/NC only.

584 Practicum for Instrumental Conductors (1) Intern experience in field other than area of major interest. S/NC only.

595 Instrumental Conducting Seminar (3) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to individual problems. Prereq: 490 or equivalent.

Music Jazz

GRADUATE COURSES

410 Advanced Improvisation (3) Further development of individual skills and solving individual problems in jazz improvisation. Prereq: 210 and 220.

420 Jazz Pedagogy (1) Methods and materials relating to teaching of jazz, designing and administering jazz programs, and 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

420-30 Piano Literature I-II (3,3) 420--From 1750 to middle 19th century; 430--Middle 19th century to present.

460-70 The Organ and Its Literature I-II (3,3) Development of organ and organ literature from Middle Ages to present; problems of style and interpretation; pedagogical literature and methods; organ design. Prereq or coreq: Music History 220 and consent of instructor.

485-85 Suzuki Piano Method I-II (2,2) Psychology, procedures, and literature of Suzuki piano method. Must be taken in sequence. Prereq: Consent of instructor.

520 Piano Literature Seminar (3) 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) 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 Performance

GRADUATE COURSES

All performance courses require an audition and consent of instructor. May be repeated. Maximum 8 hrs toward M.M. degree.

403 Flute (1-4)

405 Oboe (1-4)

410 Bassoon (1-4)

415 Clarinet (1-4)

420 Saxophone (1-4)

423 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)

495 Composition with Electronic Media (1-3)

496 Composition (1-3)

505 Oboe (1-4)

510 Vocal Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

520 Music Theatre Performance Techniques (1) Improvisation, movement, and basic techniques for dramatic vocal performance. Prereq: Vocal major or consent of instructor. May be repeated for credit. Maximum 2 hours.

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) Study of vocal production, examination of different methods. 550--Study of teaching materials, observation of studio teaching, analysis of voice problems in selected students, and supervised teaching.

570 Vocal Chamber Music Performance (2) Prereq: Consent of instructor.

580-85 Choral Literature I-II (2,2) Choral music from middle ages to present with consideration of historical development of major choral genres.

590 Advanced Choral Conducting (3) Expansions and continued refinement of conducting techniques; development of choral rehearsal skills. Prereq: Consent of instructor.

594 Project in Choral Conducting Performance (1-3) Public performance, critical document; recording project. Prereq: Consent of instructor. May be repeated.

595 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Music Theory

GRADUATE COURSES

410 Ear Training Review (1) Review and application of harmonic and melodic dictation skills for graduate and advanced undergraduate students. Prereq: Advanced Ear Training. Required of entering graduate students with deficiency in ear training.

430-40 Counterpoint I-II (3,3) Study of species counterpoint in modal and tonal styles, works of Palestrina and J. S. Bach. Prereq: 220. 440--Writing of contrapuntal forms of 16th century and fugal; analysis of works from 18th through 20th centuries. Prereq: 430.

450 Choral Arranging (2) Analysis of scores and writing of arrangements for choirs. Prereq: Theory IV or consent of instructor.

510 Musical Styles (3) Elements of design and their role in definition of musical styles. Prereq: Consent of instructor.

520 Analytical Techniques (3) Analytical techniques, contemporary approaches. Tonal and nontonal music. Prereq: Consent of instructor.

530 Music Theory Pedagogy (3) Techniques, methods, and materials involved in college-level theory programs. Prereq: Consent of instructor.

540 Computer Projects (1-3) Programming languages, design and implementation of projects in computer-managed instruction. Prereq: Consent of instructor.

593 Independent Study (1-15) See College of Liberal Arts. Prereq: Consent of department head.
Nuclear Engineering
(College of Engineering)

MAJOR DEGREES
Nuclear Engineering M.S., Ph.D.

Thomas W. Kerlin, Head

Professors:
Dodd, H. L., PE, Ph.D. Tennessee
Kerlin, T. W. (Liaison), Ph.D. Tennessee
Mihalczo, J. T., Ph.D. Tennessee
Miller, L. F., PE, Ph.D. Texas A&M
Perez, R. B., Ph.D. Madrid
Stevens, P. N., PE, Ph.D. Northwestern
Uhrig, R. E. (Distinguished Prof.), PE, Ph.D. Iowa
Upadhyaya, B. R., Ph.D. California

Associate Professors:
Groer, P. G., Ph.D. Vienna
Katz, E. M., PE, Ph.D. Tennessee
Scott, T. H., PE, Ph.D. Florida

Assistant Professor:
Ruggles, A. E., Ph.D. Rensselaer

The Department of Nuclear Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees. Students may elect a traditional nuclear engineering M.S. or Ph.D. program (focusing on fission energy or fusion energy) or a radiation protection engineering concentration at the Master's level.

The radiation protection engineering concentration prepares students for careers in the radiation safety field (health physics). The program is designed for graduates of undergraduate programs in engineering, physics, biology, and chemistry.

All entering students must have, as a minimum, competency in mathematics through ordinary differential equations, competency in atomic and nuclear physics, and competency consistent with a course in introductory nuclear engineering. If these competencies do not exist, the student must take appropriate courses not for graduate credit.

THE MASTER'S PROGRAM
A graduate program leading to the Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program.

The student must complete 24 semester hours of coursework approved by the student's advisory committee that includes the following:
1. A major consisting of a minimum of 12 semester hours of graduate courses in nuclear engineering. This must include at least one of the following sequences: 511, 512; 551, 552; 571, 572.
2. A minor of 6 semester hours of elective courses in mathematics, statistics, or computer science.
3. Six semester hours in either nuclear engineering or a related field.

The M.S. candidate must also demonstrate research or design capability. This requirement may be satisfied by a thesis project or engineering practice projects as described below:

Thesis - The student performs independent research on topics approved by the committee. He/she submits a thesis on this research. The student will then pass an oral examination on the thesis and all graduate coursework. The student must enroll for six semester hours of NE 500 (Thesis).

Engineering Practice - The student performs independent research on two to four separate topics approved by his/her graduate committee. Each project is similar to a thesis project but smaller in scope. He/she submits a report, in thesis format, on each project. The student must then pass an oral examination on his/her engineering practice projects and all graduate coursework. The student must enroll for six semester hours of NE 506 (Nuclear Engineering Practice).

THE DOCTORAL PROGRAM
Students in the field of nuclear engineering desiring to study for the Doctor of Philosophy must have a Bachelor of Science or Master of Science from a recognized university, with a major in engineering or physics. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, physics, and nuclear engineering.

Specific course requirements for the Ph.D. in Nuclear Engineering include:
1. A minimum of 40 semester hours beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 24 semester hours in doctoral research.
3. A minimum of 30 semester hours in nuclear engineering courses numbered 500 and above (or the equivalent) with at least 9 semester hours of 600-level courses. These are exclusive of thesis or dissertation credit.
4. A minimum of 12 semester hours in mathematics, computer science, or statistics courses beyond nuclear engineering undergraduate requirements numbered 400 or above.
5. A minimum of 6 semester hours in courses numbered 500 or above from a department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.
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 after completing approximately 30 semester hours of coursework. A student who fails the written part of the examination must take and pass the examination the next time it is offered to remain in the Ph.D. program. Registration for NE 600 is not permitted until the written examination is passed. The comprehensive examination is completed with a successful oral defense of the dissertation proposal.

A candidate must successfully defend, in an oral examination, all work presented for the degree--all coursework and the dissertation.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Nuclear Engineering is available to residents of the states of Alabama, Kentucky, Mississippi, or South Carolina. The M.S. program is available to residents of the states of South Carolina or Virginia (concentration in radiation protection only). Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES
400-level courses in nuclear engineering may be used for graduate credit. However, students must recognize that at least two-thirds of the minimum required hours (30) in a Master's degree program must be taken in courses numbered 500 or above.

GRADUATE COURSES

403 Nuclear Engineering Laboratory (3) Cross-sectional measurement, diffusion properties of neutrons, criticality-related calculations, control rod calibration, statistics, weight, shielding, xenon poisoning, and the control of experiments. Prerequisite: Nuclear Engineering Laboratory or equivalent. Coreq: 471, 472.

404 Nuclear Fuel Management (3) Variety of topics related to nuclear fuel cycle. Mining and milling, fuel fabrication, core fuel management, reprocessing, and waste disposal. Economic and regulatory issues. Prerequisite: 470.

405 Nuclear System Dynamics and Control (3) Methods for system modeling and simulation, Laplace transforms, frequency response, stability analysis, numerical methods, nuclear plant modeling and simulation, nuclear plant control. Prerequisite: 470.

406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma-ray and neutron attenuation, biological effects, approximate methods of shield design, discrete ordinates, and Monte Carlo. Prerequisite: 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. Prerequisite: Introduction to Nuclear Engineering.

463 Introduction to Fusion Energy I (3) (Same as Electrical and Computer Engineering 463.)

464 Introduction to Fusion Energy II (3) (Same as Electrical and Computer Engineering 464.)

470 Nuclear Reactor Theory I (3) Fundamentals of reactor physics relative to cross sections, kinematics of elastic scattering, reactor kinetics, systems, and nuclear data. Analytical and numerical methods applied to general criticality problems, eigenvalue searches, perturbation theory, and multigroup diffusion equations. Prerequisite: Introduction to Nuclear Engineering.

471 Nuclear Reactor Theory II (3) Thermal spectrum computational methods: heterogeneous effects in fast and thermal spectra; considerations in reactor core design; equations that relate thermal and neutron variables; power distribution calculations and reactivity control methods. Prerequisite: 470.

472 Special Topics in Nuclear Engineering (3) Problems related to recent developments and practice. Prerequisite: Senior standing and consent of instructor. May be repeated. Maximum 6 hrs.

500 Thesis (1-15) E only.
Nursing
(College of Nursing)

MAJOR
Nursing ........................................ M.S.N., Ph.D.

DEGREE

Nursing ........................................ M.S.N., Ph.D.

Major: Nursing

The College of Nursing offers the Master of Science in Nursing degree with concentrations in adult health nursing, parent-child nursing, mental health nursing, family nurse practitioner, and nursing administration.

Admission Requirements

1. Meet requirements for admission to The Graduate School.

2. Hold a Bachelor's degree in Nursing from a National League for Nursing accredited program or complete the equivalent of an upper division undergraduate major in nursing in addition to meeting all M.S.N. degree requirements.

3. Have an undergraduate GPA of 3.0 or higher or a GPA of 3.3 for courses in the undergraduate major.

4. Submit scores of the general portion of the Graduate Record Examination.

5. Submit Graduate Program Data Form.

6. Submit Graduate School Rating Forms from three individuals familiar with the applicant's current work performance or academic aptitude.

7. New students normally are admitted to the program only at the beginning of fall semester, however, under special circumstances and on a space available basis, a student may be admitted at the beginning of spring or summer terms in a temporary non-degree status. Applications for fall admission must be received by March 15.

Special Requirements

1. Each student must hold personal professional liability insurance.

2. Registered nurses must be licensed to practice nursing in Tennessee.

3. Each student must present proof of hepatitis B vaccination and rubella immunization or sufficient titer for immunity.
4. Each student must present evidence of current 2-person CPR certification.
5. Non-registered nurse students must have completed courses in chemistry, nutrition, microbiology, anatomy, and physiology plus 12 semester hours of behavioral science courses.

**Thesis and Non-Thesis Options**
The thesis option is available for interested students and is especially encouraged for those who are considering pursuit of doctoral degrees sometime in the future. Students who choose the non-thesis option must register for 580 Nursing Project or 582 Supervised Research.

**Program Requirements**
All students must complete a minimum of 36 semester hours distributed as follows:

**Core (12 credits)**
503-04 Holistic Nursing 6
510 Theoretical Foundations of Nursing 3
520 Nursing Resource Management 3

**Research (6-12 credits)**
--- Graduate level statistics course 3
501 Nursing Research: Methods, Design & Analysis 3
500 Thesis 6
OR
580 Nursing Project 3
582 Supervised Research 3

**Concentration (12 credits)—choose one**
650-31 Adult Health Nursing I,II 12
540-41 Family Nurse Practitioner I,II 12
550-51 Parent-Child Nursing I, II 12
560-61 Mental Health Nursing I,II 12
590-91 Nursing Administration I,II 12

**Elective (3 credits)—waived for those who choose thesis option**
Students who enter the program as non-RNs must complete the following undergraduate nursing courses in addition to meeting the requirements listed above:
301 Pharmacology 3
302 Introduction to Professional Nursing 5
304 Nursing Assessment and Health Promotion 4
311 Acute Care Nursing 10
313 Nursing Research 3
414 Community Mental Health Nursing 6
415 Family/Community Health Nursing 6

Registered nurses whose bachelor’s degrees are not in nursing must have complete courses in chemistry, nutrition, microbiology, anatomy, and physiology plus 12 hours of behavioral science courses. They must also complete 304, 305, 313, 315, and 403 and complete or successfully challenge the following:

301 Pharmacology 3
306 Health Deviation Concepts I 4
316 Health Deviation Concepts II 4
325 Nursing of Children and Adults 6
402 Family Health Nursing Theory 3
412 Psychosocial Long Term Nursing Theory 3

**Final Examination Requirements**
All students must successfully complete a final examination as required by The Graduate School. For thesis students, the examination will consist of an oral defense of the thesis as well as other written or oral questions designed to measure student mastery of the entire program of study. For non-thesis students, the written examination will cover the entire program of study and may, at the discretion of the student's committee, be followed by an oral examination.

**Special Policies**
1. If the clinical performance of any student for any course is found to be unsatisfactory, the student will receive a grade of "F" for the course.
2. If a student achieves a final grade of "D" or "F" for any required undergraduate or graduate nursing course, he or she will not be permitted to repeat the course and will be required to withdraw from the program.
3. If the clinical performance of any student is characterized by unethical, unprofessional or unsafe behavior, or behavior that places the client in jeopardy, the student will be required to withdraw from the program.

**THE DOCTORAL PROGRAM**
The College of Nursing offers a doctoral program leading to the Doctor of Philosophy degree with a major in Nursing. This is a unified program offered jointly with The University of Tennessee, Memphis College of Nursing. Students may complete all or part of the program at either site. The dissertation must be completed in its entirety at one site.

The doctoral program prepares nursing scholars capable of integrating research, theory, and practice into their roles as researchers, 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 knowledge and advances research 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. Some outstanding applicants who are prepared at the bachelor's level in nursing may be considered. In such cases, graduate level courses in nursing theory, concentration specialty, and/or research will be integrated into the formal program of doctoral degree requirements.
3. Have a minimum cumulative grade average of 3.0 on a 4.0 scale for previous college work.
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 and graduate nursing theory and research courses prior to enrollment in nursing doctoral level courses.

6. Have TOEFL scores of at least 550 if native language is not English.
7. Complete Graduate Program Data Form, College of Nursing.
8. Submit Graduate School Rating Forms from three college level instructors and/or nurses and administrators who have supervised applicant's professional work.
9. Submit a sample of scholarly writing (e.g., thesis, published paper).
10. Submit an essay describing personal and professional aspirations.
11. Submit Graduate Application for Admission, academic transcript(s), Graduate Record Examination scores, and, if required, TOEFL scores to the Graduate School. Submit three Graduate School Rating Forms, sample of scholarly writing, and Graduate Program Data Form with essay to the Director of the PhD program prior to March 15.
12. Schedule a personal interview with the College of Nursing Ph.D. Student Admissions Committee prior to March 15 of the year preceding Fall admission.

**Program Requirements**
The following courses are required for all students:
620 Directed Research 3
601-2 Theory Analysis & Construction I, II 6
505-6 Nursing Research Seminar 4
507 Qualitative Nursing Research 3
608 Quantitative Nursing Research 3
610 Nursing Science Seminar 2
611 Advanced Nursing Seminar 2
614 Nursing Preceptorship 3
--- Statistics 3
--- Electives 12
600 Dissertation 24
TOTAL 68

Possible cognate areas include, but are not limited to, anthropology, child and family studies, psychology, education, management, medical ethics, public health, social work, philosophy, and statistics.

**Doctoral Committee**
Early in the student's program, a nursing faculty advisor will be selected by the student in consultation with the program director. The advisor will chair the student's comprehensive examination committee which consists of the faculty teaching core courses and one representative from the cognate area. The student then selects the dissertation committee. Five faculty holding the rank of assistant professor or above comprise the committee, three of whom (including the chair) must be approved by the Graduate Council to direct doctoral dissertations. At least two members of the committee must be from an academic unit other than nursing.

**MINOR IN GERONTOLOGY**
Graduate students in the College of Nursing may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to Human Ecology for specific requirements.

**ACADEMIC COMMON MARKET**
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain
### Graduate Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>500</td>
<td>Thesis (1-15)</td>
<td>P/NP only. E</td>
</tr>
<tr>
<td>501</td>
<td>Holistic Nursing: Wellness (3)</td>
<td>Examination of philosophy of holistic nursing and new paradigms for nursing assessment, diagnosis, and intervention. Explorations of principles of holistic health education, and innovative strategies for achievement of wellness.</td>
</tr>
<tr>
<td>502</td>
<td>Registration for Use of Facilities (3-15)</td>
<td>Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time. Degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E.</td>
</tr>
<tr>
<td>503</td>
<td>Holistic Nursing: Illness (3)</td>
<td>Exploration, analysis, and application of principles of holistic nursing to clinical practice. Roles of health habits, psychosocial factors, and lifestyle.</td>
</tr>
<tr>
<td>504</td>
<td>Holistic Nursing: Illness (3)</td>
<td>Exploration, analysis, and application of principles of holistic nursing to clinical practice. Roles of health habits, psychosocial factors, and lifestyle.</td>
</tr>
<tr>
<td>505</td>
<td>Advanced Clinical Pharmacology (3)</td>
<td>Pharmacological agents utilized to treat common, recurrent health problems; interactions, contraindications, side effects, and adverse effects.</td>
</tr>
<tr>
<td>506</td>
<td>Mental Health Nursing I (6)</td>
<td>Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>507</td>
<td>Mental Health Nursing II (6)</td>
<td>Continuation of 506. Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>508</td>
<td>Teaching Practicum (1-6)</td>
<td>Individually designed teaching experience in college teaching.</td>
</tr>
<tr>
<td>509</td>
<td>Supervised Research (3)</td>
<td>Exploration of theoretical and application of principles of holistic nursing to clinical practice.</td>
</tr>
<tr>
<td>510</td>
<td>Theoretical Foundations of Nursing (3)</td>
<td>Historical evolution of nursing science; examination and critical analysis of nursing's metaparadigm and selected conceptual models, philosophies, and theories; contemporary nursing theories and application to nursing practice dilemmas. S.</td>
</tr>
<tr>
<td>511</td>
<td>Nursing Research Management (3)</td>
<td>Selected organizational, conflict management, decision-making, leadership, professional, and other theories, and concepts applicable to advanced clinical nursing practice.</td>
</tr>
<tr>
<td>512</td>
<td>Adult Health Nursing I (6)</td>
<td>Exploration and application of advanced clinical nursing philosophy, psychological, and psychosocial theories to nursing care and management of clients with acute and chronic diseases.</td>
</tr>
<tr>
<td>513</td>
<td>Adult Health Nursing II (6)</td>
<td>Exploration and application of advanced clinical nursing philosophy, psychological, and psychosocial theories to nursing care and management of clients with acute and chronic diseases.</td>
</tr>
<tr>
<td>514</td>
<td>Family Nurse Practitioner I (6)</td>
<td>Exploration and application of holistic nursing concepts to nursing management of common and chronic health problems. Rolloff refinement and exploration of major issues in delivery of holistic primary nursing care. Clinical experiences vary depending on student's practicum setting.</td>
</tr>
<tr>
<td>515</td>
<td>Family Nurse Practitioner II (6)</td>
<td>Exploration and application of holistic nursing concepts to nursing management of common and chronic health problems. Rolloff refinement and exploration of major issues in delivery of holistic primary nursing care. Clinical experiences vary depending on student's practicum setting.</td>
</tr>
<tr>
<td>543</td>
<td>Nurse Practitioner (9)</td>
<td>Exploration and application of holistic nursing concepts to nursing management of common and chronic health problems. Rolloff refinement and exploration of major issues in delivery of holistic primary nursing care. Clinical experiences vary depending on student's practicum setting.</td>
</tr>
<tr>
<td>550</td>
<td>Parent Child Nursing I (6)</td>
<td>Exploration and application of selected advanced clinical nursing, physiological, psychological, developmental, environmental, social, and other theories, and concepts to health care of children and their families experiencing acute and chronic health conditions.</td>
</tr>
<tr>
<td>551</td>
<td>Parent Child Nursing II (6)</td>
<td>Exploration and application of selected advanced clinical nursing, physiological, psychological, developmental, environmental, social, and other theories, and concepts to health care of children and their families experiencing acute and chronic health conditions.</td>
</tr>
<tr>
<td>552</td>
<td>Parent Child Nursing Field Work and Seminar (5)</td>
<td>Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>553</td>
<td>Parent Child Nursing Field Work and Seminar (5)</td>
<td>Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>554</td>
<td>Parent Child Nursing Field Work and Seminar (5)</td>
<td>Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>555</td>
<td>Parent Child Nursing Field Work and Seminar (5)</td>
<td>Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>560</td>
<td>Teaching Practicum (1-6)</td>
<td>Individually designed teaching experience in college teaching.</td>
</tr>
<tr>
<td>561</td>
<td>Mental Health Nursing I (6)</td>
<td>Exploration and application of advanced theories of therapeutic nursing intervention to clients experiencing mental and behavioral health problems.</td>
</tr>
<tr>
<td>562</td>
<td>Mental Health Nursing II (6)</td>
<td>Continuation of 561. Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>563</td>
<td>Mental Health Nursing II (6)</td>
<td>Continuation of 561. Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>564</td>
<td>Mental Health Nursing II (6)</td>
<td>Continuation of 561. Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice.</td>
</tr>
<tr>
<td>565</td>
<td>Teaching Practicum (1-6)</td>
<td>Individually designed teaching experience in college teaching.</td>
</tr>
<tr>
<td>577</td>
<td>Special Topics (1-3) Topic is determined by faculty and student interest.</td>
<td>Permission of instructor. S/N or letter grade.</td>
</tr>
<tr>
<td>582</td>
<td>Supervised Research (3)</td>
<td>Supervised research culminating in scholarly paper: Experiential learning of research process. Participations in on-going faculty research projects by completing specified portion of project under faculty guidance.</td>
</tr>
<tr>
<td>583</td>
<td>Directed Clinical Practice (1-9)</td>
<td>Additional opportunities for advanced nursing practice. objectives to be developed collaboratively with student and faculty.</td>
</tr>
<tr>
<td>584</td>
<td>Seminar in Gerontology (1)</td>
<td>Same as Human Ecology 585. Evaluation and utilization of research and development of gerontology.</td>
</tr>
<tr>
<td>587</td>
<td>Seminar in Gerontology (1)</td>
<td>Same as Human Ecology 585. Evaluation and utilization of research and development of gerontology.</td>
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<td>Seminar in Gerontology (1)</td>
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</tr>
</tbody>
</table>

### Nutrition

**Degree Programs**

- **MAJORS**
  - **DEGREES**
    - Nutrition: M.S.
    - Foodservice and Lodging Administration: M.S.
    - Human Ecology: Ph.D.

- **Professors**
  - Beacheune, Roy E. (Emeritus), Ph.D.
  - Zamel, Head, Ph.D.
  - Carruth, Betty Ruth, Ph.D.

- **Institution**
  - University of Arkansas for Medical Sciences (UAMS)
  - College of Human Ecology

- **Contact Information**
  - Arkansas College of Health Education
  - 4301 W. Second St.
  - Little Rock, AR 72202
  - Phone: (501) 686-4411
  - Fax: (501) 686-4461

- **Website**
  - [UAMS Website](http://www.uams.edu)

- **Programs**
  - Bachelor of Science in Human Ecology
  - Master of Science in Human Ecology
  - Doctor of Philosophy in Human Ecology

- **Research Areas**
  - Nutrition and health
  - Foodservice and hospitality management
  - Human behavior and social science

- **Admissions**
  - Apply online
  - Contact the Admissions Office for more information

- **Financial Aid**
  - Scholarships
  - Loans
  - Grants

- **Course Offerings**
  - Nutritional Sciences
  - Human Physiology
  - Public Health
  - Social Sciences

- **Graduate Programs**
  - Master's
  - Doctoral

- **Faculty**
  - Professors: Beacheune, Roy E. (Emeritus), Ph.D.
  - Zamel, Head, Ph.D.
  - Carruth, Betty Ruth, Ph.D.

- **Program Specifics**
  - Nutrition: M.S.
  - Foodservice and Lodging Administration: M.S.
  - Human Ecology: Ph.D.

- **Contact Information**
  - Arkansas College of Health Education
  - 4301 W. Second St.
  - Little Rock, AR 72202
  - Phone: (501) 686-4411
  - Fax: (501) 686-4461

- **Website**
  - [UAMS Website](http://www.uams.edu)

- **Programs**
  - Bachelor of Science in Human Ecology
  - Master of Science in Human Ecology
  - Doctor of Philosophy in Human Ecology

- **Admissions**
  - Apply online
  - Contact the Admissions Office for more information

- **Financial Aid**
  - Scholarships
  - Loans
  - Grants

- **Course Offerings**
  - Nutritional Sciences
  - Human Physiology
  - Public Health
  - Social Sciences

- **Graduate Programs**
  - Master's
  - Doctoral

- **Faculty**
  - Professors: Beacheune, Roy E. (Emeritus), Ph.D.
  - Zamel, Head, Ph.D.
  - Carruth, Betty Ruth, Ph.D.
Nutrition

414 Nutrient-Drug Interactions (2) Nutrient effects on efficacy and toxicity of drugs; drug effects on absorption and metabolism of nutrients. Prereq: Fundamentals of Nutrition or equivalent. Sp.

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

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

508 Culture, Food, and Nutrition (3) Food-related behavior of individuals and groups in United States. Sociocultural, economic, and technological influences. Nutrition and food surveys, public policy. Prereq: Nutrition for Educators or Advanced Nutrition or consent of instructor. F

509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nursing 609, Physical Education 509 and Social Work 509.)

511 Advanced Physiological Chemistry (4) Bioenergetics, flux control and hormonal interrelationships. Prereq: Advanced Nutrition or equivalent. F


513 Community Nutrition I (3) Orientation to community, assessment of nutrition problems, needs, and resources; functional roles of public health nutritionist. Concurrent field experiences. Prereq: Advanced Nutrition or consent of instructor. F

514 Community Nutrition II (3) Planning, implementation, and evaluation of public health nutrition programs. Concurrent field experiences. Prereq: 513 or consent of instructor. Sp

515 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state or regional community nutrition program. Location of in-depth study teaching seminar for GTAs and NTR 548 comprising a faculty-supervised problem in college teaching.

Consumer Environments

Students enrolled in the Ph.D. program with a concentration in consumer environments are provided with a foundation of coursework relevant to understanding the consumer in the designed environment and management of facilities. From this base, students in foodservice and lodging administration focus on areas of specialization in foodservice systems and in lodging administration to further theory and the application of theory in the field. For further information, see consumer environments concentration under Human Ecology.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Foodservice and Lodging Administration is available to residents of the states of Arkansas, Kentucky, South Carolina, or West Virginia. The M.S. program in Nutrition is available to residents of Arkansas, South Carolina, or Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records. For the Ph.D., see Human Ecology.
Hotel and Restaurant Administration

GRADUATE COURSES

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

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

530 Computer-Assisted Foodservice and Lodging Management (3) Application of computer technology to foodservice and lodging industry. Inventory, cost accounting, production, nutrition analysis, rooms management, and sales planning and analysis. Prereq. Food Procurement, Production and Service. Microcomputer Applications or consent of instructor. F

531 Advanced Financial Management (3) Financial planning, operations and evaluation techniques used in foodservice and lodging management, developing budgets, accounting systems and financial reports. Prereq. Food and Lodging Cost Control or consent of instructor. F

532 Advanced Human Resource Management (3) Identifying labor needs; development and maintenance of work force. Prereq. Food and Lodging Personnel Development or consent of instructor. F

533 Advanced Food Production and Delivery System Management (3) Analysis of food production and delivery systems; application of quantitative methods and models to optimize decisions. Prereq. Quantity Food Procurement, Production and Service or consent of instructor. F

534 Special Topics in Foodservice and Lodging Administration (1-3) Lecturediscussion format. Contemporary developments and trends in industry. Prereq. Consent of instructor. May be repeated. E

535 Directed Study in Foodservice and Lodging Administration (1-3) Problems selected for study by student under guidance of faculty member. Prereq. Consent of instructor. May be repeated. E

537 Seminar in Foodservice and Lodging Administration (1) May be repeated. S/N Conly only. E

541 Research Methods (1) Basic principles of planning, conducting, and interpreting nutrition and foodservice systems administration research. Prereq. 6 graduate hrs in nutrition and food service administration and statistics. Sp

542 Advanced Experimental Nutrition (2) Application of research principles to individual project using experimental animals. Prereq. or coreq. 541. Sp

543 Human Metabolic Research Methods (2) Application of research principles to conducting and interpreting metabolic study. Prereq. or coreq. 541. Sp

544 Food and Nutrition Survey Methods (2) Project for assessment of food consumption, nutrient intake, nutritional status, and socioeconomic parameters in populations. Prereq. or coreq. 541. Sp

547 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq. Consent of instructor. S/N Conly only. E


549 Special Topics (1-3) Recent advances in nutrition or food systems administration. Prereq. Consent of instructor. May be repeated. Maximum 6 hrs. E

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

602 Advanced Topics in Nutrition Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in nutrition. Prereq. 512 or consent of instructor. May be repeated. F

603 Current Trends in Food and Socio-cultural Change (2) Critical evaluation of research. Prereq. 508 or consent of instructor. F/A

related to current problems. Prereq. 524 or consent of instructor.
Non-Thesis Option
1. A Master's committee of no fewer than 3 faculty members will be selected.
2. Thirty-four hours of graduate coursework are required of which 22 hours must be at the 500 level or above.
3. All students are required to include 2 hours of 590 Seminar in their program and are expected to attend this course and participate in discussions each semester enrolled.
4. Twelve hours of coursework in the major must be at the graduate level.
5. Comprehensive written and oral examinations shall be taken upon completion of no fewer than 32 hours of approved graduate work.

Graduate Courses

410 Nursery Management and Production (3) Modern management 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

440 Advanced Turfgrass Management (4) Principles and scientific basis of turfgrass culture: adaptation, ecology, physiology, soil fertility, and grass diseases. Influences of grass culture, physiology of clipping and management of golf courses; and physiological influences on grass culture; physiology of clipping and management of golf courses. Prereq: Plant and Soil Science 471. F

451 Plant Tissue Culture (3) (Same as Botany 451.)

460 Professional Practices in Landscape Construction and Management (2) Professionalism, salesmanship, proposal writing, estimating, specification, and contract administration 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, landscaping, grading, applying landscape construction, planting design, analysis, programming, design, detailing, estimating, and specifying applicable to variety of landscape projects. Prereq: 280, 350, and 450, or consent of instructor. 1 hr and 2 3-hr labs. Sp

485 Computer Aided Landscape Design (3) Overview of drafting and design (CAD). Site planning and construction of related landscape plan views and 3-D drawings; introduction to operating systems; techniques on utilization of AutoCAD and LANDCAD software. Prereq: Fundamentals of Landscape Design, Microcomputer Applications to Problem Solving or consent of instructor. 2 3-hr labs. F

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 (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

510 Research Methods in Ornamental Horticulture and Landscape Design (2) Literature retrieval; research proposal writing; use of computers for word processing, data entry, statistical analysis, and graphics production. Required of all students in thesis option. Prereq: Plant and Soil Science 471, F

511 Plant Disease Fungi (4) (Same as Entomology and Plant Pathology 510)

550 Microtechnique (3) Methods of investigating histology, histochemistry, picodye, and pathological structures in ornamental and crop plants, plants, plant parts. Prereq: 8 hrs biological science, 8 hrs chemistry, and consent of instructor. 1 hr and 2 labs. Su

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 physiological aspects of flowering and seed production, photoperiodism, flowering, photosynthesis, vernalization, cold acclimation, cold hardiness, dormancy, growth regulators, environmental stress, and post-harvest consideration. Prereq: Botany 321 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 topics related to technology and science. May be repeated. Maximum 6 hrs. E

Pathobiology
(College of Veterinary Medicine)

MAJOR

DEGREE

Veterinary Medicine ........................................ D.V.M.

David O. Stauson, Head

Professors:

Edward S., D.V.M........................................ Georgia

McGavin, M., Ph.D........................................... Michigan State

Michel, R. L. (Emeritus), V.M.D., Ph.D........... Michigan State

Patton, S., D.V.M........................................... Ohio State

Powell, H. S., (Adjunct), D.V.M........................ Georgia

Schuller, H. M., D.V.M., Ph.D.......................... Hannover

Shull, R. M., D.V.M........................................... Cornell

Slauson, D. O., D.V.M................................. California (Davis)

Woychik, R. (Adjunct), Ph.D....................... Case Western Reserve University

Associate Professors:

Ciccone, M. D., D.V.M........................................... Purdue

Wilkinson, J. E., D.V.M., Ph.D.......................... Cornell

Cubbage, W. G., Ph.D............................................. Georgia

Rue, J. T., D.V.M........................................... Cornell

Coffin, W. F., D.V.M........................................... Cornell

Assistant Professors:

Bochsler, P. N., D.V.M., Ph.D.......................... Cornell

Godfrey, V., (Adjunct), D.V.M.................................. Tennessee

Kornegay, W., D.V.M., Ph.D................................. Louisiana State

McEntee, M. F., D.V.M........................................... Cornell

Merryman, J., D.V.M., Ph.D................................. Ohio State

Miller, M. S., Ph.D........................................... Columbia

Munson, L., D.V.M., Ph.D................................. Cornell

Schultze, A. E., D.V.M., Ph.D.......................... Michigan State

Post-Doctoral Research Associates:

Jian, X., D.V.M............................................... China

Richards, W., Ph.D.......................................... SUNY (Stony Brook)

Yang, Z., M.D............................................... China

Resident:

Brenneman, K., D.V.M.......................................... Virginia

Dean, D. F., D.V.M........................................... Tennessee

Donnell, R., D.V.M........................................... Tennessee

Mason, G. L., D.V.M......................................... Texas A&M

Richman, L., D.V.M............................................ Wisconsin

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 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

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 results. Preparation of specimens for sectioning. Prereq: Consent of instructor. May be repeated. Maximum 4 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 4 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 veterinary biomedicine. Students present one seminar per term enrolled. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. Class meets once monthly. E

609 Mechanisms of Disease (4) Advanced topics in pathobiology and mechanisms of disease: pathophysiology, cellular and molecular pathogenesis, immunopathology, hemostasis. Principal biochemical and morphologic responses of various cells, tissues, and organs to injury and development of disturbances. Selection of contemporary topics from current literature and textbooks. Prereq: Consent of instructor. F, A

Philosophy
(College of Liberal Arts)

MAJOR

DEGREES

Philosophy ................................................................ M.A., Ph.D.

George G. Brenkert, Head

Professors:

Aquilla, Richard E., Ph.D.................................... Northwestern

Brenkert, George G., Ph.D................................. Michigan

Cebik, L. B., Ph.D.............................................. Nebraska

Davis, John W., Ph.D........................................... Emory

Edwards, Rem B., Ph.D...................................... Emory

Graber, Glenn, Ph.D.......................................... Michigan

Postow, Betsy G., Ph.D...................................... Yale

Van de Vate, Dwight, Jr., Ph.D......................... Yale

Associate Professors:

Bennett, James D., Ph.D................................. Tulane

Bohstedt, Kathleen Emmett (Liaison), Ph.D............. Ohio State
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 fewer than 30 hours shall be in courses numbered above 500 and no fewer than 6 hours shall be in courses numbered above 600. The specific number and distribution of courses will be determined by the student's faculty committee.

Students must demonstrate a reading knowledge of one foreign language, normally a living language in which there exists a significant body of philosophical literature. (In special circumstances relating to the area of dissertation research, the Graduate Committee may approve a language not satisfying these conditions.) This may be done by passing the doctoral language exam given by the appropriate department, if available, or by passing French 302 or German 332 with a B or better, Bi- or multilingual (normally, foreign) students, whose native language (other than English) is one in which there is a significant body of philosophical literature, are exempted from the foreign language requirement. Students receiving the Ph.D. with concentration in medical ethics are also exempted.

**Concentrations**

Medical Ethics

The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Detailed information concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Director of the Medical Ethics Program.

**Religious Studies**

The department has an M.A. program of graduate study with a concentration in religious studies. Details concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Department of Religious Studies.

**Academic Common Market**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.A. and Ph.D. programs in Philosophy are available to residents of the states of Alabama, Kentucky (concentration in medical ethics only), Maryland (concentration in medical ethics only), Texas (concentration in medical ethics only), Virginia (concentration in medical ethics only), or West Virginia; the Ph.D. program to residents of Arkansas (concentration in medical ethics only), Louisiana, or Mississippi; and the M.A. program to residents of Oklahoma (concentration in medical ethics only). Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

**Graduate Courses**

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

411 Modern Religious Philosophies (3) (Same as Religious Studies 411.)

412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) (Same as Religious Studies 412.)

420 Topics in History of Philosophy (3) Figures or movements from antiquity through mid-twentieth century. Prereq: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 9 hrs.

425 American Philosophy (3) Colonial to early 20th Century. Prereq: 6 hrs of philosophy or consent of instructor.

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.)

450 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: 350 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: 6 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, post-structuralism. 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/N/C 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.

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.

548 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 (3) Medical 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/N/C 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/N/C 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.


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, socialist contract, Marxism. May be repeated. Maximum 9 hrs.

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

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

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

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.
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
Biss, W. E., Ph.D. ...................................... Michigan State
Breazale, M. A., Ph.D. .................................. Michigan State
Brening, M., Ph.D. .................................... Oregon
Bugg, W. M., Ph.D. .................................... Tennessee
Burgoon, J. H., Ph.D. ................................... Frie Universtitat Berlin
Caliotto, T. A., Ph.D. .................................. Purdue
Chidley, R. W., Ph.D. .................................. Vanderbilt
Christophorou, L. G., Ph.D. ................... Manchester
Colagiar, E. W., Ph.D. ................................ Cal Tech
Condo, G. T., Ph.D. ................................... Illinois
Crater, H. W. (UTSI), Ph.D. ......................... Yale

Ph.D. ............................................. Groningen (Netherlands)

Ph.D. ............................................. Ohio State
Duckett, K. E., Ph.D. ................................ Tennessee
Elton, S. B., Ph.D. ..................................... Massachusetts
Fox, K., Ph.D. .......................................... Michigan
Gallar, N. M. (Emeritus), Ph.D. ............ Ohio State
Georgiou, S., Ph.D. ................................ Manchester
Guldry, M. W., Ph.D. ............................... Tennessee
Handler, T. H., Ph.D. ................................ Rutgers
Harris, E. G. (Distinguished Prof.,) . Ph.D. .............. Tennessee

Har, E. L. (Liaison), Ph.D. .................. Cornell
Jacobson, H. C., Ph.D. ............................. Yale
King, D. T. (Emeritus), Ph.D. ..................... Bristol
Lewis, J. W. L. (UTSI), Ph.D. ......................... Mississippi
Mackay, J. (Distinguished Scientist), Ph.D. ............. Rensselaer

Mahar, 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., J.R., Ph.D. .................... Pittsburgh
Painter, L. R., Ph.D. ............................... Tennessee
Pegg, D. J., Ph.D. ................................... New Hampshire
Plummer, E. W. (Distinguished Scientist), Ph.D. ............ California

Quinn, J. J. (Lincoln Chair), Ph.D. ............ Maryland
Riedinger, R. J., Ph.D. ............................. Vanderbilt
Ritchie, R. H., Ph.D. ................................ Tennessee
Rusk, W. R. (Emeritus), M.S. ..................... Tennessee
Sander, W. Ph.D. ................................... Freiburg
Sellin, I. A. (Chancellor's Research Scholar), Ph.D. .............. Chicago
Shih, C. C., Ph.D. .................................. Cornell
Strayer, M. R., Ph.D. ............................... MIT
Thompson, J. R., Ph.D. ............................ Duke
Thomas, J. O. (Emeritus), Ph.D. ................ Illinois
Ward, B. L., Ph.D. .................................. Princeton

Wheeler, G. W. (Emeritus), Ph.D. ............. Yale
White, J. W. (Emeritus), Ph.D. ................ North Carolina

Associate Professors:

Barnes, F. E., Ph.D. ................................ Caltech
Aguiluz, Adolfo G., Ph.D. ...................... Brown
Ferrall, T., Ph.D. .................................. Clemson
Lide, R. W. (Emeritus), Ph.D. .................. Michigan
Muhlhausler, J. W. (UTSI), Ph.D. ............. Tennessee
Shieh, S. Y., Ph.D. ................................ Maryland
Sorensen, P. S., Ph.D. ............................. Copenhagen

Assistant Professors:

Canright, G., Ph.D. ................................ Tennessee
Daunt, S. J., Ph.D. ................................ Queens
Hardy, R., Ph.D. ................................... Ohio State
Levin, J. C., Ph.D. ................................ Oregon
Menzel, R. (UTSI), Ph.D. ......................... Tennessee
R. K., Ph.D. ....................................... Cornell
Sanders, J., Ph.D. ................................ Tufts
Sipos, O., Ph.D. .................................. Cal Tech
Weingart, H. H., Ph.D. ............................ Yale

Research Professors:

Blankenship, J. L., Ph.D. ...................... Tennessee
Kamyshov, I., Ph.D. ................................ ITEP (Russia)
Zhang, J., Ph.D. ................................ Lanzhou

Research Associate Professors:

Du, Yuan-Cai, Ph.D. ................................ Beijing
McCorkle, D. L., Ph.D. .............................. Tennessee
Saini, Suresh, Ph.D. ............................... Bombay

Research Assistant Professors:

Chen, X., Ph.D. ................................ Purdue
Davies, L. (UTSI), Ph.D. ......................... Auckland
Ormand, W. E., Ph.D. ............................... Michigan State
Pirandavadel, L. A., Ph.D. ...................... Pittsburgh
Yost, S. A., Ph.D. ................................ Princeton

Instructors:

Faiman, R., B.A. ................................... Earlham
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. Departmental graduate programs leading to the M.S. and Ph.D. are also available at 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 intends to present Physics as a graduate minor will have completed an undergraduate minor in Physics or its equivalent. Physics 311-12, 321, 431-32, 421, 451, 461, and 411-12 constitute the minimum courses prerequisite to graduate study.

A student who intends to present Physics as a graduate major 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. All 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 go into 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 30 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 advanced laboratory nature). At least 20 hours must be taken at the 500 level or above. In addition, the candidate must pass a written examination administered by his/her committee.

THE DOCTORAL PROGRAM

All students are expected to take Physics 521-22, 531-32, 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 651-62 of students in health physics; Physics 671-72 of students in solid state physics; and Physics 681-82 of students specializing in molecular spectroscopy. Students specializing in chemical physics may substitute Chemistry 572 for Physics 551 and should complete at least 6 semester hours chosen from Chemistry 580, 570.

The courses Physics 531-32, 571-72, 521-22, 541-42, and 561 constitute the core curriculum. They are the usual basis for the departmental comprehensive examination which is normally taken by a well-prepared student after two years of graduate study. A reading knowledge of one foreign language in which there exists a significant body of literature is required. German 332 or French 302 with a grade of A or B may be substituted for the corresponding language examination. The dissertation topic will be chosen with reference to one of the fields in which research facilities can be made available either at the University of Tennessee laboratories in Knoxville; The University of Tennessee Space Institute at Tullahoma, Tennessee; the Oak...
Astronomy

GRADUATE COURSES


421 Modern Optics (4) Transmission of light in uniform, isotropic media; reflection and transmission at interfaces; mathematics of wave motion and interference effects. Rudiments of Fourier optics and holography. Prereq: 431; or Fundamentals of Physics: Wave Motion, Optics, and Modern Physics, or Honors: Mechanics and Heat, and consent of instructor.


461-62 Modern Physics Laboratory (3,3) 461 - Introductory and modern techniques in experimental physics, and to theory and practice of measurement and data analysis. Selected experiments in nuclear, atomic, molecular and solid state physics, and modern optics. Prereq: Electronics Laboratory and other Fundamentals of Physics: Modern Physics or 411. 462 - Advanced experiments and experimental techniques in modern physics; experimental team work. Thorough quantum mechanical interpretation of results and preparation of scientific reports. Prereq: 461. 6 hrs lab per week.

471-72 Health Physics (3,3) Reactivity, interaction of electromagnetic radiation with matter, radiation quantities and radiation effects; 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, critically prevention, radiation biology and ecology. Prereq: Consent of instructor.

490 Senior Seminar (1-3) Topic of current interest. May be repeated with consent of department. Maximum 6 hrs.

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

501 Graduate Research Participation (3) Advanced research techniques under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students in good standing. Prereq: Consent of department and research director. May be repeated with consent of department. Maximum 18 hrs. S/NC only. E

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

506 Experimental Methods (3) Principles, real operational behavior of devices of various types, radiation detectors, photomultiplier tubes, image intensifiers, image converters, image dissector, streak cameras, and fast-frame amplifiers, high-vacuum systems including cryogenic-based design or operation; high-resolution spectroscopy 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 introduction to 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; modes and Fringe stabilization; specific laser types; semiconductor and solid-state, excimer, copper vapor and dye lasers.

511-12 Theoretical Physics (3,3) Classical theoretical physics, with limited use of mathematics. Prereq: 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: 311.

532 Advanced Classical Mechanics (3) Variational principles, canonical transformations, Hamilton-Jacobi theory, nonlinear mechanics, elasticity, fluid mechanics. Prereq: 531.


561 The Theory of Relativity (3) Geometry of space-time, relativistic electrodynamics, particle mechanics and continuum mechanics, Einstein’s field equations, Schwarzschild solutions, the classical test of general relativity. Prereq: or coreq: 531 or 542.


574 Group Theory for Physicists (3) Introduction to abstract group theory, discrete and continuous groups, representation theory. Noether’s theorem, symmetries and degeneracies, application of group-theoretical methods to atomic physics, solid-state physics, and particle physics. Prereq: 571-72.

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

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

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

594 Special Problems (3) Especially assigned theoretical or experimental work on problems not covered in other courses. May be repeated. Maximum 9 hrs. E


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


606 Nonlinear Optics (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, passive mixing and phase conjugation, transient coherent optical effects and free induction decay, optical breakdown and nonlinear effects in plasmas. Prereq: 511.

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 coherences; atomic scattering phenomena. Prereq: 521.

611 Advanced Quantum Mechanics & Field Theory (3) Second quantization, quantization of electromagnetic field, emission, absorption, and scattering of light, bremsstrahlung, pair creation, and annihilation. Applications of quantum field theory methods in condensed matter physics, and quantum optics. Topics vary according to instructor. Prereq: 522 and 542 or equivalent. Prereq or coreq: 561 or consent of instructor.

612 Advanced Topics in Quantum Field Theory (3) Renormalization, Lamb shift, anomalous magnetic moment, 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.

621-22 Nuclear Structure (3,3) General properties of nucleus; two-body scattering problems; saturation and symmetry properties of nuclear forces; properties of light nucleus; nuclear spectroscopy; special nuclear models; theory of nuclear reactions; theory of beta-decay. Prereq: 571-72.

626-27 Elementary Particle Physics (3,3) Survey of elementary particle physics, integro-experimental methods, conservation laws, invariance principles, and models of interactions. 627-Advanced topics: quark models, electroweak interactions and unification of elementary forces. Prereq: 522.

641 Advanced Topics in Classical Theory (3) To meet special needs of students. Advanced dynamics and hydrodynamics, electromagnetic theory, statistical mechanics and theory of non-equilibrium processes. 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,
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 organization, dealing with development problems; and in private consulting.

The Master of Science in Planning program is accredited by the Planning Accreditation Board, a joint undertaking of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning.

THE MASTER’S PROGRAM

Admission Requirements

Applicants are to submit an application for admission to The Graduate School, two letters of reference from faculty familiar with their prior academic work, and a statement describing personal career objectives. If the applicant has prior work experience in planning, a reference letter should also be provided by the work supervisor. Graduate Record Examination scores are requested of all applicants whose undergraduate GPA is below 3.0. Other applicants are encouraged to submit them.

Degree Requirements

The M.S.P. requires completion of at least 60 hours of graduate credit, at least 30 of which must be in planning. The following courses are the core curriculum required of all students: 510, 511, 515, 520, 521, 523, 530, 531, 532, 540, and 545.

Students should plan to enter the program in the fall term to take the core courses in the proper sequence.

Each student is required to develop an area of concentrated competence beyond the core curriculum. After selecting the area of concentration, usually by the end of the second semester, the student takes a minimum of 3 credits or hours from 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, economic development planning, real estate development planning, transportation planning, environmental planning, historic preservation planning, and international planning.

Students have the latitude to propose an alternate specialization consisting of at least 9 hours of coursework, subject to approval of a faculty committee.

Each student is required to develop an area of concentrated competence beyond the core curriculum. After selecting the area of concentration, usually by the end of the second semester, the student takes a minimum number of courses or hours from 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, economic development planning, real estate development planning, transportation planning, environmental planning, historic preservation planning, and international planning.

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Students have the latitude to propose an alternate specialization consisting of at least 9 hours of coursework, subject to approval of a faculty committee.

Each student is required to develop an area of concentrated competence beyond the core curriculum. After selecting the area of concentration, usually by the end of the second semester, the student takes a minimum number of courses or hours from 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, economic development planning, real estate development planning, transportation planning, environmental planning, historic preservation planning, and international planning.

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Each student is required to develop an area of concentrated competence beyond the core curriculum. After selecting the area of concentration, usually by the end of the second semester, the student takes a minimum number of courses or hours from 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, economic development planning, real estate development planning, transportation planning, environmental planning, historic preservation planning, and international planning. Additional information related to the M.S.P. program is available from the Graduate Admissions Office.
Plant and Soil Science
(College of Agricultural Sciences and Natural Resources)

MAJOR

Plant and Soil Science .................. M.S., Ph.D.

John E. Foss, Head

Professors:
Allen, Fred L., Ph.D. .................. Minnesota
Bell, Frank F. (Emeritus), Ph.D. .... Iowa State
Boswell, F. C. (Adjunct), Ph.D. ....... Penn State
Coffee, D. L., Ph.D. .................. Purdue
Conger, B. V. (Distinguished Prof.), Ph.D. Washington State
Duck, B. N., Ph.D. .................. Auburn
Foss, John E., Ph.D. .................. Minnesota
Fribourg, Henry A., Ph.D. .......... Iowa State
Hayes, R. M., Ph.D. .................. Illinois
Howard, D. D., Ph.D. .................. Auburn
Josephson, L. M. (Emeritus), Ph.D. .... Wisconsin
Luxmore, R. J. (Adjunct) (California) (Riverside)
Mullins, C. A., Ph.D. .................. Tennessee
Parks, William L. (Emeritus), Ph.D. .... Purde
Reynolds, John H., Ph.D. .......... Wisconsin
Seatz, Lloyd F. (Emeritus), Ph.D. .... Kansas State
Springer, M. E. (Emeritus), Ph.D. .... California
Swingle, H. D. (Emeritus), Ph.D. ..... California
Tyler, D. D., Ph.D. ............... Louisiana State

Associate Professors:
Ammons, J. T., Ph.D. ............... West Virginia
Dayton, D. E. (Liaison), Ph.D. ......... NC State
Krueger, W. A., Ph.D. ............... Illinois
Lee, S. Y. (Adjunct), Ph.D. .......... Wisconsin
Lessman, Gary M., Ph.D. .......... Michigan State
Lewis, R. J., Ph.D. .................. NC State
Logan, Joanne, Ph.D. .............. Nebraska
Miller, R. D., Ph.D. .................. Kentucky
Reich, V. H., Ph.D. ............... Iowa State
Sams, C. E., Ph.D. ............... Michigan State
West, D. R., Ph.D. .................. Nebraska
Wyatt, J. E., Ph.D. .................. Florida

Assistant Professors:
Essington, M. E., Ph.D. ............. California (Riverside)
Mueller, Thomas C., Ph.D. .......... Georgia
Mullen, M. D., Ph.D. ............. NC State
Newton, D. (Adjunct), M.S. ........ Kentucky
Wilson, G. V., Ph.D. ............... Arkansas

The Department of Plant and Soil Science offers graduate programs leading to the Master of Science and the Doctor of Philosophy. Concentrations for the graduate programs are offered in soil science, plant breeding and genetics, and crop physiology and ecology. For further information, contact the department head.

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 600. A minimum of 24 hours must be taken in courses numbered 501 and above. The student's advisory committee may require additional coursework if the student's progress or background indicates such need. Each student is required to take 1 hour of 501 and 1 hour of 503, and to present an exit seminar on the thesis research.

The student's advisory committee consists of the major professor, who acts 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 integrating the thesis and coursework.

A student having started on the thesis option is not eligible to transfer to the non-thesis option after the end of the first semester of graduate studies or after having received a Graduate Research Assistantship stipend for more than one semester. A student having started on the non-thesis option may transfer to the thesis option upon approval by a potential major professor and the Department Head.

Non-Thesis Option

A student desiring the non-thesis option should declare this intention at the beginning of the first semester of graduate studies, and must declare it before the beginning of the second semester. In lieu of thesis, students are required to complete 3 hours of 593 for satisfactory participation in a single research program for a period of 12 weeks and the writing of an original, creative and well-written report, both to be conducted by the major professor and approved by the advisory committee. In addition to 3 hours of 593, a minimum of 30 hours of graduate coursework is required, of which at least 20 must be taken in courses numbered 501 or above, for a total of 33 hours.

The student's advisory committee may require additional coursework if the student's progress or background indicates such need. Each student is required to take 1 hour of 501 and 2 hours of 503.

The student's advisory committee consists of the major professor, who acts as chairperson of the committee, and a minimum of two other faculty members. The advisory committee approves the student's coursework and the report on participation in a research program for 593. Students are required to take a written comprehensive examination integrating the coursework.

THE MASTER'S PROGRAM

This option requires writing a thesis based on original research. Six hours of 500 Thesis are required. Prior to conducting research, the student must develop a detailed written research plan. In addition to the thesis hours, a minimum of 24 hours of graduate coursework is required, of which at least 14 must be taken in courses numbered 501 and above. The student's advisory committee may require additional coursework if the student's progress or background indicates such need. Each student is required to take 1 hour of 501 and 1 hour of 503, and to present an exit seminar on the thesis research.

The student's advisory committee consists of the major professor, who acts 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 integrating the thesis and coursework.

A student having started on the thesis option is not eligible to transfer to the non-thesis option after the end of the first semester of graduate studies or after having received a Graduate Research Assistantship stipend for more than one semester. A student having started on the non-thesis option may transfer to the thesis option upon approval by a potential major professor and the Department Head.

Non-Thesis Option

A student desiring the non-thesis option should declare this intention at the beginning of the first semester of graduate studies, and must declare it before the beginning of the second semester. In lieu of thesis, students are required to complete 3 hours of 593 for satisfactory participation in a single research program for a period of 12 weeks and the writing of an original, creative and well-written report, both to be conducted by the major professor and approved by the advisory committee. In addition to 3 hours of 593, a minimum of 30 hours of graduate coursework is required, of which at least 20 must be taken in courses numbered 501 or above, for a total of 33 hours.

The student's advisory committee may require additional coursework if the student's progress or background indicates such need. Each student is required to take 1 hour of 501 and 2 hours of 503.

The student's advisory committee consists of the major professor, who acts as chairperson of the committee, and a minimum of two other faculty members. The advisory committee approves the student's coursework and the report on participation in a research program for 593. Students are required to take a written comprehensive examination integrating the coursework.

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 600. A minimum of 24 hours must be completed in courses numbered above 500 exclusive of doctoral research and dissertation, of which 6 must be in courses numbered above 600. A minimum of 9 hours of graduate course work taken during the doctoral program must be outside the department in one or more cognate areas.

The student and the major professor identify a 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 all cognate fields, direct the research, and recommend the dissertation for approval and acceptance by The Graduate School.

**GRADUATE COURSES**

411 Soil Microbiology (3) Soil microbial populations and role in soil ecosystem, microbial transformation of inorganic and organic compounds, decomposition of residues, dynamics of soil organic matter. Prereq: Introduction to Soil Science and Introduction to Organic and Biochemistry or Organic Chemistry or consent of instructor. 2 hrs and 1 lab. FA

412 Soil Genesis, Classification, and Mapping (3) Soil genesis and formation; observing and describing morphology of agronomic and forest soils; chemical and physical properties, classification, mapping. Two Tuesday afternoon 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 soil formation; 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 an environmental component and soil problems related to land use. Soil as resource 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, PA

415 Soil Hydrology (3) Physical relationships among solid, liquid, and gaseous phases of soil system. Relationships of soil properties to processes governing transport of water, and solutes in soil. Prereq: Introduction to Soil Science. 2 hrs and 1 lab. FA

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 212. 2 hrs and 1 lab. F, A

432 Bioclimatology (3) Solar energy budget: interactions between global, regional and local climates and biological systems; quantification of macro- and microclimatic influences on crop growth; world climates, crop distribution and productivity, human cultures, and their interaction. Prereq: 411 or equivalent; 413 or equivalent; 431 or equivalent; Soil Climatology or equivalent. 2 hrs and 1 lab. FA

511 Advanced Soil Fertility (3) Concepts of soil chemistry as related to nutrient movement and adsorption by plant roots. Fertilizer use efficiency as measured by plant response factors. Prereq: 413, Sp, A

512 Pedology (3) Physical and chemical weathering processes, factors of soil formation, soil forming processes. Prereq: 412 or consent of instructor. 2 hrs and 1 lab. FA

514 Advanced Soil Physics (3) Theory and mathematical modeling of flow and solute transport in saturated and unsaturated soil: geostatistical analysis of soil heterogeneity, stochastic properties multi-scale pore processes, anisotropy, hysteresis, analytical and numerical solution of flow and transport equations for unsaturated zone. Prereq: Calculus III, 415, or consent of instructor. F

530 Integrated Pest Management (3) (Same as Entomology and Plant Pathology 530.)

532 Advanced Crop Ecology (3) General and specific relationships among environmental factors, crop 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: 411 or equivalent; 413 or equivalent; Soil Climatology or equivalent. 2 hrs and 1 lab. FA

551 Advanced Plant Genetics (3) Discovery of genetics: controlling elements, induced mutations, genome organization, polyallelic, tetrasomic inheritance, extra-chromosomal inheritance, apomixis, inconsistency systems, and genetic engineering of higher plants. Prereq: Biology 220, F


571 Design and Analysis of Biological Research (3) (Same as Animal Science 571.)

581 Special Topics 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, N

601 Special Topics In Soil Science (1-3) Thermodynamics of soils, clay structure and surface chemistry, soil mineralogy, plant mineral nutrition, soil microbiology, water movement and use by plants, soil structure, soil thermal properties, interaction in the soil-plant environment. May be repeated. Maximum 6 hrs. E

603 Special Topics In Crop Physiology and Ecology (1-3) Microclimatology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and germplasm in crop production, theory and application of quantitative methods in crop physiology and ecology research. May be repeated. Maximum 6 hrs. E

605 Special Topics In Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutants, chromosome dynamics, polyploidy, genetic engineering, interspecific hybridization, incompatibility systems, genome organization. May be repeated. Maximum 6 hrs. E

613 Advanced Soil Chemistry (3) Surface and colloid chemistry of soil minerals; recent developments in ion speciation, ion movement, surface charge, surface complexation, and environmental stability. Prereq: 413 or consent of instructor. Sp, 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

653 Advanced Plant Breeding (4) Development and utilization of concepts of genetic variation, quantitative traits, heterosis, diversity, methods of selection in vitro-breeding, interspecific hybridization, stability parameters, genetic resistance and vulnerability to pests and environmental stresses. Prereq: 453 and 571 or equivalent or consent of instructor. 3 hrs and 1 lab. Sp, A

671 Advanced Research Planning (3) Development of agricultural research proposals utilizing prescribed resources and emphasizing experimental design and statistical techniques. Prereq: Animal Science 572, Statistics 461, or equivalent. F

**Political Science**

(College of Liberal Arts)

**MAJORS**

**DEGREES**

Political Science..........................M.A., Ph.D.

Public Administration ..................M.P.A., J.D., M.P.A.

Michael Gant, Head

**Professors:**

Carlisle, D. H. (Emeritus), Ph.D..........................North Carolina

Fitzgerald, Michael R., Ph.D.....................Oklahoma

Gant, Michael M., Ph.D..........................Michigan State

Gorman, Robert A., Ph.D.......................New York

Iredell, Vernon R., Ph.D.........................Chicago

Lyons, William, Ph.D.............................Oklahoma

Plass, Hyram, Ph.D...............................Utah

Robinson, Nelson M. (Emeritus), Ph.D..............Syracuse

Smith, T. Alexander, Ph.D........................Ohio State

Stephens, Otis H. (Distinguished Prof.), Ph.D........Johns Hopkins

Ungs, Thomas D., Ph.D...........................Iowa

Welborn, David M., Ph.D........................Texas

**Assistant Professors:**

Cunningham, Robert B., Ph.D....................Indiana

Evans, Gill C., Ph.D...............................Columbia

Folz, David H. (Liaison), Ph.D....................Tennessee

Freeland, Patricia K., Ph.D......................Florida

Peterson, Robert L., Ph.D.......................Yale

Scheb, John M., II (Liaison), Ph.D................Florida

**Graduate School**

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, scores on the general
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, a composite score of at least 1100 on the verbal and quantitative parts of the GRE is normally required.

Students pursuing the Master of Arts degree may follow one of two options:

1. Thesis Option: (36 hours) Coursework, preparation of a thesis, and an oral examination on coursework and the thesis, is required. At least 12 of these hours must be in political science, with 6 in the field of methodology (Political Science 510 and 512). Six hours may be earned through thesis credit.

2. Non-Thesis Option: (38 hours) Coursework, plus a written comprehensive examination on all coursework is required. 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 39 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.

Students must demonstrate proficiency in the use of personal computers prior to the completion of 3 credit hours in the M.P.A. program. Students may fulfill this requirement by successful completion of a short course(s) offered by the UT Computing Center. The Coordinator of the M.P.A. program will provide a list of acceptable courses. Exceptions to this requirement will be considered on an individual basis.

The M.P.A. is a non-thesis program. Specific requirements include the following:

1. Core - 21 hours.
   b. Analytical skills (6 hours): 512 Quantitative Political Analysis; 514 Research and Methodology in Public Administration.
   c. Management skills (6 hours): 560 Public Budgeting; and either 562 Public Management or 564 Human Resources Management in Public Administration.
2. Specialization - 9 hours.
   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.
3. Recommended internship with a public agency - 6 hours.
   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 9 semester hours of credit toward the J.D. degree for successful completion of approved grade 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 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 281) 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 those first two years, students may not take courses in the opposite area, without the approval of the J.D.-M.P.A. coordinators in both academic units. In the third and fourth years, students are strongly encouraged to take both law and political science courses each semester.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the J.D. or the M.P.A. degree for courses taken in the other program except as such courses qualify for credit without regard to the dual program.

Awarding of Grades

For grade recording purposes in the College of Law and the Department of Political Science, grades awarded in courses in the other unit will be converted to either Satisfactory or No Credit and will not be computed into the student’s GPA or class standing. The College of Law will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for an approved law course in which the student earns a grade of 2.3 or higher and a grade of No Credit for any lower grade. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

THE DOCTORAL PROGRAM

The Ph.D. program prepares students for careers in college teaching, as well as careers in other occupations related to service in the public or private sectors. Applicants for admission to the program should normally have completed a Master's degree in political science or a related field with a 3.0 GPA (3.5 for international students) and have earned a composite score of at least 1100 on the verbal and quantitative parts of the Graduate Record Examination.

Students admitted to the program must complete 78 hours of course work beyond the Bachelor's degree, must successfully pass written and oral comprehensive examinations in three broad subfields of political science, and must pass a final oral examination on the dissertation.

In addition, students must satisfy a research tool requirement. This requirement may be satisfied through either a Master's level graduate course in one foreign language, or by completing 12 hours of coursework, numbered 500 or above, in empirical methodology.

In addition to the total hours required for the degree, the following requirements must also be met:

1. At least 63 hours must be in political science courses.
2. At least 48 hours in political science courses must be in courses numbered 500 or above.
3. Completion of Political Science 510 and 512.
4. At least 6 hours must be earned in political science courses numbered above 600, exclusive of dissertation hours.
5. A total of 24 hours must be earned by writing the dissertation.

MINOR IN ENVIRONMENTAL POLICY

The department participates in a program designed to give Master's level graduate students an opportunity to develop an interdisciplinary specialization in environmental policy.

See Economics for program description.
GRADUATE COURSES

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.

442 Administrative Law (3) Legal dimensions of administrative power, 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.)

458 Government and Politics of the Soviet Union (3) Origins and development of Soviet political system, and study of selected policy areas.

461 Policy Making in Democracies (3) Comparative approach to theory and process of making public policies.

463 Contemporary Middle East Politics (3) Government and movements in Middle East, their characteristics, bases, and interrelationships.

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 Machiavelli to Marx.

500 Thesis (1-15) Prerequisite: Consent of instructor. Maximum 9 hrs.

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

510 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.

522 American Political Thought (3) Systematic examination of the normative and empirical theories of leading American political thinkers from the colonial period to the present.

530 American Government and Politics (3) Survey of literature, approaches to research and analysis, critical examination of major works, and overviews of research in various subfields. May be repeated with consent of department. Maximum 9 hrs.

532 Presidency (3) Systematic examination of the structure, functions and powers of the American presidency as they have evolved from the founding to the present.

533 Congress (3) Formal, empirical and theoretical approaches to and models of the institutional workings of Congress and the behavior of legislators.

535 Mass Political Behavior (3) Theoretical and empirical analyses of public opinion, public socialization, political attitudes and behavior, especially voting behavior.

537 Political Parties and Interest Groups (3) Theoretical and empirical examination of the structure, functions and operations of political parties and interest groups.

539 State and Local Government and Politics (3) Theoretical and empirical analysis of government, politics, policymaking and public administration at the state and local levels.

540 Public Law (3) Selective examination of published research and current approaches in subfields of constitutional law, judicial process, and judicial behavior. May be repeated with consent of department. Maximum 9 hrs.

546 Law and the Administrative Process (3) Constitutional position; decisional processes, regulation and management; limitations on governmental action; questions of structure, role, and administrative choice. May be repeated with consent of department. Maximum 9 hrs.

549 Public Policy Process (3) Theoretical, formal and empirical analysis of the roles, functions and decision making processes of public policymakers, including legislative, executive and judicial actors.

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.

553 Management of Information Systems (3) Theory, design, development, implementation and evaluation of information systems in public organizations. Database systems, computer applications, and training for management information technology.

556 Policy Analysis (3) Strategies and techniques for identification and analysis of public problems and policy solutions. May be repeated with consent of department. Maximum 9 hrs.

558 The Politics of Administration (3) Examination of public administration in context of American political system, policy making and political roles of public administrators and agencies. May be repeated with consent of department. Maximum 9 hrs.

560 Public Budgeting and Finance (3) Technical and political aspects of planning, preparing and adopting government budgets. Management implications of revenue collection, debt management, treasury function, accounting, internal auditing, purchasing, risk management, post-auditing.

562 Public Management (3) Interpersonal and leadership skills, techniques and methods for planning, decision making, and implementation of management strategies in public sector. May be repeated with consent of department. Maximum 9 hrs.


566 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system.

569 Internship in Public Administration (3-9) Open to students participating in approved internship programs. May be repeated with consent of department. Maximum 9 hrs. S/NC only.

570 Comparative Government and Politics (3) Selected topics in modern government. 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, Asian, Latin American, Middle East, Soviet Union, Eastern Europe or Western Europe. May be repeated with consent of department. Maximum 9 hrs.

580 International Politics (3) Survey of literature and major aspects of international politics. May be repeated with consent of department. Maximum 9 hrs.

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

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

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

595 Readings and Special Problems in Political Science (1-3) Prerequisite: Consent of instructor. May be repeated. Maximum 15 hrs.

600 Doctoral Research and Dissertation (3-15) Prerequisite: Satisfactory performance in degree requirements. May be repeated. Maximum 9 hrs.

610 Special Topics in Empirical Theory and Methodology (3) Advanced methods and procedures of analysis in political science. May be repeated with consent of department. Maximum 9 hrs.

615 Formal Political Analysis (3) Assumptions, methods and applications of formal political models, including game theory, rational choice theory, and public choice theory, and mathematical modeling. May be repeated with consent of instructor. Maximum 9 hrs.

628 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.

639 Special Topics in American Government and Politics (3) Advanced study of selected topics. May be repeated with consent of instructor. Maximum 9 hrs.

640 Special Topics in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of public policy. May be repeated with consent of department. Maximum 9 hrs.

642 The Politics of Criminal Justice (3) Selective examination of contemporary problems of research and public policy formulation: criminal process; law enforcement administration; criminal court administration; and prison administration. May be repeated with consent of department. Maximum 9 hrs.

654 Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor. May be repeated with consent of department. Maximum 9 hrs.

660 Contemporary Perspectives on Public Administration (3) Development of theory in public administration; contemporary critiques and alternatives. May be repeated with consent of instructor. Maximum 9 hrs.

667 Comparative Public Administration (3) Comparison of policy-making structures and public policies in selected countries. May be repeated with consent of department. Maximum 9 hrs.

668 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration. May be repeated. Maximum 9 hrs.

670 Special Topics in Comparative Government and Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

682 Theory and Analysis of U.S. Foreign Policy Processes (3) Theoretical approaches to decision making in foreign policy area and analysis of policy-making processes. May be repeated with consent of department. Maximum 9 hrs.

688 Special Topics in International Politics (3) Selected issues and problems in international politics. Specific content determined by instructor. May be repeated with consent of instructor. Maximum 9 hrs.

Polymer Engineering

See Materials Science and Engineering

Psychology

(College of Liberal Arts)

MAJOR

DEGREES

Psychology............................................................. M.A., Ph.D.

Warren H. Jones, Head
of 500- or 600-level foundation courses. Students must earn a grade of B or better in all courses that are to count toward the 30-hour total.

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 the Life Sciences Program. Doctoral study in industrial and organizational psychology is offered through the Intercollegiate Program in Industrial and Organizational Psychology, to which application is made through the Department of Management.

Departmental Requirements

All students in the doctoral program in psychology must obtain a score of at least 630 on the GRE in psychology by the end of the first year, and all students must pass the departmental general psychology examination (a comprehensive, two-day essay exam offered twice each year) by the end of the second year. In addition, each student must pass the doctoral comprehensive exam, complete an acceptable dissertation, and conduct a satisfactory oral defense of the dissertation. All doctoral students must complete a minimum of 73 hours of graduate-level courses, including courses required by their program; at least 3 hours in 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 565 (History and Systems of Psychology), plus at least one course or sequence equivalent from each of four categories in the following list. (This requirement may be met by passing approved written examinations.)
   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.
3. Research practicum (509) - research apprenticeship involving participation in the ongoing research of two different members of the faculty during the first two semesters in the program.
4. Pre-dissertation research project completed during the second year, involving the collection of original data or analysis of existing data, reported in publishable form and acceptable to the doctoral supervisory committee.
5. At least 4 graduate seminars in psychology numbered above 600.

Clinical Psychology

This program is designed to lay the groundwork for a career as a clinical psychologist capable of working in both academic and applied settings. The program emphasizes the theoretical foundations of psychology as well as supervised experience oriented toward the development of practical skills. The program embodies the scientist-practitioner model of 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. Life-span Development (512);
   e. Statistics and research methods (504 Empirical Methods in Psychology plus either 505 Research Design or 557 Applied Psychological Measurement);
   f. Psychopathology (572, 573, 574);
   g. Psychological Assessment (504-505, 506);
   h. Psychotherapy (670, 671, 673, 675);
   i. Ethical, Legal, and Professional Issues (635).
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.

MINOR IN GERONTOLOGY

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


409 Group Facilitation (3) Study of theory and technique through supervised experience in small groups. Prereq: 359 and consent of instructor. May be repeated. Maximum 6 hrs.


420 History and Systems of Psychology (3) History of psychology through Classical approaches and recent developments. Prereq: 110, 210, 220, and 3 upper division courses in Psychology.

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.)


450 Comparative Animal Behavior (3) (Same as Zoology 450.)

459 Comparative Animal Behavior Laboratory (3) Coreq: 450. (Same as Zoology 459.)

461 Physiological Psychology (3) Nervous system and physiological correlates of behavior. Biological basis of emotion, learning, memory and stress. Prereq: 110 or equivalent, 210, and 1 yr of biology or zoology introductory sequences.

469 Laboratory in Physiological Psychology (3) Laboratory studies of nervous system and physiological correlates of behavior. Coreq: 461.

470 Theories of Personality (3) Survey of major theories of human personality and their development. Prereq: 220 and 300 or 330.

480 Theories of Learning (3) Classical and current approaches to learning and cognition. Prereq: 310.


489 Supervised Research (1-9) Prereq: Consent of instructor. May be repeated as long as credit is earned. Maximum 12 hrs in 389, 489, 491, 492, and 493 combined may apply toward undergraduate major.

500 Thesis (1-15) P/F 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 facility time before degree is completed. May not be used toward degree requirements. May be repeated. S/N 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. Learning, validity of studies to maximize validity. Prereq: Consent of instructor. Sp

508 Readings and Special Issues in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

509 Research Practicum (1-3) Required of first-year graduate students in psychology. May be repeated. Maximum 5 hrs. S/W only. Prereq: Consent of instructor. Sp

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. Problem situation from infancy, childhood, and adolescence. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F

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/N only. E

517-19 Proseminar in Industrial and Organizational Psychology (3-3) (Same as Management 567-68.)

520 Interventions for Behavioral Change (3) Principles, techniques for planning, implementing, and evaluating interventions derived from social learning theory. Interventions by people in community: teachers or supervisors. Token economies 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: 110 or equivalent, 210, 330. (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/N 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.

547 Conceptual Foundations of Evolution and Behavior (3) Critical evaluation of seminal writings on theory and methods in comparative analysis of behavior. (Same as Zoology 547.)

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, validity, reliability, and their applications, computerized adaptive testing and other tests. Prereq: Statistics 537-538 or equivalent. May be repeated. Maximum 6 hrs.

557 Applied Psychological Measurement (3) Issues and techniques in applying psychological measurement (same as organizational, clinical, and community research. Prereq: Statistics 537-538 or equivalent or consent of instructor. May be repeated. Maximum 6 hrs.

558 Interviewing and Observation (3) Sensitizing students to own feelings and beliefs and to feelings of interviewee, and analysis of language content, style, and body language. Exploration of various important aspects of interviewee’s life. Prereq: Admission to doctoral program in psychological or consent of instructor. Coreq: 556.

559 Laboratory in Interviewing and Observation (1) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 558.

560 Psychology of Learning (3) Review of current evidence from research involving human and/or nonhuman animals. Prereq: 409 and consent of instructor. May be repeated. Maximum 6 hrs.

565 History and Systems of Psychology (3) History of philosophy concerning psychology. Major systems of psychology emerge during 20th century. Prereq: Graduate standing. Sp

570 Personality: Theory and Research I (3) Advanced survey of psychodynamic and neo-Freudian approaches to personality; related research. Prereq: Admission to clinical program or consent of instructor.

571 Personality: Theory and Research II (3) Advanced survey of behavioral and humanistic approaches to personality; related research. Prereq: Admission to clinical program or consent of instructor.

572 Descriptive Psychopharmacology (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.

575 Psychopharmacology (3) Connections between pharmacology and psychology. Prereq: Consent of instructor.

576 Object Relations (3) European and American concepts of normal and psychopathological development of object relations. Significance for psychotherapy, psychodynamic, and psychoanalytic theory. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

578 Clinical Aspects of Human Sexuality (3) Variation in human sexual behavior. Theories of etiology, treatment. Prereq: Consent of instructor.

580 Research Questions and Designs (3) Question-asking process in research and strategies or designs through which answers might be derived. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

583 Seminar in Gerontolgy (1) (Same as Human Ecology 585, Educational and Counseling Psychology 585, Nursing 585, Public Health 585, Human Performance and Sport Studies 585, Social Work 585, and Sociology 585.)

593 Independent, Off-campus, or Foreign Study (1-15) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/N only.

594 Psychological Assessment I (3) Basic concepts and techniques of adult assessment. Intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

595 Psychological Assessment II (3) Basic concepts and techniques of adult assessment. Intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

596 Laboratory in Psychological Assessment (1) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 596. May be repeated. Maximum 4 hrs. S/N only.

597 Evaluation of Development in Childhood (3) Structural and projective tests and interview techniques for evaluation of intellectual, personality, and social development in childhood. Prereq: 511 and admission to
Religious Studies
(College of Liberal Arts)

Charles H. Reynolds, Head

Professors:
Dungan, David L., Th.D. Harvard
Heffernan, Thomas (Adjunct), Ph.D. Cambridge
Humphreys, W. Lee, Ph.D. Mission
Linge, David E., Ph.D. Vanderbilt
Lusby, F. Stanley (Emeritus), M.Div.
Norman, Ralph V., Jr., Ph.D. Colgate Rochester
Reynolds, Charles H., Ph.D. Harvard

Associate Professors:
Fitzgerald, James L., Ph.D. Chicago
Gwynne, Rosalind W., Ph.D. Washington
Hackett, Rosalind I. J., Ph.D. Aberdeen
Hedges, John O., Ph.D. Chicago
Levener, Miriam L., Ph.D. Harvard

Assistant Professors:
Hulsether, Mark, Ph.D. Minnesota
Schmidt, G., Ph.D. Pittsburgh
Tober, Linda (Adjunct), Ph.D. Vanderbilt

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 Nicolas of Cusa to nineteenth-century German Idealists. (Same as Philosophy 411.)

412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) Investigation of selected writings and philosophical problems of traditions of Sankhya, 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.

445 Theoretical Issues in Medical Ethics (3) (Same as Philosophy 445.)

490 Readings and Research in Religious Studies (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

499 Prospects 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.

532 Topics in the History of Religions (3) Prereq: Consent of instructor.

533 Topics in Religious Thought (3) Prereq: Consent of instructor.

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

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

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

Romance and Asian 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, D.U.P. Sorbonne
Cobb, Carl W., Ph.D. Tulane
Elliott, Jacqueline C. (Emeritus), M.A. Illinois
Handelsman, Michael H., Ph.D. Florida
Hefflin, William H., Ph.D. Florida State
Irvine, Thomas B. (Emeritus), Ph.D. Princeton
Maurino, Ferdinando D. (Emeritus), Ph.D.
Petroska, Maria (Emeritus), Ph.D. Kentucky
Pinkney, Clara (Emeritus), Ph.D. California
Rivera-Rodas, Oscar (Liaison), Ph.D. California
Romeiser, John B. (Liaison), Ph.D. Vanderbilt
Vazquez-Big, A. M. (Emeritus), Ph.D.
Wallace, Albert H. (Emeritus), Ph.D.
Washburn, Yulan M., Ph.D. North Carolina
Young, Dolly, Ph.D. North Carolina

Assistant Professors:
Campion, Edmund J., Ph.D. Yale
Criel, Bryant, Ph.D. California
DeRycke, Robert M., Ph.D. Illinois
DiMariani, Salvatore, Ph.D. Wisconsin
DiPuccio, Denise M., Ph.D. Kansas
Duncan, Cynthia K., Ph.D. Illinois
Lav, Karen D. (Liaison), Ph.D. Kentucky

Associate Professors:
Beauvoux, Margarat, Ph.D. Texas
Brizio, Flavia, Ph.D. Washington
Cazeneve, Odile, Ph.D. Pennsylvania
Da Cruz, Jose, Ph.D. California
Ehrlich, Linda, Ph.D. Hawaii
Holm, Christine, Ph.D. Wisconsin
LaCure, Jon, Ph.D. Indiana
Nakuma, Constance, Ph.D. Sorbonne
Wilkinson, Douglas, Ph.D. Yale
Young, Dolly, Ph.D. Texas

The Department of Romance and Asian Languages offers two advanced degrees: the Master of Arts in French and in Spanish and the
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, 560. 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 coursework beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. Two tracks are available.

The coursework for Track I must be distributed as follows: (1) at least 39 hours in the first concentration; (2) at least 18 hours in the second concentration; and (3) at least 6 hours in a cognate field.

1. First Concentration: French, German, or Spanish. It consists of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:
   - A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.
   - 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 consists of at least 18 hours of courses beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.
3. Cognate Field: Six hours must be in graduate courses numbered 400 and above in a field outside 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.
   - The coursework for Track II must be distributed as follows: (1) at least 45 hours in the first concentration; (2) at least 12 hours in the second concentration; and (3) at least 6 hours in a cognate field.
   - First Concentration: French or Spanish. It consists of 45 semester hours beyond the Bachelor's degree, distributed as follows:
     - A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.
     - A minimum of 27 hours at the 500 level (exclusive of thesis hours) including French 584 (3) or Spanish 550 (3); French 512 (3) or Spanish 512 (3); and French 516 (2) or the appropriate Spanish course.
     - At least 12 hours at the 600 level (exclusive of dissertation hours).
   - Second Concentration: French, German, Italian, Portuguese, Russian, or Spanish (different from the first concentration). It consists of at least 12 hours, with a minimum of 3 hours at the 500 level. Students are encouraged to take classes that complement the primary area of expertise in the first concentration, so that this second concentration will be a useful research tool for the dissertation and future professional activities. Because Track II students will have taken 12 graduate hours instead of 18 hours in the second concentration, they will normally not be eligible to teach that language at institutions which follow SACS guidelines for college foreign language teaching.
   - Cognate Field: Six hours must be in courses numbered 400 and above and in a field outside the candidate'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 for both tracks: A student must demonstrate competence in the languages of both the 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).

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

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct at least two foreign languages, subject to staffing needs. Doctoral students are strongly encouraged to reside and study abroad and will be assisted in identifying potential sources of financial support (e.g., Fulbright, McClure, Rotary fellowships).

For additional courses, see Germanic and Slavic Languages.

ACADEMIC COMMON MARKET

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

Asian Languages

GRADUATE COURSES

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.

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 Pléiade. Prereq: 212, 218 or equivalent.
413 French Literature of the 18th Century (3) Major works of Enlightenment. Prereq: 212, 218 or equivalent.


416 Survey of Francophone Literature (3) Examination of French literature outside metropolitan France, particularly Africa and Caribbean. Prereq: 212, 218 or equivalent.

420 French Cinema (3) French cinema from earliest days through New Wave directors. Prereq: 212, 218 or equivalent. May apply toward major.


422 Advanced Grammar (3) Improving one's written French by studying basic and more refined structures of French language. Writing free-style compositions. Prereq: 342 or 345.

423-4 Advanced Conversation (1,1) Informal conversation with native speaker on contemporary topics. Stresses in-class contact rather than outside preparation. Prereq: 342 or 345. 2 hrs weekly.

425 Introduction to Descriptive Linguistics (3) Phonetics and phonemics, morphology and syntax. Type of languages, family, groups, dialects, and dialect geography. Application of descriptive linguistics—field linguistics, dialect study; its practical use in learning languages and in language teaching. Introduction to transformational grammar. Prereq: 6 hrs of upper-division English or 6 hrs of upper-division courses in a modern or ancient language (exclusive of German and French 301-02, courses in literature in translation, and general courses in Latin and Greek requiring no knowledge of these languages), or consent of department. (Same as German 425, Russian 425, Spanish 425, and Linguistics 425.)

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

428 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. (Same as Spanish 429 and Linguistics 429.)

430 Theatrical French (2-3) Performance in one or more French plays. Prereq: 212, 218 or equivalent and consent of instructor. May apply toward major.

431 Highlights of French Civilization (3) Survey of French civilization from the Gauls to World War II. Historical events, daily life, all forms of art. Prereq: 212, 218 or equivalent.

432 Contemporary French Culture (3) French contemporary civilization and culture since World War II. Problems, trends, and organization of French society today. Prereq: 212, 218 or equivalent.

434 Literature of Quebec (3) Survey of literature of Quebec as well as French literature connected with North America. Readings include explorer and missionary works, such as Voyages of Champlain and Journals of Jau utility and history of contemporary Quebec. Prereq: Intermediate French or equivalent.

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

501 Techniques in Literary Analysis (2) Required for M.A. program. Intensive course in explication de texte, a close stylistic analysis of texts representative of different eras and of different literature. Prereq: 212, 218 or equivalent.

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

512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic language skills and foreign language skills; and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.


531 French Literature of the 16th Century I (3) Literature of first half of 16th century; Rabelais and other prose writers, humanists, and poets of Maecis, Lyonnais group, and young Pélissier poets. Prereq: French 426, Russian 426, Spanish 426, and Linguistics 426.

532 French Literature of the 16th Century II (3) Literature of second half of 16th century, mature works of Pélieade writers and such poets as d'Aubigné and Sponde; Montaigne; writers of scientific works and memoirs; drama. Prereq: French 426, Russian 426, Spanish 426, and Linguistics 426.


542 French literature of the 17th Century II (3) (Classical) French theatre of 17th century.


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. Prereq: French 426, Russian 426, Spanish 426, and Linguistics 426.

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

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

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

Italian

401 Dante and Medieval Culture (3) Introduction to significance of this great Italian writer. Prereq: 212 or consent of instructor.

402 Petrarch and Boccaccio (3) Prereq: 212 or consent of instructor.

403-04 Literature of the Rinascimento (3,3) From Dante to Tasso, Guadernino and Cinquecento. Prereq: 212 or consent of instructor.

405 Modern Italian Poetry (3) From Pazzolato to Montale. Prereq: Italian 212 or consent of instructor.

406 The Modern Italian Novel (3) From Manzoni to Calvino. Prereq: 212 or consent of instructor.

409 Directed Readings (3)

410 Italian Theatre (3) Survey of Italian theatre from Renaissance to present. Prereq: Intermediate Italian or consent of instructor.

421 Topics in Italian Literature and Cinema (3) Italian literature and cinema from 1930 to present focusing on literary works translated into English and adapted into film. Investigation of relationship between literature and cinema and achievement of greater understanding of Italian culture since 1930. Films in Italian with English subtitles. May be repeated.Maximum 6 hrs. (Same as Cinema Studies 421.)

510 Readings in Italian Literature (Topics vary). May be repeated with consent of department.

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

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

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

Portuguese

GRADUATE COURSES

431-32 Topics in the Language & Literature & Portuguese-speaking World (3,3) Outstanding works of literature and culture from Portuguese countries. Topics may vary. Prereq: At least one course at the 300 level or the equivalent. May be repeated. Maximum 12 hrs.

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

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

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

Spanish

GRADUATE COURSES

421 Phonetics (3) Prereq: Intermediate Conversation and Composition or consent of instructor.

422 Advanced Grammar (3) Finer points of grammatical structures. Required of all majors. Native speakers must receive consent of instructor. Prereq: Intermediate Conversation and Composition or consent of instructor.

423-24 Advanced Conversation (1,1) Conversational and written Spanish for pre-professionals. Native speakers must receive consent of instructor to take course. Prereq: Intermediate Conversation and Composition or consent of instructor. Prereq for 423: 422 or consent of instructor.

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

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

429 Romance Linguistics (3) (Same as French 429 and Linguistics 429.)

431 Spanish Civilization (3) Major social, political, and cultural achievements of Spanish people from origins of their civilization until today. Prereq: 311, 312 or equivalent.


450 Hispanic Drama (3) Close reading and analysis of representative works by selected dramatists of Spain and Spanish America. Topics vary. Prereq: Aspects of Spanish and Spanish-American literature or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

451 Hispanic Prose (3) Close reading of selected works of prose fiction and essays by major writers from Spain and Spanish America. Topics vary. Prereq: Aspects of
Spanish and Spanish-American Literature or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

452 Hispanic Poetry (3) Major poets of each period, either Spanish or Spanish-American. Topics vary. Pre-req: Aspects of Spanish and Spanish-American Literature or consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

459 Capstone Colloquium in Spanish (3) Integrative experience. Broad range of issues and topics that affect much of Spanish-speaking world and also involve those who specialize in Hispanic studies. Pre-req: 311, 312 or equivalent.

461 Special Topics (3) Aspect of Hispanic literature, culture, linguistics, or foreign language pedagogy. Topics vary. May be repeated with consent of department. Maximum 6 hrs.

471 Latin American Civilization (3) Latin America's diverse heritage and major social and political institutions. Pre-req: 311, 312 or equivalent.

473-74 Survey of Spanish American Literature (3,3) 473-Historical survey from Conquest to late 19th century. 474—Major literary movements, writers and works of 20th century. Pre-req: 311, 312 or equivalent.

479 Social Protest Literature of Latin America (3) Analysis of literature as means of unmasking social ill that have traditionally beset Latin America, Indigenismo, Black literature, and the role of the writer in Latin American society. Pre-req: 311, 312 or equivalent.

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

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

512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic language skills and cultural aspects through seminars, conferences, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.

522 Advanced Communication Skills for Teachers and Other Professionals (3) Advancement of oral and written proficiency in Spanish through extensive use of authentic contemporary materials; class lectures and discussions; oral and written presentations and reports. Especially recommended for graduate students, teachers, and other professionals seeking to maintain or enhance high level communicative competency.

531 Old Spanish (3) Old Spanish language and medieval Spanish literature through 13th century.

532 Medieval Spanish Literature (3) Spanish literature of 14th and 15th centuries.

533 Golden Age Prose (3) Wide range of prose fiction in Spain during 16th and 17th centuries: Moorish, picaresque, sentimental, pastoral and exemplary novels, and dialogues.

534 Don Quijote (3)

535 Golden Age Poetry (3) Garcilaso, Fray Luis de León, San Juan de la Cruz, Lope de Vega, Quevedo, and Góngora.

537 Golden Age Drama (3) Major dramatists of period: Lope de Vega, Tirso de Molina, Ruiz de Alarcón, Guillén de Castro, Calderón de la Barca, Moreto, and Rojas Zorrilla.


543 The 20th-Century Spanish Novel (3) Baroja, Azorín, Valle-Inclán, Pérez de Ayala, Cela, Delibes, Goytisolo, Maladre, and at least one present-day novelist.

545 Modern Spanish Poetry (3) From Bécquer, Unamuno, A. Machado, Jiménez, Lorca, Guillén, Alexandre, and a contemporary, Celaya.

547 Modern Spanish Drama (3) Major playwrights of 20th-century Spain.

550 Techniques of Literary Analysis and Research Methods (3) Theoretical and critical essays on various techniques of literary analysis. Exploration of bibliographical and research materials.

551 Special Topics in Spanish or Spanish American Literature (3) May be repeated. Maximum 6 hrs.

552 Directed Readings (3)

561 Spanish American Colonial Literature (3) From pre-Columbian era through 18th century. Reading and pre-analysis of selected works from Colonial Spanish American period and their Continental sources. Indigenous texts and authors.

562 Nineteenth-Century Spanish American Literature (3) From early nineteenth century to 1880. Content varies with regard to genre, theme, literary movements, or other aspects contributing toward definition of Spanish American literature.


565 The Spanish American Novel: Chile and the River Plate Nations (3) Novels from Chile, Argentina, Uruguay and Paraguay. Modern period.


567 Contemporary Spanish American Poetry (3) Major poets in Spanish America from post-modernismo to present day.

568 Spanish American Drama (3) Major playwrights of 20th-century Spanish America.


570 The Spanish American Short Story (3) Short story by major writers in Spanish America from Romanticism to present day, theory and criticism of genre.

571 Foreign Study (1-15) See College of Liberal Arts.

572 Off-Campus Study (1-15) See College of Liberal Arts.

573 Independent Study (1-15) See College of Liberal Arts. Letter grade or S/N.

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 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.

E. M. Green, Head

Professors:

Associate Professors:

Assistant Professors:

Residents:

Interns:

See Veterinary Medicine for program description.

GRADUATE COURSES

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

501 Special Topics in Large Animal Medicine and Surgery (1-4) May be repeated. Maximum 6 hrs. E

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

Professors:
The Master's Program

The Master of Science in Social Work program prepares social workers to provide professional leadership in: 1) the direct provision of social work services and 2) social welfare administration and planning. These objectives are met through a curriculum requiring of all students a professional foundation and a concentration in either social work treatment or social welfare administration and planning.

Admission Requirements

Admission to the Master's program is based on the following requirements:

1. A Bachelor's degree from an accredited college or university with appropriate preparation in the social sciences. At least three-fourths of the applicant's undergraduate work should be in the social sciences, humanities, physical sciences, and other liberal arts subjects. Those with other academic backgrounds should request consultation regarding ways in which they might be admitted.
2. A grade-point average of 2.7 on a 4.0 scale, with preference given to applicants with 3.0 and above.
3. Personal qualifications acceptable for entrance into the professional practice of social work.

Preference is given to applicants with a 3.0 average in undergraduate work and substantial preparation in the social sciences. Applications should be filed no later than March 1 for the year in which admission is desired.

Advanced Standing

The University of Tennessee College of Social Work has an advanced standing program. Admission to advanced standing requires: (1) a B.S.W. from an accredited program, (2) an overall undergraduate GPA of 3.0 or greater, and (3) personal qualifications acceptable for entrance into the professional practice of social work. Students admitted into advanced standing are required to complete a minimum of 42 hours of study in either of the college's concentrations - social work treatment or social welfare administration and planning. These students will follow the curriculum plan and meet all requirements of the concentration during three semesters of study in the program.

Specific information about the advanced standing program is available from the college. Application for admission to the advanced standing program is through the regular admission process.

Extended Study

Planned part-time programs are available in all three branches of the college. Admission requirements are the same as for full-time study. Coursework can be completed over a three- or four-year period. One year of the student's period of study must be on a full-time basis.

Financial Aid

Students may apply directly to the University's Financial Aid Office for assistance such as the National Direct Student Loan or the Work-Study Program. Other stipends are administered by the College and awarded on the basis of financial need. Applications for these funds must be made to the Branch of the College the student will attend. A student must first apply for University assistance, since College funds are considered supplementary to those of the University. Additional information about College stipends may be obtained from the College of Social Work.

General Requirements

1. A minimum of 57 semester credit hours including a) completion of foundation courses and field practice (15 hours), b) the course Social Work with Oppressed Populations (3 hours), and c) at least six courses (18 hours) and three semesters of field practice (15 hours) in the social work treatment concentration or at least four courses (12 hours) and two 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 Professional Foundation Curriculum

The foundation curriculum is a 15-semester hour sequence of five basic areas required of all students before entering either of the concentrations. As the initial phase of the educational program, the foundation curriculum contributes to the process of professional identification while presenting a comprehensive and broad knowledge base from which to operate in the future as practitioners, supervisors, administrators, and planners.

Upon completion of the foundation curriculum (at the beginning of the second semester), students select a concentration in either social work treatment or social welfare administration and planning.

Social Work Treatment: The social work treatment concentration provides the educational basis for practice with individuals, families, and groups in order to enhance their social functioning, ameliorate problems, and prevent social dysfunction. The concentration provides knowledge of theory and methodology basic to individual, family, and group methods applicable in the treatment of diverse client problems.

Social Welfare Administration and Planning: The social welfare administration and planning concentration provides the educational basis for leadership in the design, implementation, and continued development of effective human service programs at local, regional, and state levels. This concentration emphasizes theory and skills related to administration and planning, and permits considerable flexibility in tailoring a program to fit the student's individual interests, capabilities, and career goals.

Field Practice

Field instruction is a critical component of the student's first- and second-year programs. Through cooperation with a wide range of social agencies and human service programs throughout Tennessee, the college is able to provide field placements in a variety of social work practice areas. The faculty works closely with the placement agencies and the field instructors to ensure that students have quality field practice experiences, meeting the objectives of the core curriculum and the concentration.

The college uses a concurrent class and field plan. Students are in field two days per week during the first year and three days per week in the second year.

First-year agency placements are selected to provide practice experiences related to the foundation curriculum content and beginning concentration. Within the placement, each student's experiences are planned and designed according to educational objectives. Second-year placements are selected according to the student's area of concentration, individual career interests, and educational needs. The student actively participates with the field practice coordinator and the educational committee in selection of the second-year placement. The second-year field placement experience focuses on the integration of social work knowledge and values, and emphasizes the acquisition and development of practice skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over scheduled University breaks and may result in variations in holidays and office hours for the student.

Transfer Credits

Coursework equivalent to the first year of the Master's program, completed in another accredited graduate social work program, is usually accepted toward degree requirements. Applicants must meet the admission requirements of The Graduate School and the College of Social Work. Transfer courses must be approved as equivalent to required and/or elective courses taken for graduate credit and passed with a grade of B or better. An S (earned on an S/NC system) for the field practicum is also accepted. In addition, transfer courses
must be part of an otherwise satisfactory graduate program (B average) and be approved by the dean. This coursework must be completed within the six-year period prior to the receipt of the degree.

A maximum of 6 semester credits from work earned in disciplines other than social work may be transferred as elective credits. The student's academic committee must approve the request and the transfer credit must meet Graduate School requirements.

**Proficiency Examination**

Students in the Master's program may earn a maximum of nine hours by proficiency examination, with the exception of field practice courses. Students interested in proficiency examinations are referred to The Graduate School statement describing the procedure for applying for examination.

**THE DOCTORAL PROGRAM**

The College of Social Work offers the Doctor of Philosophy with a major in Social Work. The focus of social work education at the doctoral level is to foster the development of an attitude of scientific inquiry, knowledge of the scientific method, ability to extend the knowledge base of social work practice, and effective participation in leadership roles in social work education, research, and practice.

The emphasis of the doctoral program is upon:

- The analysis of direct intervention and social administration and of the interrelationships 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 Master'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 coursework, 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, research design, 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 begun during the first year of study. The elective requirement is completed and dissertation research begun in the second year of study, and dissertation research is continued in the third year of study. While it is generally expected that the coursework will be completed on a full-time basis, dissertation research can be completed on a part-time basis.

Specific courses required are 601, 602, 612, 613, 540, and Statistics 531 and 532 or any two graduate level statistics courses approved by the Doctoral Program Chair.

**Examinations**

All doctoral students are required to pass a qualifying examination and a comprehensive examination. The qualifying examination covers the foundation curriculum. The comprehensive examination is administered by members of the doctoral committee and is designed for the student to demonstrate comprehensive knowledge of the major and cognate areas and the dissertation topic. In case of failure of either examination, the student may request a retake. The result of the second examination is final.

**Financial Aid**

Financial aid is available to qualified students in the form of fellowships, scholarships, and teaching and research assistantships. Graduate assistantships and other forms of assistance are awarded on the basis of merit and interest to applicants who are accepted into the Ph.D. program.

**MINOR IN GERONTOLOGY**

Graduate students in the College of Social Work may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with a concentration. Please refer to Human Ecology for specific requirements.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. 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 Admissions Specialist in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

NOTE: 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.

**500 Registration for Use of Facilities (3-15)**

Required for the student not otherwise registered during any semester when instruction and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. **S/NC only.**

**500 Practicum in Social Work Research (3-6)**

Supervised practicum in application of research methods to social work. Prereq: 510 and consent of faculty conducting investigation. May be repeated. **Maximum 6 hrs. S/NC only.**

**500 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nutrition 509, Physical Education 509 and Nursing 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 utilization of research. Prereq: Admission to college or consent of instructor. **F**

**512 Social Work Practice (3)**

Basic theory, values, and methodology generic to social work practice at various system levels presented from an 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, structures, roles, and processes. Systems conceptualized along functional-dysfunctional and normal-deviant continuum: stress, development, and maturation. Open systems approach to understanding of biological, psychological, and social variables, implications of culture, race, ethnicity, and gender. Prereq: Admission to college or consent of instructor. **F**

**516 Social Welfare Policy and Services (3)**

Development of contemporary social policy at local, state, national, and international levels. Contribution of social work profession to formal policy-making process through governmental and non-governmental channels. Determination of which aggregate social welfare services are proposed, authorized, financed, and programmed. Theories of complex organizations applied to social welfare service delivery settings. Prereq: Admission to college or consent of instructor. **F**

**518 Social Work with Oppressed Populations (3)**

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, handicapping conditions, ethnicity and race. Prereq: Admission to college or consent of instructor. **F**

**520 Social Work Treatment with Individuals and Families (3)**

Nature and process of practice with individuals and families in helping them resolve or cope with problems of living. Working with disadvantaged clients and enhancing client confidence. Prereq: Foundation or consent of instructor. **Sp**

**522 Social Work Treatment with Groups (3)**

Theories and practice of social work with small groups. Treatment groups, task groups. Prereq: Foundation or consent of instructor. **F**

**524 Psychopathology and Social Deviance (3)**

Theories of and recent research in etiology of psychiatric dysfunction and social variance. Categorical approach to psychopathology. Prereq: Foundation or consent of instructor. **F**

**526 Research for Assessment of Social Work Treatment (3)**

Application of research methods for assessment of social work treatment. Prereq: Foundation, 520 or 522, or consent of instructor. **F,Sp**

**530 Seminar in Social Work Treatment (2-3)**

Topics in theory and practice of social work treatment with individuals, couples, families, and groups. Prereq: Foundation and 520, or consent of instructor. Required for group treatment. 522. May be repeated. **Maximum 6 hrs.**

**531 Family Therapy in Social Work Practice (3)**

Major family therapy models, perspectives on family dynamics and interaction, and techniques of treatment and their application to families from diverse social and cultural backgrounds. Prereq: Foundation and 520, or consent of instructor. **F**
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 relationship to treatment, and skills for problem resolution. Prereq: Foundation and 520, or consent of instructor.

534 Social Work Treatment with Children and Adolescents (3) Examination of various treatment modalities for assessing and treating children and adolescents. Prereq: 520 and 522, or consent of instructor.

540 Administration of Social Welfare Programs and Services (3) Analysis of organizations and provision of services to clients. Models of social welfare administration, their historical perspectives, context for designing organizational structure and processes, planning, developing, and implementing agency policies and programs, and management of service delivery systems. Prereq: Foundation or consent of instructor. Sp

542 Financial Management and Resource Development in Social Welfare Administration (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 in Social Welfare Administration (3) Administrative and leadership skills required for management and development of human resources within context of organization and its environment. Prereq: Foundation or consent of instructor.

550 Seminar in Social Welfare Administration and Planning (2-3) Areas and issues relating to methods and techniques of social welfare administration and planning. Prereq: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.

551 Seminar in Social Welfare (2-3) Social welfare problem area or field of practice. Prereq: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.

552 Community Organization (3) Locality development, social planning, and social action as practice modes to development of resources to meet human needs. 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.

561 Field Practice (3) Instruction and supervision in social work practice. Prereq or coreq: 512, 520, or 524. S/N only.

581 Field Practice (3) Instruction and supervision in social work practice. Prereq or coreq: 512, 520, S/N only.

582 Field Practice (6) Instruction and supervision in social work practice. Prereq or coreq: 512, 520, S/N only.

583 Field Practice (6) Instruction and supervision in social work practice. Prereq or coreq: 512, 520, S/N only.

584 Field Practice (2-6) 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 (1-5) Only. E

601 Research for Social Work Practice I (3) Epistemological and methodological considerations for both qualitative and quantitative 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. F

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. F

611 Social Work Practice I (3) Critical analysis of knowledge bases of major practice modalities in direct intervention. F

613 Social Work Practice I (3) Critical analysis of knowledge bases of major practice modalities in indirect intervention. F

614 History of American Social Work (3) Social, cultural, economic and political contexts for development of social work profession, development of education for profession, and modern welfare system. F

660 Issues in Social Work Knowledge Building (3) Advanced seminar in theory and model building in direct intervention, administration and planning. Prereq: First year required Ph.D. courses or consent of instructor. May be repeated. Maximum 9 hrs. F, Sp

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

694 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


537 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

538 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

608 Applied Research for Social Work Practice, Programs and Policy (3) Techniques and strategies for quantitative and qualitative analysis for social policy. F

580 Field Practice (3) Instruction and supervision in social work practice. Prereq or coreq: 512, S/N only.

Sociology (College of Liberal Arts)

MAJOR

SOCIOLOGY (M.A., Ph.D.)

Michael L. Benson, Head

Professors:

Betz, D. Michael, Ph.D. ................ Michigan State
Black, James A., Ph.D. .................... Iowa
Cleland, Donald C., Ph.D. ............... Michigan State
Hastings, Donald W., Ph.D. ............. Massachusetts
Hood, Thomas C., Ph.D. ............... Duke
Ploch, Donald R., Ph.D. ............... North Carolina
Shover, Neal, Ph.D. ..................... Illinois
Wallace, Samuel E., Ph.D. .............. Minnesota

Associate Professors:

Benson, Michael L. Ph.D. .............. Illinois
Cable, Sherry, Ph.D. ..................... Penn State
Gaventa, John P., Ph.D. ............... Oxford
Kurth, Suzanne B., Ph.D. ............. Illinois (Chicago)
Perrin, Robert G. (Liaison), Ph.D. .... British Columbia

Assistant Professor:

Jalata, Asafa, Ph.D. ............. SUNY (Binghamton)

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 Sociology 540, 551, 653, and 655. The energy, environment and resource policy concentration includes 560, 563, 661, 662, and 665. The political economy concentration includes 504, 540, 641, 643, 644, and 645. Both the Master's and the doctoral program allow for the construction of individualized programs of study. Detailed information may be obtained from the Director of Graduate Studies in Sociology. All incoming students will be advised by the Director of Graduate Studies. New students are admitted in fall semester only and applications must be received by the Graduate Admissions and Records Office by January 1.

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 degree is a major in one of the social sciences, for the M.A. program; Master's degree in one of the social sciences for the doctoral program).

THE MASTER'S PROGRAM

Thesis Option

A minimum of 30 hours beyond the baccalaureate degree, including 24 hours of coursework and 6 hours of Thesis 500, is required. Students must complete Sociology 521, 531, Statistics 531, and one foundation course (504, 505, or 560). At the end of all coursework, the student must take an oral examination on course material and thesis. The examination will be administered by the student's committee.

Non-Thesis Option

A minimum of 30 hours of coursework is required, including Sociology 521, 531, Sociology 531, and one of the following: 504, 505, or 560. Sociology 653, 651, and Statistics 532 are recommended. Sociology courses at the 400 level may be taken with the approval of the student's committee. A student's plan of study should follow one of the following approaches: Plan 1, 6 hours in one of the department's concentrations and 6 hours in a
second area, including areas outside the department, subject to the approval of the student's advisor and the Graduate Program Committee. Students are encouraged to prepare a paper synthesizing their knowledge of the concentration(s). Students who incorporate supervised field experience in their programs are encouraged to prepare a report based on those experiences that demonstrates their understanding of research, theory, and report writing. All students must take final written and oral examinations that include questions on general coursework in theory and methods and on their areas of study.

Subject to approval by the student's committee, up to 12 hours may be taken in courses outside the department for either program.

THE DOCTORAL PROGRAM

Coursework

Twenty-four hours of coursework beyond the Master's degree are required. Twelve hours of course credit in Sociology at the 600 level are required. Students who enter the program without the courses required for the M.A. degree (521, 531, 537) or their equivalents must take these remedial work which does not apply to their residence. Students must complete Sociology 522: 594, 563, 633, or 636, and Statistics 532 or another advanced course in statistics. Completion of 9 hours in each of two concentrations is encouraged. A student who cannot achieve her/his 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. 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 (sociological theory, research methodology, and two substantive areas). Doctoral students are eligible to take the theory and methodology examinations whenever offered. Substantive examinations may be taken upon completion of theory and methodology examinations. Detailed information on examinations and examination options (generalist, specialist, and collateralist) 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.

MINOR IN GERONTOLOGY

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

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

405 Sociology of Sport (3) Social meaning, organization, and processes of sport. Prereq: 291 or consent of instructor. (Same as Physical Education 405.)

414 Sociology of Health Care (3) Organization of health care facilities, staff-patient relationships, demographic characteristics, and prevalence of disease.

415 Sociology of Aging (3) How roles and statuses change with age in relation to major social institutions; impact that rapidly increasing number of older people has on society, affecting society on older people.


455 Society and Law (3) How laws and legal processes are affected by social change, social impact of legal sanctions, relations between law and social justice.

450 Organizational and Corporate Crime (3) Analysis of crime and deviance committed by organizations. Case studies of corporate 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 SOCIOLOGICAL THEORY AND SOCIAL CHANGE (3) Sociological theories and social change. (Same as English 473.)

480 AIDE To Agricultural Technology (3) (Same as Biological Science 480.)

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

520 CRIMINOLOGY (3) SURVEY OF CRIMINOLOGY (3) (Same as Criminal Justice 520.)

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 developments in criminology, theories of crime causation and theories of responses to crime. Prereq: 350 or equivalent.

507 Foundations of Social Psychology (3) Current and classical theoretical perspectives in social psychology.

510 Teaching Sociology (3) Art and craft of teaching sociology from curricular considerations through teaching techniques. May be repeated. Maximum 6 hrs.

521 Sociological Theory I (3) Assessment of what sociological theory is; its major figures and their approaches to understanding society.

531 Research Methods in Sociology (3) Research designs, measurement, sampling, qualitative and quantitative data collection techniques, data, reduction, and analysis.

534 Advanced Sociological Analysis (3) Unifying assumptions and logical procedures used by sociologists in relating elements of sociological research strategies and techniques.

540 OCCUPATIONS (3) Occupational and family sociology, economic stratification, and social organizations.

541 Collective Behavior, Social Movements, Social Change (3) Basic theory and research on conditions of social change in human collectivities and efforts of collectives to change existing society.

542 Sociological Aspects of Sports and Physical Education (3) (Same as Physical Education 542.)

543 Sociology of Development (3) Sociological theories and methods of development: modernization, colonialism, 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 measures of demographic variables, life table analysis, 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 College of Liberal Arts.

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

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

594 Social Theories of Sport (3) (Same as Physical Education 594.)

595 Special Topics in Rural Sociology (1-3) (Same as Rural Sociology 595.)

599 Readings (3) Selected topics. May be repeated. Maximum 6 hrs.

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

622 Sociological Theory II (3) District 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. Prerequisite: Comprehensive examination. Prereq: Consent of instructor. S/C only.

633 Survey Design and Analysis (3) Systematic exploration of survey research techniques through student participation in design and analysis of surveys. Prereq: 531 or consent of instructor. (Same as Child and Family Studies 533.)

636 Field Research (3) Research experience in selected field sites using techniques of interviewing, partici-
The Stokely Institute curriculum comprises three seminars which are offered once annually during the summer term. The seminars are interdisciplinary in focus and are taught by faculty representing the humanities and fine arts, the natural sciences and the social sciences. The content of the three seminars embraces those three major areas of inquiry in the liberal arts, with an emphasis on understanding the characteristic methods and goals of each mode of inquiry and the kind of knowledge each mode yields. Seminar participants are encouraged to think critically and to reflect on the intellectual and practical implications of their learning.

Additional department offerings may be included with most of the coursework offered by the departments of Special Services Education and Rehabilitation Counseling. Consultants in a variety of special education programs providing services to people certified as mentally retarded, learning disabled, emotionally disturbed, gifted, physically disabled, multiply disabled, and socially or emotionally disturbed.

Special Services Education

MAJORS

Special Education .................................. M.S. Rehabilitation Counseling .................. M.S. Education ................................. Ph.D.

Special Services Education

(College of Education)

MAJORS DEGREES

Special Education .................................. M.S. Rehabilitation Counseling .................. M.S. Education ................................. Ph.D.

Laurence J. Coleman, Head


Assistant Professors: McLean, J. D., Ph.D. .......... Chicago Warden, K., Ph.D. .......... 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

Special Education

The department offers two tracks for the Master’s degree in Special Education for all areas of concentration. Track 1 is for students who are already licensed to teach in special education or a related field or those who are seeking a master’s degree without teacher licensure. Track 2 is for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

An area of concentration may be selected from the following: early childhood special education, general special education, or education of the hearing impaired.

Track 1 students select coursework based on their area of concentration as described below. Some coursework may apply toward State of Tennessee endorsements (add-on certification in specific licensure areas). The non-thesis option requires 36 hours, including a minimum of 18 in special education, and a final written and oral comprehensive examination. The thesis option requires 30 hours including 6 hours of Thesis 500.

Track 2 students select coursework based on a specified course of study required for teacher licensure and options for areas of specialization and/or cognates as described below. The non-thesis option requires 24 hours of internship year coursework and an additional 12 hours prescribed by the student’s committee, for a total of 36 hours. The thesis option requires 9 additional hours of Thesis 500 for a total of 42 hours.

Students completing a program of study in the early childhood special education concentration area are qualified to be preschool teachers, home-based interventionists, educational consultants, and family service coordinators. The curriculum is interdisciplinary in nature, with most of the coursework offered by the Departments of Special Services Education and the Department of Child and Family Studies. Additional department offerings may be included through elective hours.

Students completing a program of study in the general special education concentration area are qualified to be teachers and/or consultants in a variety of special education programs providing services to people certified as mentally retarded, learning disabled, emotionally disturbed, gifted, physically disabled, multiply disabled, and socially or emotionally disturbed.

General special education majors, in conjunction with their committees, select one or more specializations for their program of study.
Six to nine hours of coursework in the designated area should be taken. Approved specializations include affective/motivational approaches, assessment/ diagnosis, cognitive education, early childhood, gifted education, rehabilitation, and/or technology. Students also may select a cognate of three to six hours of coursework taken outside the department.

Students completing a program of study in the education of the hearing impaired concentration area are qualified to teach in public or residential schools for the hearing impaired. Graduates are eligible for both Council on Education of the Deaf (CED) certification and Tennessee state certification. Internships (student teaching) may be completed at the Tennessee Special Programs at UT. Knoxville on an in-state tuition basis for residents of some states to enroll in certain graduate programs in the state or in programs for the hearing impaired in North Carolina, Kentucky, Georgia, and the District of Columbia.

Rehabilitation Counseling
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 internship. The program requires 54 semester hours. Thesis and non-thesis options are available.

ADDITIONAL PROGRAMS
Under the sponsorship of the Office of Special Education and Rehabilitative Services (R.S.A.), special programs for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people are provided. A federally supported Educational Consortium provides staff development and technical assistance for 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 on an in-state tuition basis. The M.S. program in Special Education is available to residents of the states of Kentucky (concentrations in hearing impaired and early childhood only), South Carolina (concentration in hearing impaired only), Virginia (concentration in hearing impaired only), or West Virginia; the M.S. in Rehabilitation Counseling is available to residents of Alabama. Additional information may be obtained from the Admissions Specialist 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. S/NC only. Sp., Su.

415 Language Development of Hearing Impaired (3) Language problems of hearing impaired contrasted with scope and sequence of normal language development. Formal linguistic systems used to describe language development problems.


419 Speech Development of Hearing Impaired (4) Theories of speech development, approaches in training perceptual and production of speech, and aural habilitation. Practicum experiences.

420 Psychology and Education of Students with Mild Disabilities (6) Nature and characteristics of mildly handicapped students with mental retardation, learning disabilities, physical health impairments, emotionally disturbed, educational status found effective in modified classrooms; assessment, diagnosis, legal ramifications as well as psycho-social and pre-vocational aspects. Collaborative approaches to programming. Prereq: Special Education Principles, Special Education Strategies and Admission to Teacher Education and Curriculum and Instruction 422. Coreq: 420. S/NC only. F.

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

423 Communication Processes for the Hearing Impaired (3) Expressive and receptive vocabulary development in sign communication 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 audiological 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.

430 Psychology and Education of Students with Moderate-They-Severe Disabilities (3) Nature and characteristics of persons with moderate/severe disabilities and educational strategies appropriate for those persons. Prereq: Special Education Principles and Special Education Strategies, Admission to Teacher Education and Curriculum and Instruction 422.

431 Field Experience in Comprehensive Programs (3) Prereq: Special Education Principles and Special Education Strategies. Admission to Teacher Education and Curriculum and Instruction 422.

433 Observation of Clinical Practice (1) Same as Audiology and Speech Pathology 433.

434 Clinical Practice in Speech-Language Pathology II (1-4) Same as Audiology and Speech Pathology 434.

440 Voice Disorders (3) Same as Audiology and Speech Pathology 440.


456 Speech and Language Basis of Learning Disabilities in the Classroom (3) Normal communication development; understanding of speech and language impairments in school-age students; integration of oral/written communication. Prereq: 420. S/NC only.

470 Psychology of the Exceptional Child (3) Varieties of exceptional children, general characteristics and educational needs. Implications of developmental variations for teaching as adults. Opportunity to expand upon particular exceptionality. Enrollment limited to non-special education majors.

471 Internship I: 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: 460.

473 Audiology II (3) (Same as Audiology and Speech Pathology 473.)

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 programming for students age 4-21. Procedures and materials, group intervention, and classroom consultation.

483 Clinical Practice in Communication Disorders in Schools (3) Supervised practice with children with communication disorders. Prereq. 453, 454 (80-100 clinical contact hrs.), 482.

484 Internship with Hearing Impaired Children (6) Supervised practicum with preschool, day school and residential students.

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

505 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 requirement. May be repeated. S/NC only E.

506 Internships in Teacher Education (4) Placement in professional settings in public schools or agencies under supervision of master practitioners. Enrollment limited to those in fifth-year program. S/NC only.

509 Vocational Guidance and Career Planning (3) Utilization of psychological, educational, social and vocational, diagnostic and resources appropriate for hearing impaired persons to provide guidance in career decisions and individualized rehabilitation plan.

510 Advanced Educational and Clinical Procedures (3-6) Integration of advanced educational and clinical procedures; skills and knowledge for implementing instructional strategies for students with special needs. Prereq: Prior language experience or consent of instructor.


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: 522.

525 Manual Communication (3) American Sign Language (ASL) and culture of American deaf community. Acquisition of basic linguistic properties of ASL, cultural differences between hearing and deaf community, and vocabulary development. Prereq: Prior sign language experience or consent of instructor.

526 Advanced Sign Language (3) Intermediate ASL stressing fluency of expressive and receptive communication with deaf people and structure and history of language. Prereq: 525 or equivalent.


529 Teaching Reading to the Hearing Impaired (3) Specific techniques necessary to teach the specifically 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: 415.

530 Orientation to Rehabilitation (3) History, philosophy, legal and economic bases, current issues, and practices in public and private rehabilitation programs. Qualification of service providers, assessment, planning, development, and provision of services to people who have disabilities and vocational handicaps.
532 Caseload Management in Rehabilitation (3) Techniques and procedures involved in management of caseloads of functionally disabled rehabilitation patients, private rehabilitation companies, and public or private rehabilitation facilities. Analysis of appropriate industrial management models related to rehabilitation programs.

533 Job Analysis, Development, and Placement (3) Determining employment-readiness of people with disabilities, identifying appropriate jobs for selected clients, and assisting with information gathering, obtaining, and retaining employment. Job analysis, job modification and re-engineering, marketing, and employer-service 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 of people with disabilities. Functional analysis of biographical and interview data; selection and application of relevant psychometric instruments; 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. Exploring perspectives of work, attributes of effective programs, and interface between school-based programs and rehabilitation agencies.

541 Psychosocial Aspects of Exceptionalities (3) Psychosocial impact of exceptionality on person and family. Reaction to loss, coping with disability, and societal rehabilitation.

543 Medical Aspects of Disability (3) Etiology and clinical symptoms related to disabling conditions served by special education and rehabilitation personnel. Effective measures to eliminate or minimize resulting handicaps. Skills necessary to communicate with lay and professional persons.

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 hours required).

551 Issues and Theories in Cognitive Education for Disabled Learners (3) Current cognitive education theories; implications for disabled learners; effects of philosophy, attitude, and expectations, perspectives and emerging directions; characteristics of learners with cognitive disorders. Coreq: 552 or consent of instructor.

552 Instructional Systems in Cognitive Education for Disabled Learners (3) Informal and dynamic assessment: application instructional program planning and decision making related to nature and needs of disabled learners. Prereq or coreq: 551 or consent of instructor.

553 Assessment of Exceptional Students (3) Current issues relating to advanced study of evaluation models for special education; dynamic and other innovative assessment approaches; advanced study of application to educational programming; basic statistics and application in assessment procedures.

554 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 programming assessment issues. Prereq: 553 or consent of instructor.

555 Characteristics of Affective/Motivational Functioning in Children with Disabilities (3) Definition, identification, and symptoms of children with affective/motivational development in disabled youth. Comparison to normal development and that of children labeled disturbed or behavior disordered.

556 Instructional Systems for Affective/Motivational Functioning in Children with Disabilities (3) Instructional strategies and models of instruction; demonstration, observation, and media; teaching techniques, materials, and teacher/pupil/relationships. Therapeutic forms, rehabilitation through art, music, role play, play therapy, bibliotherapy, and group interactions. Prereq or coreq: 555 or consent of instructor.

558 Neuromuscular and Health Disorders: Education Implications (3) Neuromuscular and health disorders: physical disabilities and special health conditions: assessment, investigation of instructional techniques and adaptations.

564 Psychosocial Development of Gifted and Talented Children (3) Phenomena of talent development in context of home, school, and society. Implications of maladjustment. Practices for promoting social and emotional development. Prereq: 451 and 452 or equivalent or consent of instructor.

565 Instructional Systems for the Gifted and Talented (3) Instructional methods and systems evaluated in terms of effectiveness in various educational environments. Prereq or coreq: 564 or consent of instructor.

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 and Vocational Rehabilitation (3) Application of microcomputer technology with all categories of exceptionalities and across all chronological functioning age ranges. Microcomputer adaptive software, special switch access, authoring systems, text communication, and strategies for cognitive development.

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

592 Assistive Technology in Special Education and Vocational Rehabilitation (3) Technology as applied to needs of school-age and post-secondary-age students. Delivery of assistive technology services; software and devices; delivery systems; interdisciplinary evaluation/planning, and funding issues.


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 or consent of instructor. F.

600 Doctoral Research and Dissertation (3-15) P/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) Social 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 Seminar in Research in Special Education and Rehabilitation (3) Development and implementation of research. Independent research studies. Research proposals. Prereq: 9 hrs of research core and consent of instructor.

610 Internship in College Teaching and Supervision (3-9) Supervised practice in college teaching and supervision. Prereq: Admission to doctoral program or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

620 Internship in Research in Special Education and Rehabilitation (3-9) Placement with professional employing agency; research experience in special education and rehabilitation. Prereq: 9 hrs in statistical and research methods. May be repeated. Maximum 9 hrs. S/NC only.

630 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level field experiences under supervision of practitioner. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

670 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)

Faye D. Julian, Head

Professors:

Julian, Faye D., Ph.D. .................... Tennessee Lester, Lorayne W., Ed.D. ............... Tennessee Yeomans, G. Allan (Emertus), Ph.D. ............. Louisiana State

Associate Professors:

Ambrose, M. L., Ph.D. .................... Ohio Buckley, J. E., Ph.D. ..................... Northwestern Cook, N. C., M.A. ....................... Alabama Glenn, Robert W., Ph.D. ................. Northwestern

Assistant Professor:

Amber, R. S., Ph.D. ....................... Ohio State Arnold, Christa L., Ph.D. .............. Florida Haas, John W., Ph.D. ..................... Kentucky

Graduate courses in Speech Communication provide opportunities for students in a variety of disciplines to investigate how oral language can effect changes in the knowledge, the understanding, the ideas, the attitudes, or the behavior of other human beings.

GRADUATE COURSES

420 Communication and Conflict (3) Communication as significant factor in development, management, and resolution of conflict at interpersonal, small group, organizational or societal levels.

440 Organizational Communication (3) Organizational setting and variables of communication process that affect quality of human interaction both within and outside organization.

465 Studies in Rhetorical History and Criticism (3) May be repeated. Maximum 6 hrs.

466 Rhetoric of the Woman's Rights Movement to 1930 (3) Historical and critical study of public address in campaigns for women's rights in United States from 1830's through 1920's. (Same as Women's Studies 466.)
Statistics

(College of Business Administration and Intercollegiate Program)

MAJORS

Statistics ........................................ M.S.
Business Administration ................. MBA

William C. Parr, Head

Professors:

Downing, Darryl J. (Adjunct), Ph.D. .......... Florida State
McLean, Robert A. (Emeritus), Ph.D. ....... Florida
Parr, William C., Ph.D. ................. Southern Methodist
Philpot, John W., Ph.D. ................. VPI
Sanders, Richard D., Ph.D. .......... Texas A&M
Sanders, William L. (Adjunct), Ph.D. .......... Tennessee
Sylwester, David L., Ph.D. .......... Stanford
Thigpen, Charles C. (Emeritus), Ph.D. ......... VPI

Associate Professors:

Bozdogan, Hamparsum, Ph.D. .......... Illinois State
Guess, Frank M., Ph.D. ................. Florida State
Leitnaker, Mary G. (Liaison), Ph.D. ....... Kentucky
León, Ramón V., Ph.D. .......... Florida State
Lin, Dennis K. J., Ph.D. .......... Wisconsin
Mee, Robert W., Ph.D. ................. Iowa State
McGuire, Stephen S. (Adjunct), Ph.D. .......... Kansas State
Raney, Gispie B. (Adjunct), Ph.D. ........ NC State
Walker, Esteban, Ph.D. ..................... VPI
Wright, Tommy (Adjunct), Ph.D. .......... Ohio State
Younger, M. S., Ph.D. ................. VPI

Lecturer:

Schmidhammer, James L., Ph.D. ............. Pittsburgh

Instructors:

Donnelly, Sharon, M.S. .......... Tennessee
Neidert, Sharon, M.S. .......... Miami (Ohio)
Cwik, Charles, M.S. .......... Tennessee
Wright, S. Paul, M.S. .......... Tennessee

Additional Intercollegiate Program Committee Members:

Bunting, Dewey, Liberal Arts
Dessart, Don, Education
Fribourg, Henry, Plant and Soil Science
Glinsson, Charles, Social Work
Huck, Schuyler W., Educational Counseling Psychology
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, the 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 other academic disciplines and hold joint appointments with the College of Agriculture, the Computing Center and the Medical Center. Statistics graduate students may gain consulting experience by working with faculty involved in these consulting activities. All students are encouraged 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 mathematics 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 12. 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 at least 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 consulting or internship. Students must complete a minimum of 21 hours in approved statistics courses, exclusive of consulting, internship, independent study, or thesis.

Thesis or Independent Study

The thesis option for the Master's degree requires the student to complete 6 hours for the thesis. Alternatively, the non-thesis option requires a minimum of 3 hours for an independent study project.

Comprehensive Examination

Students must pass a two-part written comprehensive examination covering 1) theory and 2) methods. Upon failing either part of the examination, the student may retake it. The result of the second examination is final. For students writing a thesis, this examination must be passed before the thesis is defended.

INTERCOLLEGIATE GRADUATE STATISTICS PROGRAM

The Intercollegiate Graduate Statistics Program is a formal University of Tennessee academic program established to recognize graduate students for completing the requirements of a major or minor in Statistics as part of their degrees. The program enables a student to obtain the M.S. in Statistics simultaneously with the Ph.D. or Ed.D. in another department. The program also enables a student to obtain a Statistics minor along with the M.S., Ph.D., or Ed.D. in another department. The program is administered by an executive committee with advisory input from the program faculty. The program is open to well-qualified graduate students in all departments which have 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 coursework. 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 from 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  9
M.S. outside of Statistics, minor in Statistics  9
M.S. in Statistics, both degrees  18
Doctorate outside of Statistics, minor 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

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

MBA Concentration: Statistics.
Minimum course requirements are 571, 566, 567, 538 with prerequisite or corequisite of 561.

ACADEMIC STANDARDS

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

GRADUATE COURSES

411 Introduction to Statistical Computing (3) Use of computer operating system commands and packaged programs for statistical analysis and file management. Not available for credit in the statistics major. Prereq: 251 or 251.

461 Applied Regression Analysis (3) Linear regression and correlation, multiple regression, polynomial regression, selection of variables, use of dummy variables, analysis of residuals, logistic regression and its applications. Use of standard computer packages. Major writing requirement. Prereq: Probability and Statistics for Scientists and Engineers I and Introduction to Statistical Software or graduate standing and consent of Instructor. F

462 Analysis of Variance and Experimental Design (3) Analysis of variance techniques for single and multi-factor models. 

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, model building and model validation, analysis of variance, 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 factorial, sequential designs. Prereq: 571.


585 Principles of Statistical Process Management (3) Control charts and other statistical techniques applied to management of business processes. Prereq: Consent of department head.

587 Graduate Seminar (1) Directed readings and active participation in colloquium in the Department of Statistics and of student's minor program. Prereq: Consent of Statistics department director of graduate studies. May be repeated. Maximum 2 hrs. S/NC only.

592 Internship (1-6) Supervised off-campus experience in application of statistical principles and methods in industry, government or business and industry. Written and oral report. Prereq: 4 courses in graduate-level statistics and consent of statistics department director of graduate studies. May be repeated. Maximum 6 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 or letter grade.

595 Statistical Consulting Pracicum (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 536. May be repeated. Maximum 6 hrs.

673 Advanced Topics in Design of Experiments and Linear Models (3) Experimentation for product and process improvement: response surface methodology and robust design methods; mixture experiments; optimal design topics; distribution theory and inference for linear models. Prereq: 573 or consent of instructor.

675 Categorical Data Analysis (3) Log-linear analysis of multidimensional contingency tables. Logistic regression applied to categorical data and applications, and use of statistical software. Prereq: 1 yr graduate-level statistics, regression analysis and analysis of variance and familiarity with CMIS or VAX; or consent of instructor.

679 Multivariate Statistical Modeling (3) Modern information based techniques and model selection in multivariate analysis. Informational tests of significance with multivariate data, multivariate analysis of variance, multivariate regression and variable selection, discriminant analysis, common principal component model, factor analysis model, covariance structural models with latent variables. Prereq: matrix model cluster analysis. Prereq: Matrix algebra and 564, or matrix-based linear models with experience in interactive computing, or consent of instructor.

681 Special Topics in Probability (1-3) Presentation of specialized topics in probability and stochastic processes. May be repeated. Maximum 6 hrs.

683 Special Topics in Statistics (1-3) Presentation of special topics in statistics. May be repeated. Maximum 6 hrs.
Technological and Adult Education
(College of Education)

MAJORS

DEGREES

Technological and Adult Education ... M.S., Ed.D.
Vocational-Technical Education ... Ed.S.
Education ... Ph.D.

Gregory C. Petty, Interim 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. (Liaison), Ph.D. ... Wisconsin
Craig, D. G., Ed.D. ... Cornell
Haskell, R. W., Ph.D. ... Purdue
Matthews, John I. (Emeritus), Ph.D. ... Arizona State
Peters, John M., Ed.D. ... NC State
Reed, J. L. (Emeritus), M.S. ... Oklahoma State

Associate Professors:

Brewer, Ernest, Ed.D. ... Tennessee
Brockett, Ralph, Ph.D. ... Syracuse
Hanson, R., Ph.D. ... Purdue
Kasworm, Carl, Ed.D. ... Georgia
Leford, B. J., Ed.D. ... Tennessee
Mann, E. C., Ed.D. ... Penn State
Petty, G. C., Ph.D. ... Missouri
Radcliff, B. J., M.S. ... West Virginia

Assistant Professors:

Pierce, R., Ph.D. ... Ohio State
Powell, Terrence L., M.S. ... Oklahoma

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. Two tracks are available. Track 1 is for students who are already certified to teach or those who are seeking a Master's degree without certification. Track 2 is for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

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

Track 2 - Concentrations are available in business and marketing education, and technology education. The non-thesis requirements are Education 574 and 591, 6 hours; for business and marketing education, 531 and 532, 6 hours; for technology education, 553 and 555, 6 hours; internship, 12 hours; and 12 hours of specialty courses as approved by the student's committee for a total of 36 hours. The thesis option requires 6 additional hours of thesis 500 for a total of 42 hours.

THE SPECIALIST PROGRAM

The Ed.S. program is a cooperative undertaking involving all vocational service areas. Concentrations are available in agricultural, business, marketing and distributive, home economics, industrial, and technical education, and in general vocational education.

The degree requires a minimum of 24 hours of graduate study. Credits earned for the Master's degree may meet program requirements in the courses which contribute to the program objectives of the candidate. A major area 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, 8 hours; professional education, 9 hours; research techniques, 12 hours; and dissertation, 24 hours. A minimum of 90 hours above the baccalaureate is required.

The Doctor of Philosophy with a major in 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 UT Knoxville 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 Kentucky and West Virginia. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES

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

410 Foundations of Technological and Adult Education (3) History, philosophy, economy, social, and psychological foundations of vocational and adult education. Prereq: Consent of instructor.

411 Special Topics in Technological and Adult Education (1-3) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

412 Research in Technological and Adult Education (3) Solution of problems encountered in vocational and adult education. Prereq: 12 hrs of graduate credit.

413 Special Topics in Technological and Adult Education (1-3) Special topics in technological and adult education. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

414 Individual Study in Technological and Adult Education (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

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

502 Problems in Lieu of Thesis (3) May be repeated. Maximum 6 hrs.

504 Research in Technological and Adult Education (3) Solution of problems encountered in technological and adult education. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

509 Internship in Technological and Adult Education (3) Practical field experiences in settings in which supervision of practitioner and departmental representative is provided. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

510 Foundations of Technological and Adult Education (3) Historical, philosophical, economic, social, and psychological foundations of vocational and adult education. Prereq: Consent of instructor. S, Su.

511 Issues and Trends in Technological and Adult Education (3) Academic, social, economic, cultural, and other handicaps of special students. Prereq: 9 hrs of graduate credit.


513 Special Topics in Technological and Adult Education (3) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


515 Microcomputer Software Development (3) Advanced design in BASIC; random access and binary files, search and sort algorithms, and bitmapped graphics for educational environment. Hands-on learning and program development. Prereq: Consent of instructor.

516 Microcomputer Software Development (3) Advanced design in BASIC; random access and binary files, search and sort algorithms, and bitmapped graphics for educational environment. Hands-on learning and program development. Prereq: Consent of instructor.

517 Education Specialist Research and Thesis (3) May be repeated. Maximum 9 hrs. P/NP only.

520 Survey of Adult Education (3) Historical development, philosophies of adult education agencies, associations, programs, issues, and literature illustrating processes of adult education and the significance of continuous education. Prereq: Consent of instructor. S, Su.

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.

522 Adult Development (3) Changes in characteristics of adults over life span and implications for adult education. Prereq: Consent of instructor.

455 Performance-Based Evaluation (3) Assessing effectiveness of training through development of performance-based measures. Prereq: Senior standing or consent of instructor. Sp, Su.

524 Continuing Professional Education (3) Theories and concepts supporting design and management of educational programs for adults in professions. Prereq: 510 or equivalent. Sp. Su.


531 Organization and Supervision of VOE and Marketing Programs (3) Developing office and marketing occupations, guiding the professional, organizational, 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 typewriting, word processing, business communications and office procedures. Prereq: Consent of instructor. Su.

534 Improvement of Instruction in Accounting and Data Processing (3) Principles of learning issues, research findings and materials in basic accounting, automated accounting and data processing as secondary and post-secondary levels. Prereq: Consent of instructor. F. Su.


536 Organizing and Teaching Adult Business and Marketing Education (3) Planning, organizing, conducting, teaching and evaluating continuing education programs in business and marketing education; utilizing trade associations, employment agencies, business groups, and advisory committees in program implementation. Prereq: 3 yrs teaching experience and consent of instructor. F. Su.


540 Special Topics in Business and Marketing Education (1-3) Specific objectives, activities, and evaluations vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E.

541 Practicum in Business/Marketing Education (3) Practical updating 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 problems in teaching of business and marketing education and related areas. Prereq: Consent of instructor. E.


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

552 History and Philosophy of Industrial Education (3) Societal, economic and historical events that influence development of industrial education. Philosophical problems, justification, values, principles and concepts of industrial education. Prereq: Consent of instructor. F. Su.

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

554 Technical Program Planning (3) Instructional systems attending to analysis, design, development, implementation, and evaluation of trade, technical supervisor 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: 555 or consent of instructor. Sp. Su.

557 Advanced Methods of Teaching Technical Subjects (3) Proper selection and effective application of innovative methods and teaching specialized skills and technical information. Diversifying and individualizing teaching of technical subjects. Prereq: 373. Sp. 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. Su.

571 Supervisory Skills for Improving Industrial Productivity (3) Philosophy of improving industrial productivity through quality and introduction to basic tools of statistical process control. Demystifying philosophy, control charting, 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.


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

601 Curriculum Planning in Technological and Adult Education (3) Curriculum theory, models, contents planning evaluation and implementation of specialized program areas. Prereq: 555 or equivalent. 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. Principles, 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.


620 Seminar in Adult Education (3) Issues in adult education, theories and concepts, philosophical positions, research trends and methodologies. Prereq: 510 or equivalent. F. Su.


651 Higher Education in Business and Marketing Education (3) Review of both secondary and post-secondary levels. Prereq: 12 hrs of graduate credit E.

Textiles, Retailing and Interior Design
( College of Human Ecology)

MAJORS

DEGREES

Textiles, Retailing and Consumer Sciences M.S. Human Ecology Ph.D.

Nancy B. Fair, Head

Professors:

Blakemore, R. G. (Emeritus), Ph.D. Florida State University
DeLong, A. J. (Liaison), Ph.D. ...... Penn State University
DeJonge, Jacquelyn C., Ph.D. .... Iowa State University
Drake, Mary Fran, Ph.D. ...... Penn State University
Duckett, Kermit E., Ph.D. ...... Tennessee State University
Wadsworth, Larry C., Ph.D. ...... NC State University

Associate Professors:

Breese, Randall R. (Liaison), Ph.D. Florida State University
Canestaro, Nancy, Ph.D. ...... Michigan State University
Dyer, C. L., Ph.D. ...... North Carolina State University
Fair, Nancy B., Ph.D. ...... NC State University
Fairhurst, Ann, Ph.D. ...... Oklahoma State University
Rabun, Jocsette, Ph.D. ...... Tennessee State University

Assistant Professors:

Bhat, Gajanam, Ph.D. ...... Georgia Tech University
Dillard, Susan, Ph.D. ...... Florida State University
Gupta, Millard, Ph.D. ...... Missouri State University
Houser, T. L., M.S. ...... Tennessee State University
Lee, Jinkook, Ph.D. ...... Ohio State University

Research Assistant Professors:

Dever, Molly, Ph.D. ...... Kansas State University
Hassenbroekh, Charles, Ph.D. ...... Tennessee State University
Huang, Xuan Chao, Ph.D. ...... Leeds University
Khan, Ahamad, Ph.D. ...... Tennessee State University
Ko, Wen-Chien, Ph.D. ...... Tennessee State University
Malkan, Sanjiv, Ph.D. ...... Tennessee State University
The Department of Textiles, Retailing, and Interior Design offers Master’s degrees in Interior Design and Textiles, Retailing and Consumer Sciences. The program in Textiles, Retailing and Consumer Sciences offers concentrations in textile science and in retail and consumer sciences. An interdisciplinary minor in gerontology gives the graduate student an opportunity for combining the knowledge and experience about aging in American society with his/her own major concentration.

The Master’s program in Interior Design will provide a balance between creative and theoretical foundations of the field; emphasis is placed on the dissemination of knowledge. The program is accredited by the Foundation for Interior Design Education Research (FIDER). The goal of the graduate program in interior design is to provide the student with scholarly and professional experiences through seminars, studio work, and research. Interdisciplinary thrusts will increase the depth of understanding of the field of interior design essential to function as educators or as independent professionals. Areas of emphasis within interior design may include: historic preservation and adaptive use/history of interior design, computer-aided design, and human environment interaction. Supporting courses are available in lighting, furniture design, business practices, etc.

The programs in Textiles, Retailing and Consumer Sciences prepare students for careers in industry, business, public and private agencies, and educational institutions. Master’s level work enables students to conduct research in retail management and merchandising and in the consumer related areas to retail decision making. Students in textile science are expected to have a solid foundation in mathematics, as well as a formal background in a physical science or engineering. Interested students should contact the department head for more information.

ADMISSION REQUIREMENTS

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

In addition to specified entrance requirements stipulated by The Graduate School, admission to the particular programs in the department is based on the following requirements:

Interior Design

Admission to the Master’s degree program with a major in Interior Design requires: 1) a background in interior design, 2) a cumulative GPA of 3.0 or above (on a 4.0 scale), and 3) a portfolio of undergraduate studio work (and professional work, if applicable) submitted to the department. The portfolio may include slides or original work. It is recommended that deficien-
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.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Interior Design is available to residents of the states of Kentucky, Louisiana, Mississippi, or Virginia. The M.S. program in Textiles, Retailing and Consumer Sciences is available to residents of the state of Mississippi. Additional information may be obtained from the Admissions Specialist in the office of Graduate Admissions and Records. For the Ph.D., see Human Ecology.

**Interior Design**

**GRADUATE COURSES**

400 Proxemics (3) Space and behavior within cultural context. Application of biodesign and design process. Theoretical foundations and concepts from environment and behavior. Simulation techniques and methods for identifying behavioral design requirements. Prereq: Textile and Apparel Economics, Mathematics 503 or equivalent. F

450 Advanced Interior Design II (5) Comprehensive studio problems of advanced complexity; integration and extension of experiences utilizing systematic design methodologies. Prereq: Advanced Interior Design or consent of instructor. F


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

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

510 Needs Assessment and Design Programming (3) Use of systematic design methodology and design research methods as part of design problem-solving experience. Lecture and studio. May be repeated. Maximum 6 hrs. Prereq: Admission to graduate program. F

520 Integrative Interior Design Studio (3) Identification, integration and synthesis of multidisciplinary data input. Advanced programming techniques and design evaluation. Lecture and studio. Prereq: 510, 564, or consent of instructor. Sp

531 Research Methods in Historic Preservation (3) Methodology for research and generation of design criteria, consideration of conservation problems in interior design. Prereq: Architecture 403 or consent of instructor. Sp

555 Micro-computer Research Applications in Interior Design (3) Advanced micro-computer concepts and applications for research in interior design. Project design and development. Consideration of design criteria, programming, schematic design, computer-aided design, advanced spreadsheet and database analysis, and desktop presentation. Prereq: 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, anthropometry and social and behavioral sciences. Prereq: 6 hrs of behavioral science and 6 hrs natural science, or consent of instructor. Sp

570 Facilities Planning (3) Considerations in program development, design, management, and operation of specialized facilities: hotels, restaurants, work environments, day care facilities, retailing-consumer interface and environments for elderly. Prereq: Consent of instructor. Sp

575 Environment and Aging (3) Seminar on design of physical environment and relationship to aging process. Concepts and theories from design, and social and behavioral sciences. Analysis of social/behavioral science or consent of instructor. F

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

581 Directed Study in Historic Preservation (1-3) Independent advanced research in 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 in interior 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

585 Directed Study in Facilities Planning (1-3) Independent advanced research in facilities management. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

590 Research Seminar (1-2) S/NC only. E

500 Dissertation (3-15) P/NP only. E

510 Issues in Interior Design (1) Readings, reports, and discussion concerning current research and related issues in interior design, history of interior design, historic preservation, and environment and behavior. Registration each semester of residence. E

520 Advanced Special Topics in Interior Design (3) Selected topics of major interest: history of interior design, advances in historic preservation, environment and behavior. Topics vary. Prereq: 510, 552, 562, 564. May be repeated. Maximum 9 hrs. E

525 Integrative Facilities Design in Consumer Environments (3) Methodologies and skills necessary for creation of settings responsive to needs of users. Techniques for programmatic analysis and development: goals, user requirements, technical, functional, and behavioral analysis of consumer in business and built environment. Prereq: Consent of instructor. F

530 Advanced Directed Study in Interior Design (3) Individual study in aspect of interior design culminating in scholar paper. May be repeated. Maximum 6 hrs. E

**Retail and Consumer Sciences**

**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 Retail Strategy and Decision Making (3) Strategy, strategic management and strategic process in retail sector. Analytical decision-making skills in retailing, retail industry structure, international differences in retail systems. Prereq: Retail Management or equivalent. Sp


540 Socio-Psychological Aspects of Apparel (3) Apparel and human behavior in social situations. Prereq: 6 hrs or equivalent from sociology and psychology. E

550 Consumer Economics and Market Choices (3) Economic framework for evaluating consumer behavior and consumer choice within market system. Theory of consumer preferences and decision making, consumption and demand models for individuals and households. Integration of consumer economics, issues and policies. Prereq: Textile and Apparel Economics, Mathematics 503 or equivalent. F

552 Economics of Textile Complex (3) Economics considerations of U.S. textile complex. Quantitative approaches to an industry structure, production, marketing, distribution and institutions within both global and domestic settings. Current and future international issues and policies. Prereq: Calculus I or equivalent. Micro economics. F

562 Research Methods (3) Fundamentals of research method, advancement of science, methodology and method of research. Issues and concepts of basic and applied research. Prereq: Statistics 531 or equivalent. Sp

590 Research Seminar (1) Research topics in retail and consumer sciences. May be repeated. S/NC only. F, Sp

591 Directed Study (3-13) Individual problems in retailing and consumer sciences. Prereq: 9 hrs retailing and consumer sciences graduate coursework. May be repeated. Maximum 9 hrs. E

595 Advanced Topics in Retail and Consumer Sciences (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

614 Theory in Retail Environment (3) Analysis and evaluation of theory in retail environment and its application to research in retailing market. Prereq: 562, 592. F

615 Retail and Consumer Sciences Literature and Thought (3) Evaluation of retail and consumer sciences literature with emphasis upon research literature, development of scholarly thought, and identification of potential areas of further study. Prereq: 562, Marketing 501. Economics 501. F, A

616 Research Methods, Models and Measurement in Retail and Consumer Sciences (3) Quantitative methods and analytical concepts in research process. Mathematical and statistical formulation of retail and consumer sciences phenomena, utilizing models, model building and measurement constructs. Prereq: 562, Statistics 350, Econ 501. F, Sp

641 Retail Consumer Behavior (3) Theories and concepts from social science in relation to ultimate consumer's behavior. Prereq: 6 hrs of sociology and/or psychology or consent of instructor. E

651 The Consumer and Public Policy (3) Public policy issues within consumer environments. Analysis of past and present policies within economic, social, legal and business frameworks. Implications of consumer issues and policy alternatives. Literature and research focus. Prereq: 552 or consent of instructor. Sp

695 Advanced Topics in Retail and Consumer Sciences (3) Lecture, group discussion, individual research on advanced topics and research areas of current significance to retail and consumer sciences. Prereq: 9 graduate hours in consumer sciences. May be repeated. Maximum 9 hrs. E

**Textile Science**

**GRADUATE COURSES**

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
510 Fiber Science (3) Physical properties, mechanical properties and microstructure of polymeric fibers; relation to end-use properties. Prereq: Organic Chemistry and Thermal Physics or equivalent.


521 Nonwovens Science and Technology I (3) Nonwoven fabric technology; different web forming processes; and relationships among the chemical, morphological, and physical properties of fibers and orientation in webs to final performance properties of bonded structures. Prereq: Organic chemistry or consent of instructor.

524 Advanced Textile Dyeing and Finishing (4) Chemistry, processing and fastness of chemical finishes and various classes of dyes on different fibers. Prereq: 510 or consent of instructor. 2 hrs and 4 labs. 5p

526 Nonwovens Science and Technology II (3) Interrelations between mechanical production and mechanical properties of nonwoven fabrics; characterization of fiber morphology and web structure; chemistry of nonwoven binders and finishes; and engineering of specific fabric properties. Prereq: 521 or equivalent.


590 Research Seminar (1) Research topics in textile science. May be repeated. SFNC only. F, Sp

593 Directed Study (1-3) Individual problems in textile science. Prereq: 5 hrs textiles graduate coursework. May be repeated. Maximum 9 hrs.

595 Advanced Topics in Textile Science (1-3) Lecture, group discussion on specialized topics. Prereq: 9 hrs textiles graduate coursework or consent of instructor. May be repeated. Maximum 9 hrs.

600 Dissertation (3-15) PNP only. E

625 Physical Chemistry of Fibers (3) Physical chemistry of fibers and fiber forming polymers: surface chemistry and thermal properties. Prereq: 510.

626 Physics of Fiber Structures (3) Morphology of polymeric structures; thermal and processing history on mechanical, electrical and chemical properties of fibers. Prereq: 510.


695 Advanced Topics in Textile Science (3) Lecture, group discussion, individual research on advanced topics and research areas of current significance: future direction, professional issues, theoretical approaches. Prereq: Doctoral student and 9 hrs textiles graduate coursework. May be repeated. Maximum 9 hrs.

The Department of Theatre offers the Master of Fine Arts degree in Theatre with area concentrations in acting, directing, playwriting, dramaturgy, scene design, costume design, lighting design and theatre technology. Not all areas of concentration accept applicants every year.

Applicants must have completed undergraduate degrees approximately equivalent to requirements for those specified for degrees conferred by The University of Tennessee, Knoxville.

The Graduate Record Examination, three letters of recommendation and interviews with appropriate faculty are required of all applicants. Applicants for admission to M.F.A. design/technical theatre and playwriting/dramaturgy programs must submit samples of their work. Auditions are required of M.F.A. degree acting and directing applicants.

For detailed information about the graduate program, contact the Director of Graduate Studies, Department of Theatre.

THE MASTER OF FINE ARTS 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 to be completed in three consecutive years of full time residence. Theatre 501 is required the first year of residence. A diagnostic examination in theatre history and literature/criticism and 3 hours of advanced theatre history is required. An additional 3 hours of each may be required as determined by the diagnostic examination.

Students in the M.F.A degree program are evaluated annually by both performance or portfolio submission. Continuation in the program is with the approval of the faculty committee for the M.F.A. degree program. Theatre 599 Projects in Lieu of Thesis and an oral defense of the project 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 Theatre 580, Design and Technical Production Seminar, and at least 6 hours in the projects courses. Theatre 401, Principles of Design is required the first year of residence.

Acting

Theatre 520-21, 22-23-24-25 Master Class are required, along with one course in directing and two hours each in voice and dance.

Associate Professor:
Black, W., M.F.A. Illinois
Crockett, J., M.F.S. Southern Methodist Moran, J., M.F.A. Brandeis

Assistant Professors:
DeCuif, L. J. (Liaison), M.F.A. Tulane
Gould, B. K., M.F.A. Catholic
Oliva, J. L., Ph.D. Northwestern
Werte, T., M.F.A. Alabama

Adjunct Faculty:
Arnould, P., M.A. Catholic

Theatre

(College of Liberal Arts)

MAJOR DEGREE

Theatre ........................................ M.F.A.

Tom Cooke, Head

Professors:
Cooke, Tom, Ph.D. Florida State
Cothran, R. M. Wisconsin
Custer, M., M.F.A. Wisconsin
Field, R. C., M.A. Miami (Ohio)
Harris, A.I., Ed.D. Tennessee
Mashburn, Robert R., Ph.D. Florida State
Soper, Paul L. (Emeritus), Ph.D. Cornell

Directing

Required courses are 430 Directing, 520-21 Master Class for first year acting candidates and 9 hours of 536 Projects in Play Directing.

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 as are Theatre 570 Dramaturgy: Theory and Practice, at least 6 hours of 585 Production Workshops, 430 Play Directing, 3 hours of 536 Projects in Directing, and 12 hours of 573 Seminar and Projects. In addition, students must select an arts and humanities specialization comprising at least one year of language study plus 6 hours in the selected area.

REQUIREMENTS FOR SECOND MASTER'S DEGREE

Students admitted to the MFA program who have already earned a Master's or a doctoral degree may apply up to 12 credit hours from the previous graduate program to the MFA degree with approval of the student's committee, the Dean of the College of Liberal Arts, and the Dean of the Graduate School.

Any such credits applied from a previous graduate program would be from courses that are directly relevant to the student's MFA curriculum and must have been earned within the time limit (6 years) established for completion of the MFA degree.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.F.A. program in Theatre is available to residents of the state of Virginia (concentration in costume design only).

Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

GRADUATE COURSES

401 Principles of Theatrical Design (3) Fundamental principles of design, visual and spatial relationships. Prereq: 100 or consent of instructor.

409 Stage Make-up (2) Problems in make-up design and application, character analysis, physiognomy and Chiaroscuro. Prereq: 100

420 Special Studies in Acting (3) Content varies. Exercises in selected concentration areas such as style, character, movement, and practice of musical theatre material: dance and vocal work. Prereq: Advanced Acting and consent of instructor. May be repeated. Maximum 6 hrs.

423 Period Movement and Dance (2) Movement studies and dances from Renaissance to 20th century. Prereq: Stage Movement or consent of instructor.

424 Theatre Dance II (2) Advanced dance technique incorporating elements of musical theatre. Prereq: Theatre Dance I or consent of instructor. May be repeated. Maximum 6 hrs.

425 Selected Musical Theatre Techniques (2) Study and practice of musical theatre material: dance and vocal work. Prereq: Theatre Dance I or consent of instructor. May be repeated. Maximum 4 hrs.

426 Applied Phonetics (3) Development of skills in transcription and reproduction of principal varieties of English Language in North America and Great Britain
and selected foreign dialects in North America. Prereq: Consent of instructor.


445 Advanced Costume Construction (3) Advanced studies in costume technique, tailoring, vacuum forming, plastic molding, and cobbling. Prereq: 345 or consent of instructor.

446 Costume Pattern Making (3) Draping patterns for period costumes. Cossetry and study of historical patterns 1500-1800. Prereq: 345 or consent of instructor.

450 Advanced Scenography (I, I) Study and practice of stage rigging for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

451 Advanced Scenography II (I) Study and practice of metalworking and plastics for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

452 Advanced Scenography III (I) Study and practice of stage rigging for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

454 Scenery Painting (I) Introduction to techniques, theories, and principles of craft. Gaining skill and understanding through studio experience. Prereq: Consent of instructor.


456 Rendering (I) Techniques in monochrome and full color illustration of space and form. Prereq: Acquaintance with basic mechanical perspective and freehand sketching.

460 Advanced Lighting Design (3) Advanced problems in lighting design and theory. Required. Prereq: 260. Graduate credit to theatre M.F.A. students only.

462 Advanced Lighting Design (3) Advanced problems in lighting design and theory. Required. Prereq: 260. Graduate credit to theatre M.F.A. students only.

463 Sound Design (3) Sound design for performing arts. Review of equipment and acoustical factors that affect sound production. Selected design plotted from selected plays. Final projects mixed, edited, and cued for production.

464 Computer Assisted Design for Stage Lighting (3) Advanced techniques in computer-assisted design for stage lighting. Work with CAD and other stage lighting software for preparation of lighting plots and associated paperwork. Prereq: Introduction to Lighting Design or consent of instructor.

465 Aesthetics of Lighting Design (3) Theory and practice of stage lighting design. Relationship between designers and non-practitioners: directors, actors, choreographers, architects, etc.

470-71 Playwriting (3,3) Advanced instruction in writing of plays. Prereq: Consent of instructor.

491 Foreign Study (1-15) See College of Liberal Arts.

492 Off-Campus Study (1-15) See College of Liberal Arts.

493 Independent Study (1-15) See College of Liberal Arts.

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. SNC only.

510 Studies in Theatre History (3) Intensive study of selected topics in theatre history. May be repeated. Maximum 9 hrs.

512 Dramatic Literature Analysis (3) Dramaturgical approach to major playwrights, using a variety of analytical approaches from Aristotelian to Structuralist.

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 M.F.A. students only.

536 Projects in Play Directing (3) Practical work in play directing involving various lengths and kinds of scripts. May be repeated. Maximum 9 hrs.

542 The Social History of Costume (3) Study and analysis of costume as related to society's manners and morals, architecture and furniture.

543 Projects in Costume Design (1-3) Projects in costume design for theatre. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

544 Millinery for the Stage (3) Study and practice of millinery techniques for period costume. Prereq: Consent of instructor.


547 Painting and Dyeing for the Theatre (3) Fibers, dyes and dye processes, color matching and distressing.

549 Projects in Costume Technology (1-3) Individualized projects in costume technology in theatre production. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


552 Projects in Stage Design (1-3) Projects in stage design. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

553 Projects in Scene Technology (1-3) Advanced study in scene technology. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

556 Advanced Scenography Painting (2) Advanced instruction in materials, techniques, and principles of scenic design. Prereq: 454 or consent of instructor.

560 Projects in Lighting Design (1-3) Projects in lighting design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

562 Special Problems in Lighting Design (3) Special problems in lighting design and production. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

563 Projects in Sound Design (1-6) Special problems in sound design and production. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

570 Dramaturgy: Theory and Practice (3) Methods and materials. Prereq: Consent of instructor.

573 Seminar in Playwriting (3) Exercises and projects tailored for advanced students in playwriting. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

575-76 Studies in Dramatic Theory and Criticism (3,3) Broad-based study of major ideas about drama.

580 Design and Technical Production Seminar (1-6) Selected aspects of 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.


589 Project in Lieu of 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
Sims, M. H., Ph.D. .................. Auburn

Assistant Professors:

Adams, W. H., D.V.M. .................. Florida
Frank, L. A., D.V.M. .................. Tufts
Jenkins, C. C., D.V.M. ............. Tuskegee
Millis, D. L., D.V.M. ............... Missouri
Thomas, W. B., D.V.M. ............ Auburn
Ward, D. A., D.V.M. .................. Tennessee

Research Professor:

Overholt, B. F., M.D. ................. Tennessee

Research Associate Professor:

Panjehpour, Masoud, Ph.D. .... Toledo

Clinical Assistant Professor:

Shull, E. A., D.V.M. ............... Tennessee

Clinical Research Associate:

Sackman, J. E., D.V.M. ........... Michigan State

Clinical Instructors:

Arrington, K. A., D.V.M. .......... Tennessee
Campbell, S. L., D.V.M. ............ Wisconsin
Mawby, D. I., D.V.M. ............... Saskatchewan
Residents:
Bravo, L., D.V.M .................................. Florida
Burkett, G., D.V.M ................................. Mississipi
Davies-Dean, W. L., D.V.M ....................... Tennessee
Mears, E., D.V.M ................................. Tuskegee
Potter, B. A., D.V.M ............................... Texas A&M
Vogt, J. D., D.V.M ................................. Michigan State
Wells, K., D.V.M .................................... Texas A&M
Wilkens, B. E., D.V.M ............................. Kansas
Wright, K., D.V.M ................................. Michigan

See Veterinary Medicine for program description.

GRADUATE COURSES

500 Thesis (1-15) P/NP only, E
501 Special Topics in Small Animal Medicine and Surgery (1-4) May be repeated. Maximum 6 hrs. E
502 Registration for Use of Facilities (3-15) Required only.

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 rotation experience extending over the calendar year.

The first year consists mostly of the pre-clinical subjects of anatomy, physiology, histology, and microbiology. Also included in this first year are clinical subjects of physical diagnosis and anesthesia. Considerable integration of subject matter is incorporated during this year.

The second and third years include the study of diseases, their causes, diagnosis, treatment and prevention, and courses are team-taught on an organ system basis.

The final year (three semesters) is devoted to intensive education in solving animal disease problems, involving extensive clinical experience in the Veterinary Teaching Hospital. Each student will rotate through a series of clinical blocks.

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 allows select students who have special educational goals (such as advanced or veterinary medicine programs) to enroll in all, some, or none of the regularly scheduled courses during that semester. Students enrolled in the D.V.M. program are required to complete at least 16 credit hours in the sixth semester and may register for up to 10 credit hours of graduate courses without enrolling in The Graduate School and these hours will be credited toward the D.V.M. degree. This semester of elective study offers a unique educational alternative for select students in the College of Veterinary Medicine and is intended to enhance professional growth, concentration in an area of interest and career opportunities.

In addition to this course, students gain instruction in paramedical subjects such as animal behavior, medical communication, professional ethics, jurisprudence, economics, and practice management.

Admission Procedures

Application of new students is for the fall semester, with first priority given to residents of Tennessee.

Farms and instruction for making application for admission may be obtained, after September 1st each year, from Office of Veterinary College Admissions in the University of Tennessee, Knoxville, TN 37996-0200.

Applications must be completed and mailed to reach the UT Knoxville Director of Admissions by January 15 each year. All supporting documents, official transcripts, and the Veterinary College Admissions Test (VCAT) results from a test taken within 24 months of the January application deadline date, and letters of reference must arrive no later than 30 days after the application deadline date.

NON-TEENNESSEE APPLICANTS MUST HAVE A MINIMUM CUMULATIVE GRADE-POINT AVERAGE OF 3.2 ON A 4.0 SCALE.

Applications are accepted only from U.S. citizens or permanent residents of the U.S.

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 completed at any accredited college or university that offers courses equivalent to those at The University of Tennessee, Knoxville. Pre-veterinary course requirements must be completed by the end of the term of the year in which the student intends to enroll. Biochemistry requirements must have been satisfactorily completed within five years of the time the student wishes to enter the program.

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>English</td>
<td>8</td>
</tr>
<tr>
<td>Humanities and Social Sciences*</td>
<td>18</td>
</tr>
<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>
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<tr>
<td>Biochemistry**</td>
<td>4</td>
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<tr>
<td>General Biology</td>
<td>8</td>
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<tr>
<td>Genetics**</td>
<td>3</td>
</tr>
<tr>
<td>Cellular Biology***</td>
<td>3</td>
</tr>
</tbody>
</table>

TOTAL 66

*May include, for example, courses in English literature, speech, music, art, philosophy, religion, language, history, science, anthropology, political science, psychology, sociology and geography.

**Exclusively 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.

THE PROFESSIONAL PROGRAM

The College also administers a graduate program involving all departments which lead 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, physiology, genetics and animal management), Microbiology (bacteriology, virology and immunology), Ecology (environmental toxicology), Public Health, and Comparative and Experimental Medicine. (Refer to other sections of this catalog for a full description of these programs.) The majority of the graduate students and graduate faculty of the College of Veterinary Medicine are involved in the Comparative and Experimental Medicine program. This program provides a wide spectrum of interdisciplinary training that prepares graduates for teaching and research careers in the health sciences.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. and Ph.D. programs in Comparative and Experimental Medicine are available to residents of the state of Kentucky. Additional information may be obtained from the Admissions Specialist in the Office of Graduate Admissions and Records.

PROFESSIONAL COURSES

811-12 Microbiology I, 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.

821-22 Anatomy I, II (4,4) Gross and applied anatomy: neural structures of common domestic animals; dog, cat, horse, cow, sheep. Dissection of dissected specimens, sections, slides, models, and living animals.

823-24 Physiology I, II (4,4) Introduction to concepts and problems in physiology which form basis for clinical applications and for formal training in pharmacology, medicine, pathology, and surgery. Cellular, nervous, cardiovascular, renal, respiratory, digestive, endocrine, and reproductive physiology.


827 Special Problems in Animal Science (1-8) Extra-mural and specially designed study for students interested in select topics in anatomy, histology, and physiology.
McCracken, G. F., Ph.D. ..................... Cornell
Pimm, S. L., Ph.D. ........................... New Mexico State
Riechert, Susan E., Ph.D. .................. Wisconsin
Roth, L. Evans, Ph.D. ....................... Chicago
Shevlin, C. A., Ph.D. ........................ Michigan State
Vaughan, G. A., Ph.D. ..................... Duke
Welch, H. G. (Emeritus), Ph.D............ Florida
Whiston, G. L., Ph.D. ........................ Iowa

Associate Professors:
Boake, C. R., Ph.D. ......................... Cornell
Burnham, K. D. (Emeritus), Ph.D ........... Iowa
Draeke, J. A., Ph.D. .......................... Purdue
Fox, David J., Ph.D. .......................... Johns Hopkins
Ganguly, R., Ph.D. ........................... Nebraska
Gittleman, J. L., Ph.D. ..................... Sussex
Greenberg, Neil, Ph.D. ..................... Rutgers
McKee, B. D., Ph.D. ........................... Michigan State
Pan, M., L., Ph.D. ............................ Pennsylvania

Research Associate Professor:
Tindall, R., Ph.D. ............................ Penn State

Assistant Professors:
Hall, J. C., Ph.D. ............................. Illinois
Prosser, R. A., Ph.D. ......................... Illinois

The Department of Zoology offers the Master of Science and Doctor of Philosophy with concentrations in aquatic biology, ecology, cell and molecular biology, physiology, genetics, and reproductive and developmental biology.

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 a 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.

GRADUATE COURSES

403 General Genetics Laboratory (3) Experiments designed to illustrate basic principles of inheritance; primary organism-Drosophila. Prereq: Biology 220. 2 labs.
405-06-11-12 Minicourse in Zoology (2,2,2,2) Select advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for topics offered. Prereq: As announced. May be repeated. Maximum 4 hrs may apply toward zoology major.
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 (3) (Same as Microbiology 430.)
439 Immunology Laboratory (2) (Same as Microbiology 439.)
445 Comparative Animal Physiology (3) Comparison of physiological mechanisms aiding in adaptation to typical habitats and lifestyles. Prereq: Biology 210, 220. 2 yrs of chemistry. Recommended prereq: 360.
449 Laboratory in Physiology (2) Prereq or coreq: 440 or 445.
450 Comparative Animal Behavior (3) Principles and methods of ethology, ecological, developmental, physiological and evolutionary aspects. (Same as Psychology 450.)
455 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 biotic communities and their interrelations. Prereq: Chemistry 120-30 and Biology 230. 2 hrs and 1 lab.
472 Arachnology (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 (4) Evolution, classification, collection and identification, distribution and biology of fishes, fresh-water fauna of Eastern North America. Prereq: Biology 230 or consent of instructor. 2 hrs and 2 labs.
475 Ornithology (3) Behavior, ecology, populations, evolution and 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) (Same as Physical Education 480.)
490 Comparative Endocrinology (3) Comparative analysis of physiology and morphology of endocrine glands in vertebrates and invertebrates, their role and interaction in maintenance of organism and species. Prereq: 440 or equivalent.
500 Thesis (1-15) P/NP only. E
501 Graduate Research Participation (3) Advanced research techniques studied under supervision of staff research director. Open to all graduate students in good standing. Prereq: Consent of department and research director. S/N Only.
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N Only.
504 Special Topics (1-3) Selected directed readings or special course topics in current interest. Consult department listing for offerings. May be repeated with consent of instructor. Maximum 6 hrs. S/N Only.
506 Research Methods (1-3) Instruction in methods and techniques of research. Consult department listing for offerings. May be repeated with consent of instructor. Maximum 9 hrs.
507 Animal Cell Culture (2) Techniques for culture of animal cells, tissues and organs. 1 hr and 1 lab.
510 Introduction to Electron Microscopy - Transmission Electron Microscope (4) Practical application of techniques for preparation of biological samples for viewing in transmission electron microscopy. Use of microscope and ancillary equipment, darkroom techniques, preparation of materials for publication and special project. Admission limited only to departmentally approved graduate students. (Same as Botany 510.) 3-5 hr labs. Sp
511 Introduction to Electron Microscopy - Scanning Electron Microscope (3) Practical introduction to techniques of electron microscopy and to scanning electron microscopy. Use of microscope and ancillary equipment, darkroom techniques, digital image processing, preparation of samples for observation, and special project. Prereq: Consent of instructor. 2 hrs and 1 lab. Sp
513 Advanced Developmental Biology (3) Molecular and cellular aspects of development and morphogenesis; current literature. Recommended prereq: Life Sciences 511-12.
516 Colloquium in Ethology (1) (Same as Psychology 516.)
521 Advanced Mammalian Physiology I (4) (Same as Animal Science 521.)
522 Advanced Mammalian Physiology II (4) Respiratory, gastrointestinal, and reproductive physiology, acid-base mechanisms, and metabolism. Prereq: 521. (Same as Animal Science 522.)
523 Physiology of Hormones (3) Cellular and organ- system action of hormones in vertebrates and invertebrates. Prereq: 490 or consent of instructor. Recommended prereq: Biochemistry 410. 2 hrs and 1 lab.
524 Physiological Ecology of Animals (3) Adaptive physiological response of animals to natural changes in or extremes of physical and biotic environment. Terrestrial vertebrates. Prereq: Undergraduate courses in animal physiology and ecology, 440 and Biology 230 or equivalent.
525 Physiological Ethology (3) Behavioral 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: 490 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.)

547 Conceptual Foundations of Evolution and Behavior (3) (Same as Psychology 547.)

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.)

575 Ecological Genetics (3) Genetics of natural populations, using both single-locus and quantitative genetic approaches. Prereq: 573 and statistics course.

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 College of Liberal Arts.

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

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

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

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.

609 Seminar in Organic Evolution (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.